ECONOMIC DEVELOPMENT AND THE AMERICAN COMMUNITY COLLEGE: A SYSTEMS THEORY APPROACH

BY

WINSTON BOOS RICHTER, JR.

A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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1986
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by
Winston Boos Richter, Jr.
This study is dedicated to

Elsa Lee Neely and Winston Boos Richter, Sr., my parents, who raised me in an atmosphere of love and support.

Suzanne Richter, my wife, a brilliant and long-suffering woman who is still, after 22 years, my best friend.

Miami-Dade Community College, Robert H. McCabe, its current president, and the memory of Peter Masiko, Jr., who welcomed this country boy to Miami and took him downtown.
ACKNOWLEDGEMENTS

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Abstract of Dissertation Presented to the Graduate School of the University of Florida in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

ECONOMIC DEVELOPMENT AND THE AMERICAN COMMUNITY COLLEGE: A SYSTEMS THEORY APPROACH

By

Winston Boos Richter, Jr.

May, 1986

Chairman: James L. Wattenbarger
Major Department: Educational Leadership

The fundamental issue facing community colleges today is that of mission. That every community college exists in a unique environment clearly abrogates the possibility of establishing a universal mission. Previous research has provided only limited guidance for the individual institution seeking to formulate a mission within its own service area. This study developed the theoretical basis and a model process for determining institutional missions via the formal investigation of institutional environments.

The study was conducted in four stages. First, the conceptual framework was developed from a review of the literature related to general systems theory. The community college was identified as a social organization, a subset of open living systems, acutely dependent upon its external environment for essential resources and the legitimization of institutional goals. Second, the economic environment of American community colleges was described on the basis of a further
review of relevant literature. Conditions having direct implications for the nation's present and future training and manpower needs were identified. Third, specific measures by which community colleges across the nation have adapted to these conditions were identified through a third review of relevant literature. These ranged from the provision of conventional occupational education programs to more specialized training and services provided through contracts and state-sponsored partnerships with business and industry. Elements of system-like behavior were identified and discussed.

Fourth, a case study was conducted to determine the environmentally sanctioned mission of one comprehensive, urban community college with regard to the economic development of its service area. A 31-item survey instrument was distilled from the universe of possibilities set forth in the review of nationwide antecedent movements. An expert jury of 100 members rated each item in terms of its perceived importance and eligibility for tax-based support. The data were analyzed and interpreted; implications for policy were discussed. Priorities were established as follows: (1) conventional occupational education programs with strong public support, (2) customized training for business and industry with cost sharing between public and private sources, (3) cooperation with community-based clients primarily with private support, and (4) programs responding to international impingements primarily with private and foreign support.
CHAPTER ONE
INTRODUCTION

The community college, as an educational entity, is young. However, its youth belies its size, rate of growth, and propensity for further development. Becoming increasingly characteristic of the community college is the typical adolescent search for identity. According to Cross (1981), new ideals have not yet emerged to fill the void created by waning enthusiasm and a lost sense of common purpose. "Meanwhile, community colleges sit, not altogether comfortably, on a plateau assimilating and consolidating the social change of the 1950s and 1960s, concerned about what the future holds" (p. 113).

And the future is uncertain. As the flow of traditional college-age students dwindles, other sectors of education have begun to compete for what has customarily been the community college market.

The evidence is considerable, for example, of high schools being pressured to provide better basic education and of four year colleges attempting to inject career education into traditional baccalaureate programs. Both segments of education have for years operated extensive continuing education programs and are now beginning to further their involvement in this area to absorb the many new learners in the higher education marketplace. (Alfred, 1979, p. 23)

Educational subsystems compete, not only for students, but for resources and prestige. In its infancy, the community college opened its doors to those not invited elsewhere; it, therefore, posed no threat even though "the community college was philosophically, geographically, and economically constituted to be all things to all people" (Vaughan, 1984, p. 38).
McCartan (1983), after reviewing the community college literature written between 1979 and 1981, noted that "a need for reflection, reassessment, and reform pervades this writing in a stronger sense than the usual turn-of-the decade analysis" (p. 677). In other words, the dissonance is not just rhetoric, but a cumulative quest for consensus missions, based on the realization that what has been accepted in the past is being challenged by both the students and the taxpayers.

Vaughan (1984) concluded that

the people's colleges are at a point of crisis: they are facing problems never dreamed of when they became a focal point of the nation's drive to democratize higher education. The community college is reexamining its priorities, its resources, and its mission. However, community colleges are failing to come up with definitive answers. Indeed, the community college is facing a crisis of identity that may prove to be as significant as any other event in its development. The decisions made now may well determine the future of a major segment of higher education. (p. 38)

An example of the crisis in mission is the debate regarding whether the associate degree is still the principal function of the community, technical, and junior college. Richardson (1985) insisted that the reasons for the traditional primacy of the degree-granting function are changeless, regardless of time and place. He wrote of community college founders:

They wanted students to have access to degree programs that would make a significant difference in their lives. They did not work to establish institutions to compete with YMCAs in offering leisure time activities or to subsidize private industry in the retraining of their workers. Even though times may change, the needs of important segments of our population have not. (p. 70)

If the various missions, the goals, of a sector of education or of an individual institution are not periodically questioned and systematically evaluated by those involved, others tend to step into the vacuum and assume the evaluative role. The community college is particularly
vulnerable in this regard because it answers to numerous masters. Criticisms come from businesses who hired graduates fresh out of college and were stunned to find how poorly they could read, write, and count. Similar noises came from universities plagued by students whose requisite knowledge for upper-level courses was sorely lacking. The grumbling came from the graduates who learned a pragmatic lesson soon after commencement: a sheepskin does not guarantee the skills to succeed in either the business or academic worlds. Finally, the complaints came from legislators whose threats to take matters into their own hands materialized as mandatory competency tests for diplomas and skepticism about spending any additional money on public education. (Dubocq, 1981, p. 26)

The community college must consolidate its position, its purview, its territory; it must be prudent in the use of scarce public resources; it must reconfirm its role relative to the salvage of individuals not destined for the baccalaureate degree; it must be alert to the economic and political impacts of its programs within the community (Alfred, 1979). When such evaluation is not sought, or sought and not heeded in a responsible manner, the result is an educational institution unresponsive to its community and clients—and the obviation of control to forces outside of the ken of the college.

Community college missions are "truly evolutionary in nature" (Nespoli & Martorana, 1983-84, p. 3). It is the responsibility of each community college to resolve how each of its missions fits into the overall scheme of its own economic-political sphere. Breneman and Nelson (1981) expected community colleges to respond to the uncertainty and challenges ahead in diverse ways, depending upon which direction appears most suited to each institution's particular circumstances. Community college leaders must draw upon the unique strengths of their own institution as they seek to resolve the inevitable dilemma posed by changing missions and restrictive financing. (p. 215)

The mandate for the evaluation of missions by individual community colleges is clear. The time is also propitious for such evaluations to
be of major significance in shaping the future. Nespoli and Martorana (1984) contended:

Recent political history in this country suggests that organizations closest to the needs of the people can be the most effective in playing the political game. As "the people's colleges," community colleges are in a position to play that game very well.

Given the current direction of community college missions, the time is right for a more proactive approach in dealing with public policy makers at the local, state, and even national levels. Whether or not community college leaders will press their advantages to the fullest extent possible remains to be seen. (p. 11)

The Problem

Statement of the Problem

The problem addressed in this study was an application of concepts derived from general systems theory to an investigation of the relationship between the American community college and its economic environment. This was approached in two ways:

1. An analysis of descriptive occurrences in which the economic development activities of American community, junior, and technical colleges demonstrate the actions of an open system adapting to its environment.

2. A determination of the environmentally sanctioned mission of one comprehensive, urban community college with regard to the economic development of its service area.

The theoretical framework that guided the study was constructed from a review of the literature describing the behavior of general systems. A second review of the literature set forth selected characteristics of the economic environment in which American community, junior, and technical colleges exist, and a third review provided details on selected economic development activities undertaken by those
institutions. Starting with conventional occupational education programs, the discussion identified built-in design features for maintaining these in a state of dynamic equilibrium within the environment, then proceeded to describe specific innovations developed in response to currently evolving conditions in the environment. In the process, the description generated a universe of possible initiatives available to any individual institution seeking to determine its mission with regard to the economic development of its service area. These were incorporated into a survey instrument and submitted to an expert jury whose members were selected on the basis of four criteria: (1) their broad knowledge of economic conditions in the local environment, (2) their representative distribution across the spectrum of local business and industry, (3) their prior association with and understanding of the institution, and (4) their political influence within the community. The survey was designed to (1) confirm the institution's current response, (2) provide guidance for future directions, and (3) lay the groundwork for political support by community influential. The specific recommendations sought were at the level of policy, leaving implementation to the discretion of the institution.

Delimitations

The scope and intent of this study were delimited as follows:

1. The description of the economic environment was restricted to conditions having direct implications for the nation's present and future training and manpower requirements. Specifically deleted from consideration were the effects of federal and state policy decisions beyond institutional control, such as
those related to regulation of the money supply, interest rates, foreign exchange rates, and taxes.

2. The description of the community college response was restricted to programs designed to train individuals for immediate employment or to provide direct services to business and industry. Deleted from consideration were programs addressing students' personal, intellectual, or cultural development and programs designed to provide instruction for the first two years of the baccalaureate degree. Though it is widely recognized that many students complete or drop out of university-parallel programs and seek employment, such is incidental to the design of these programs.

3. The programmatic elements admitted into the description of the community college response were restricted to items reported in the literature since 1970.

4. Also deleted from consideration was the economic impact of the college itself via its payroll and its budget for goods, services, and capital expenditure.

5. The survey population was restricted to the environment of one comprehensive urban community college and was further restricted to individuals judged competent to respond.

Limitations

The following limitations are applicable to the design and conclusions of this study:

1. The completeness of the descriptions attributed to the economic environment and the community college response was limited to the level achievable through a review of the literature.
2. The specific elements of the community college response were described in terms of actual or recommended practice. Only to a very limited degree was it possible to evaluate their effectiveness toward accomplishing desired ends.

3. The specific findings of the survey may not be generalizable to institutions existing in other environments.

Justification of the Study

That significant controversy currently surrounds the community college mission, generating the need for continued research on the subject, has been established in the introduction of this chapter. From the broad range of possibilities, the occupational mission was selected as the topic for the research reported here. Three considerations justify that choice. First, the nation's economic welfare depends upon the cultivation of a highly skilled workforce. "Meeting the economic needs of this nation, particularly through human resource development, is our greatest challenge today" (Garrison, 1985, p. 54). "Improving the quality of the labor force is the principal route to increased national productivity, particularly in the coming decade when capital will become scarce and the technology of many nations will be comparable to ours" (Garrison & Korim, 1982, p. 10). Second, nontraditional linkages between business and education are becoming increasingly important. "We have seen remarkable strides by our colleges across grassroots America toward building partnerships with employers and labor" (Garrison, 1985, p. 55). "The private and public sector need look no further for the massive task of job retraining; . . . the community colleges of the nation are ready and willing to undertake the task" (Bundy, 1982-83, p. 44). And third, the role of the community
college with respect to overall national, state, and local economic development is rapidly expanding.

The simple fact of the matter is that today community colleges can no longer serve only to train people for jobs--because these days enough jobs just do not exist--but they must help create and retain those jobs as well. Economic development is far from being solely the colleges' responsibility, but it can no longer be done without them. (Burger, 1984, p. 39)

Missions cannot be analyzed in isolation from financial constraints. Nespoli and Martorana (1984) observed:

When priorities among the three basic missions [university-parallel programs, occupational programs, and developmental programs] are not clear and, even more, when the colleges move beyond them to the area of lifelong learning and related community-based learning activities, then serious questions are raised about what kinds of institutions should be providing these services and who should pay for them. (p. 5)

Wattenbarger (1985) has lamented the paucity of "research relating to the mission of the community college and how it is financed" (p. 64). "It is obvious that most researchers have not attempted to establish a connection between the special mission of the community college and the financial support of these institutions" (p. 65).

Finally, a review of dissertations published since 1970 detected an increased frequency since 1980 of studies related to the economic development mission of community colleges, further evidence of the topic's current significance. For present purposes, such studies can be divided into two groups: (1) studies focusing on a single component of the role, e.g., high technology training (King, 1985), contract training programs (N.D. Smith, 1983), cooperation in union apprenticeship programs (Griffin, 1985), and cooperative work experience opportunities for students (Brightman, 1973); and (2) studies focusing on a broader conception of role but for an entire community college system, e.g., Oregon (Kingry, 1985), California (Averill, 1983), and Maryland (Linck,
1984; Waddell, 1985). These studies were either too narrowly focused or too broadly based to provide sufficient guidance for a single community college seeking to formulate an overall economic development mission within its own service area.

**Definition of Terms**

**Economic development.** In the context of this study, economic development refers to the systematic, organized promotion of economic growth and business activity. As applied to state action, it includes efforts to create new jobs, reduce unemployment, and strengthen the current industrial base. The community college contribution to economic development entails the creation of a highly skilled workforce via conventional occupational education programs and more specialized training and services through contracts and partnerships.

**Economic environment.** For purposes of this study, the economic environment comprises all conditions identified as having direct implications for the nation's present and future training and manpower needs.

**Community college.** For purposes of this discussion, community, junior, technical, and two-year college are used synonymously to refer to institutions providing postsecondary education and training at a level less than the baccalaureate degree.

**Occupational education.** Occupational education refers to credit courses and certificate and degree programs at the postsecondary level, not designed for transfer to senior institutions, but rather leading to direct employment or career advancement upon completion. Occupational education includes such designations as technical, semi-professional,
paraprofessional, and terminal education, but not vocational education, which is reserved for preparation of less than college grade.

**Contract programs.** In a contract program, a community college is effectively hired to design and provide specialized training needed and paid for by an organization. Any public funding is incidental, deriving from the college's discretionary use of its local (ad valorem) support or from the associated enrollment submitted for reimbursement under a state funding formula.

**Partnership.** A partnership is a collaborative arrangement for training or services between a community college and an organization, supported by specially targeted state funding.

**Articulation.** Articulation refers to the alignment or coordination of community college occupational education programs with those offered at the secondary or four-year level or with noncollegiate training programs sponsored by business or public agencies. The essential element is to assure a smooth transition of students from one level to another without unnecessary delay or duplication of effort; articulation agreements may involve the formal award and transfer of credit.

**Career ladder.** This is an expression denoting provisions designed to facilitate students' cycling in and out of the institution for training and retraining throughout their working lives for continuing development and advancement.

**High technology.** High technology industries devote much of their efforts to scientific research and development, or they rely significantly for their products and processes on near-term scientific research. Examples include electronics, computers, robotics, word and data processing, telecommunications, and biotechnology. High technology
training creates the workforce necessary to support high technology industry.

**Technology transfer.** This is the transmission of research and development results to the local or operational level. As contrasted with high technology training, technology transfer entails direct assistance with applications of technology.

**Crosstraining.** Crosstraining is an expression denoting occupational education's long-held goal of teaching broad generic competencies that are transferable across families of occupations.

**Developmental education.** In the context of this study, developmental education is the community college provision designed to prepare students with serious basic skills deficiencies for entry into occupational education programs.

**General education.** In the context of this study, general education is the component of community college occupational education programs designed to strengthen students' information skills and to create well rounded individuals possessing life skills as well as technical skills.

**Information skills.** Information skills refer to the analysis, synthesis, and evaluation of qualitative and quantitative data, including the ability to read critically, to conceptualize, to draw conclusions, and to communicate such understanding verbally or in writing.

**Employability skills.** These skills help a student obtain and keep a job. Included are effective communication, good work habits, appropriate personal appearance, and successful application techniques.
Design/Procedures

Theoretical Framework

The theoretical framework that guided this study was constructed from a review of the literature describing the behavior of general systems. Major concepts were identified and elaborated, and their implications for educational administration were explored. The community college was identified as an open system that prevents the buildup of entropy within its boundary through continual exchange of matter, energy, and information with its environment. The necessity of boundary-spanning agents capable of assessing conditions in the environment and of generating the support of community influential for college initiatives was clearly set forth. That each institution exists in a unique environment clearly abrogated the possibility of establishing a universal mission for all community colleges and motivated the institution-specific survey conducted in this study.

Description of the Economic Environment

A second review of the literature identified selected characteristics of the environment in which American community, junior, and technical colleges exist. Delimited to the economic environment, this description focused on conditions having direct implications for the nation's present and future training and manpower needs. Among these were industry's transformation from goods producing to service producing, the advent of the information age, technological advances, the rapid decline of farm labor and unskilled occupations, increased foreign trade and competition, the disparity between skills possessed and skills
needed by the current workforce, and the poor preparation of incoming students.

The Community College Response to Environment

A third review of the literature provided details on specific measures by which community colleges across the nation have adapted to the previously identified conditions in their economic environment. Characterized as economic development activities, these ranged from the provision of conventional occupational education programs to more specialized training and services provided through contracts and state-sponsored partnerships with business and industry. The review identified a number of components designed to monitor feedback from the service area and maintain programs in a state of dynamic equilibrium. A number of community and international linkages were discovered, as were a number of system inputs judged necessary for successful participation in state-sponsored economic development efforts. The review completed the first branch of the problem posed in this study and provided the basis for accomplishing the second.

Determining the Economic Development Mission of a Single Institution

In applying the systems approach to the study of organizations and their management, it is essential to start with the environmental suprasystem rather than any internal subsystem (Kast & Rosenzweig, 1974). The suprasystem sets the limits of variance for system behavior (Katz & Kahn, 1966). Clearly such application must be done on a case by case basis, due to the uniqueness of each institution's environment. To demonstrate the feasibility of determining a single institution's mission through a formal investigation of its environment, a case study
of one comprehensive urban community college was undertaken. This served the three-fold purpose of (1) validating a model process that other institutions could follow, (2) providing specific directions for the evolving mission of the institution under investigation, and (3) laying the groundwork for political support of that mission by community influencers.

Selection of a subject for study

Two considerations motivated the selection of Miami-Dade Community College as the subject for this case study. First was that institution's recent confirmation as America's most highly regarded community college--a "beacon for the movement toward educational excellence . . . in all aspects of the comprehensive mission of the community college"--by a panel of nationally recognized experts in the community college field (Roueche & Baker, 1985, p. 21). The panel took particular note of the institution's traditional insistence upon developing data to substantiate its results. And second was Miami-Dade Community College's recently stated intention to conduct a two-year investigation of all components of its mission within the service area. This case study was the first step in that investigation, providing a pretest of environmental perceptions and priorities and identifying issues detrimental to political support of the mission by community influentials.

Development of the instrument

The review of literature treating the community college response to environment generated a universe of potential environmental adaptations for consideration by any given institution. These were distilled into a 31-item survey instrument following guidelines laid down by Isaac and
Michael (1978), Best (1977), and Babbie (1973). All three writers agreed on the importance of a cover letter signed by the highest ranking college official available.

Several considerations further guided the selection of items and the construction of the instrument. First was the need to collect quantifiable data on a comprehensive and representative range of possibilities. Two ratings—(1) Important to Do, (2) Support with Tax Funds—were attached to each item, and in view of the data analysis projected, a five-point Likert scale was utilized on both dimensions. Second was the goal to develop recommendations at the level of policy, leaving the details of implementation to the discretion of the institution. The specifics of how the college might provide a particular service were not included in the associated item unless these were judged to be at issue. Third was the need to keep the instrument short enough to secure a usable rate of response from busy high-level executives, and closely related to this was the need to employ nontechnical and unambiguous language so the items would be meaningful to external respondents. A conscious effort was made to define unfamiliar terms in the stems of the questions themselves.

A final consideration was the need to deal with constraints peculiar to the environment of the subject institution. For example, Miami-Dade Community College is not designated as an Area Vocational Center, which, under State of Florida regulations, precludes the institution's offering programs of less than college level. Moreover, in Florida, the Associate of Science degree awarded in occupational programs is defined as nontransferable, rendering moot the question of articulating it with senior institutions. On the other hand, the nearby
regional state university has been assigned official responsibility for service to small business. The judgment was made that with adequate political backing, Miami-Dade could gain entry into this market, hence the inclusion of a related item.

**Pretesting the instrument**

In accord with the previously cited guidelines for questionnaire construction, the survey instrument was extensively pretested and refined with the assistance of Miami-Dade personnel chosen for their specific expertise. The president reviewed the instrument and concluded that the range of items was well matched with the college's aspirations and did not exceed its potential for achievement with suitable political backing. The director and two staff members of the Institutional Research Office suggested several technical revisions and verified that the item scaling was appropriate for the analysis projected. Two English composition teachers provided advice regarding style and word usage, and a reading specialist declared the required reading level to be appropriate for the projected survey population. A group of 10 administrators and faculty having experience in the local business community concluded that the items were sufficiently jargon free to be understood unambiguously. Finally, this group actually completed the questionnaire, requiring an average time of approximately 15 minutes.

**Selection of the survey sample**

Implicit in the case study design were three goals: (1) to elicit environmental sanction of the college's current response, (2) to determine acceptable future directions, and (3) to lay the groundwork for political support of the institutional mission. Thus a conscious
decision was made to select an expert jury rather than a random sample of the business community. Jury members were selected on the basis of four criteria: (1) their reputed broad knowledge of economic conditions in the local environment, (2) their representative distribution across the entire spectrum of local business and industry, (3) their prior association with and understanding of the college, and (4) their standing and political influence within the community. From a mailing list comprising the entire membership of the Greater Miami Chamber of Commerce, the researcher identified 450 persons judged to fit the criteria most closely. This selection was validated by a Miami-Dade team consisting of the president, the dean of occupational education, the director of the college's Center for Business and Industry, and one academic dean.

Collection of data

The survey instrument was mailed to the prospective jury on October 7, 1985, along with a cover letter asking them to complete and return it immediately. The cut off date for returns was set at six weeks; all usable responses received by then were included in the analysis. Numbering 100 in total, the respondents were distributed across the various bands of the business and industry spectrum as follows:

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<th>Category</th>
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<td>Manufacturing</td>
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<td>Service</td>
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<td>Medical</td>
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<td>Retailing</td>
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<tr>
<td>Foreign Trade</td>
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<td>Banking</td>
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<td>Utilities</td>
<td>5</td>
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<td>Communications</td>
<td>10</td>
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<tr>
<td>Small Business</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
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Data treatment

For each item, the arithmetic average of all 100 individual ratings was calculated on the "Important to Do" dimension and on the "Support with Tax Funds" dimension. A percentage of positive responses on each dimension was calculated for each item from the sum of "agree" and "strongly agree" ratings. A percentage of negative responses on each dimension was calculated for each item from the sum of "disagree" and "strongly disagree" ratings. The percentage of undecided responses on each dimension carried the balance for each item. An item ranking from highest to lowest mean was constructed on each dimension; the two rankings were analyzed for general trends. Finally, an analysis of all relevant measurements was conducted on an item-by-item basis. Perceived priorities were assessed and interpreted; implications for policy were discussed.

Organization of the Research Report

The study was introduced in Chapter One. Following a statement of the problem, the delimitations, limitations, and justification of the study were explained; terms were defined, and the study design and procedures were described. In Chapter Two, the relevant literature is reviewed in two sections. The first, focusing upon general systems theory, establishes the theoretical framework that guided the study; the second sets forth selected characteristics of the economic environment in which American community colleges exist. In Chapter Three, specific examples of how these institutions have responded to conditions in their economic environment are discussed. The discussion draws attention to elements of system-like behavior and provides the details from which the
survey instrument was extracted. In Chapter Four, the survey data are presented and analyzed; policy implications are explored. Finally, all components of the study are summarized in Chapter Five; conclusions and recommendations are presented.
CHAPTER TWO
REVIEW OF RELATED LITERATURE

The literature reviewed in this chapter is divided into two major sections: (1) a discussion of general systems theory, which established the conceptual framework that guided the study, and (2) a description of the economic environment in which American community, junior, and technical colleges exist. Concluding each section is a summary that highlights specific implications of immediate relevance to the study.

General Systems Theory

For approximately the last four decades, general systems theory has provided a basis for integrating scientific knowledge across a diverse spectrum of what had been highly specialized and essentially isolated disciplines.

Psychologists, sociologists, anthropologists, economists, and political scientists have been "discovering" and using the system model. In so doing, they find intimations of an exhilarating "unity" of science, because the system models used by biologists and physical scientists seem to be exactly similar. Thus, the system model is regarded by some systems theorists as universally applicable to physical and social events, and to human relationships in small or large units. (Chin, 1961, p. 202)

"General Systems Theory is not a search for vague and superficial analogies between physical, biological, and social systems. Analogies as such are of little value, since beside similarities between phenomena, dissimilarities can always be found as well" (von Bertalanffy, 1956, p. 2).

It does not seek, of course, to establish a single, self-contained "general theory of practically everything" which will replace all the special theories of particular disciplines. Such a theory
would be almost without content; all we can say about practically everything is almost nothing. (Boulding, 1956, p. 11)

General systems theory is concerned with those attributes that systems share by virtue of the fact that they are systems. "A one-to-one correspondence between objects which preserves the relationships between the objects is called an isomorphism" (Hall & Fagan, 1956, p. 24). If two systems "are found to be isomorphic, then either may serve as the model for the other" (Hill, 1972, p. 14). For systems to be isomorphic, it is not necessary that they be identical. Boulding (1956) pointed out that systems are distributed along a continuum of increasing levels of complexity. It is quite possible to make limited comparisons between a relatively elementary, but easily studied, system and a more complex system of interest. The limitation is that relationships will exist in the more complex system that have no analogue in the simpler system. The trend in modern systems theory is toward a parallelism of ideas based on the search for isomorphisms among systems.

The following review of general systems theory is divided into two parts. First is a discussion of major concepts, and second is a synthesis of these concepts and related corollaries into a description of the relationship between the social organization and its environment.

**Major Concepts**

Clarification of major concepts is an essential first step. "No explicit, comprehensive formulation of systems theory exists" (Immegart, 1969, p. 166). Rather, the theoretical base is eclectic, assimilating the contributions of researchers from a broad range of disciplines. Nevertheless, "systems theories are remarkably similar and depart from each other more in terms of emphasis or focus than of substance or form"
(p. 166). In the following discussion, major concepts are treated in turn; isomorphisms of relevance to the management of social organizations are foreshadowed along the way.

System—the central construct

"A conceptual framework for theory building is only as good as the central construct around which it is organized" (Hearn, 1958, p. 38). Accordingly, it would seem highly desirable for the term system to be well defined. The literature abounds with definitions; two examples follow:

A system is defined here as an orderly array of sets of objects, principles, and/or facts so arranged by some form of regular interaction as to present itself as a rational, coherent whole. (Hale, 1971, p. 7)

Any recognizably delimited aggregate of dynamic elements that are in some way interconnected and interdependent and that continue to operate together according to certain laws and in such a way as to produce some characteristic total effect. (Allport, 1955, p. 469)

Kimbrough and Nunnery (1976) provided six more definitions they had culled from the literature. For present purposes, it is sufficient to summarize these as follows: Systems are set off from their environments or suprasystems by boundaries; systems are composed of subsystems; these subsystems interact or have relationships; and it is precisely this capacity for concerted action that makes systems interesting and distinguishes them from a "heap."

It is important to differentiate between concrete and conceptual systems. A concrete system is real and tangible, "a nonrandom accumulation of matter-energy in a region of physical space-time" (Miller, 1978, p. 17). Conceptual systems should be thought of in the symbolic sense as, for example, in a system of mathematical equations, the system of logic utilized in a computer program, or a society's system of
values. A conceptual system may be of intrinsic interest or may be used to model a concrete system, but being composed of words or symbols, a conceptual system has no physical manifestation (Miller, 1978).

**Open systems, closed systems**

A distinction of particular significance in general systems theory is between open systems and closed systems. "A closed system is one with rigid, impermeable boundaries; as such, there are neither inputs nor outputs—no exchange of matter and energy with the environment" (Kimbrough & Nunnery, 1976, p. 77). The value of the closed system concept is that once initial conditions are set, the closed system's future behavior is completely predictable—its fate is preordained. Frequently an investigator will start conceptually with a closed system and introduce outside influences one at a time. This gives a way to manage the complexity of "everything depends on everything else" (Chin, 1961, p. 206).

Open systems represent the opposite set of conditions: permeable boundaries, inputs and outputs, the exchange of matter and energy with the environment. More interaction occurs among subsystems than between the system and its suprasystem; moreover, it takes more energy to transmit matter or information across the system's boundary than is required for such exchanges within the system (Miller, 1955). Most scholars agree that it is practical to think in terms of a continuum along which concrete systems vary from relatively closed to relatively open (Kimbrough & Nunnery, 1976).
Entropy and the first and second laws of thermodynamics

The crucial distinction between open and closed systems is most frequently described in terms of entropy. Considerable confusion attends the concept of entropy, probably because the word appears to have more than one meaning. There is, however, a unifying principle.

To the physicist, energy is the ability to do work. Energy comes in several forms: for example, mechanical (kinetic or potential), electrical, chemical, and nuclear energy, and finally thermal energy or heat. According to the First Law of Thermodynamics, energy can neither be created nor destroyed; it can, however, be converted from one form to another. All forms of energy can be converted into heat, but heat can be converted into other forms only with difficulty, and never completely. In all natural processes in which energy is utilized for doing work, some of the energy is converted into heat and rendered unavailable for further useful work. No perfectly efficient transformations occur in nature. Entropy is simply the quantitative index used to measure the extent to which the energy in a system has been degraded into heat (Adair, 1969; Cooper, 1968; Roemer, 1976).

Statistical mechanics is the branch of physics that attempts to understand the behavior of systems containing many particles—so many that the system may be meaningfully described only in terms of overall configurations (as concentrations here, rarefactions there, and so on). At the microscopic level, the interactions of interest are the numerous elastic collisions among particles and between particles and the walls of a closed container. The net effect of such collisions is for the particles to distribute themselves randomly throughout the available space. A highly ordered configuration—for example, with all of the
particles congregated in one subvolume of the container, leaving effectively a vacuum everywhere else—would be very unlikely. The entropy of a configuration is defined as the logarithm of the probability of its occurrence—the more probable the configuration, the higher its entropy. Maximum entropy corresponds to the most probable state—called the state of equilibrium—the configuration of most random distribution (Cooper, 1968; Murray & Cobb, 1970).

The connection between the two conceptions of entropy flows from the realization that heat is the macroscopic manifestation of the random disorderly motion of vast numbers of molecules at the microscopic level. By contrast, the kinetic energy of the moving parts of a machine is the result of the orderly motion of groups of molecules in concert—a common motion superimposed on the random thermal motion of the molecules composing the parts. As energy is transmitted from part to part, some of it is lost as heat through friction. As this heat is absorbed by the parts, the molecules composing them achieve greater random velocities. The molecules become less cohesive; the structure of parts begin to break down; wear occurs. The process is inevitable and irreversible (Cooper, 1968; Roemer, 1976).

To summarize, in all natural processes, some of the energy utilized is converted to heat and rendered unavailable for further useful work. Moreover the associated natural processes of weathering, erosion, and wear are inexorable and irreversible. In the long run, every closed system approaches equilibrium, the state of maximum entropy, in which all structure has broken down into random distribution, all forms of energy have degenerated into heat, and everything is at a single uniform temperature. This is the Wärmestod, or heat death, of the closed
system. Its description may be considered the most general statement of the Second Law of Thermodynamics (Dolloff, 1975).

It follows that for a system to survive and continue to operate, the system must be open; it must exchange matter-energy with its environment, and it must be capable of carrying out purposeful processes of assembly. Such is the nature of the earth as a whole. The total energy in the earth system is very nearly constant; the energy it receives from the sun is in almost perfect balance with the energy it emits into space in the form of heat. But the input energy is of high grade or low entropy, while the output energy is of low grade or high entropy. The earth system maintains a steady state (characterized by constant entropy) by exporting more entropy than it imports, the difference being just enough to get rid of the entropy produced in all work and ordering processes occurring on earth. It should be recognized, however, that while the total energy of the universe (the earth's suprasystem) remains constant, its total entropy inexorably increases (Cooper, 1968; Roemer, 1976).

Living systems

Living systems, a subset of open systems, are a principal focus in general systems theory and are of primary relevance to the present study because social organizations are an example.

The steady state of a living system is not a static or true equilibrium, but rather a moving or dynamic equilibrium. The body of a living organism continually imports matter-energy in the form of food, water, and oxygen and continually exports products such as wastes, work, and heat. The catabolic and anabolic processes of tissue breakdown and restoration preserve the steady state in such a way that the organism
not only survives, it grows. As time progresses, the organism is not the same organism, but it remains a very similar organism. The character of the system—the ratio of the matter-energy exchanges and the relationships between parts—remains the same. Again, all energy conversions within the body produce entropy, but the exchange in favor of high-grade matter-energy for low-grade matter-energy allows the body to expel the net entropy produced in the life-giving and growth processes (Ford & Monroe, 1977; Katz & Kahn, 1966).

Functional unity. The essential feature of a living system is thus a continuously repeating process of input, transformation, and output of matter-energy and information. The totality of all elements contributing to the accomplishment of a particular process or function in a living system is called a subsystem. The steady state is maintained through the orderly balance and dynamic interplay of these subsystems, each of which exchanges and transforms matter-energy and information in its own right (Immegart & Pilecki, 1973). "Each makes its contribution toward the processes of the whole and receives in return a portion of the benefits derived from these activities" (Miller, 1978, p. 1025). "The state of each unit is constrained by, conditioned by, or dependent on the state of other units; the units are coupled" (p. 16). Moreover, this coupling produces a combined effect that is greater than the sum of its parts. On this basis, Hearn (1958) coined the expression functional unity to describe the "condition in which all parts of the social system work together with a sufficient degree of harmony and internal consistency . . . [to avoid] persistent conflicts that can neither be resolved nor regulated" (p. 46).
Homeostasis. "The definition of a system as boundary maintaining is a way of saying that, relative to . . . fluctuation in factors of the environment, it maintains certain constancies of pattern, whether this constancy be static or moving" (T. Parsons, 1961, p. 215). Changes in the external environment tend to produce comparable changes in the internal environment, and extreme changes in the latter can destroy the functional unity of a living system. In the course of evolution, higher-ordered living systems have developed a number of elaborate self-regulating mechanisms to resist the effects of external changes and keep their internal environments constant to within critical limits (Villee, 1977). This tendency toward constancy is termed homeostasis. Homeostatic processes in the human body, for example, include mechanisms for balancing the concentrations of sugar, salt, and oxygen in the blood, for maintaining constant body temperature, and for the removal of invading organisms from the circulatory system (Lonsdale, 1964). The essential feature is a compensating process to lead the system back to a desired mean whenever it begins to wander away (Beer, 1967).

Feedback. It is now widely recognized that functional unity, boundary maintenance, and homeostasis depend upon feedback. Pfiffner and Sherwood (1960) defined feedback in terms of a circular pattern involving "the flow of information to the point of action, a flow back to the point of decision with information on the action, and then a return to the point of action with new information and perhaps instructions" (p. 299). Ford and Monroe (1977) noted that the function of feedback is to prevent excessive reaction, "in other words, the regulatory machinery must know when enough action has been taken" (p. 286). The process requires a constant flow of information, specific receptors
to read the information, and effectors to carry out the necessary action. Kuhn (1976) distinguished between negative feedback, which is deviation correcting, and positive feedback, which is deviation amplifying. Herreid (1977) noted examples in medicine where positive feedback can set up a "vicious cycle"—as when decreased blood flow due to a severed artery signals the need for increased circulation, which leads to faster bleeding and finally to heart fibrillation. In such cases, unless the positive feedback can be interrupted, death is inevitable.

Numerous authors have commented upon the implications of the feedback concept for the management of organizations, none better than Kimbrough and Nunnery (1976):

First, because the [organizations] vary in their openness, the nature of the feedback, the amount of feedback, and the adequacy of processing of the feedback will vary. Only positive feedback, too little feedback, or inadequate processing can be damaging to an organization in that it will lack appropriate information upon which to decide whether its outputs need modification. Too much negative feedback can be depressing to organizational members. Because the transmission and use of feedback brings about a dissipation of energy, too much feedback results in "system over-load" and enhances the movement toward entropy. Therefore an organization needs a balance of positive (reinforcing) and negative (critical) feedback in amounts that can be processed if it is to maintain a steady state. Second the feedback must be from both internal and external sources. The feedback from internal sources will serve primarily to keep the several organizational subsystems in balance, whereas the information from external sources will serve primarily to tell the organization how its outputs are being received by the environment. (p. 82)

Teleology. Historically, the biologists who sought explanations for teleological behaviors, such as adaptivity, goal-seeking, and purposiveness, were divided into two camps. Vitalists claimed that living organisms "had" something not found elsewhere; mechanists studied the effects but ignored differences between life and nonlife (Russell, 1958). It is now generally agreed among systems theorists that the
principle underlying teleological behavior is that of a cybernetic system responding to environmental feedback, that is, an open system

1. Whose characteristic features depend on certain internal parameters or criterion variables remaining within certain limits;

2. Whose organization has developed a selective sensitivity . . . to environmental things or events of relevance to these criterion variables;

3. Whose sensory apparatus is able to distinguish any deviations of the system's internal states and/or overt behavior from goal states defined in terms of the criterion variables;

4. Such that feedback of this "mismatch" information into the system's behavior directing centers reduces (in the case of negative feedback) or increases (in the case of positive feedback) the deviation of the system from its goal-states or criterion limits. (Buckley, 1967, p. 53)

Equifinality. Teleological behavior has also been characterized in terms of equifinality, defined as "the tendency toward a characteristic final state from different initial states and in different ways, based upon dynamic interaction in an open system attaining a steady state" (von Bertalanffy, 1956, p. 7). The concept flows from a well-known biological finding that a normal organism can develop from a complete egg, from either half of a divided egg, or from the fusion product of two eggs. Granger (1971) broadened the definition to include its logical converse--that identical initial conditions may lead to different final results.

In a closed system, given initial conditions must invariably lead to a predictable final state--static equilibrium characterized by maximum entropy. In open systems, this is not true even at the biological level, much less the social level. Failure to recognize the equifinality of social systems is to miss the point that there are more ways than one to produce a given outcome. Under certain conditions
there may indeed be one best way, but these conditions must be discovered, not assumed (Katz & Kahn, 1966). Accordingly, the function of management may not be "one of seeking a rigid optimal solution, but rather one of having available a variety of satisfactory alternatives" (Kast & Rosenzweig, 1974, p. 119). "Concentration on efficiency per se may be a very inefficient way to manage a system from the overall point of view. In other words, the one best way may not be the optimal way for the whole system" (Churchman, 1968, p. 18). Immediate productivity must sometimes be sacrificed to assure innovation in an organization (V.A. Thompson, 1965).

The Organization in its Environment

In applying the systems approach to the study of organizations and their management, it is essential to start with the environmental suprasystem rather than with any internal subsystem (Kast & Rosenzweig, 1974). "The first step should always be to go to the next higher level of systems organization, to study the dependence of the system in question upon the supersystem of which it is a part, for the supersystem sets the limits of variance of behavior of the dependent system" (Katz & Kahn, 1966, p. 58). "Living systems, whether biological organisms or social organizations, are acutely dependent upon their external environment and so must be conceived of as open systems" (p. 18).

To say that an organization is an open system means more than simply that it engages in interchanges with its environment; such interchange is the essential factor underlying the organization's viability, continuity, and ability to change. The environment is as fundamental as the system itself in accounting for the adaptation and evolution of complex organizations (Buckley, 1967). From this point
of view, an organization's essential function is to define and implement goals that are somehow important to society. Not only does the social environment impose conditions governing the resources an organization can command, it is also the source of higher level support that legitimizes the organization's own goals and makes possible their realization (T. Parsons, 1958).

Nature of the organizational environment

Conceptualizing the organizational environment as an information system, Dill (1964) identified four features of relevance to this study. The first is ambiguity. Organizations rarely encounter problems that are clearly defined and ready for deliberation; even those that initially seem clear-cut often contain hidden complexities. An organization's skill at clarifying issues and defining problems accurately may have more impact upon its continued survival than does its guiding philosophy or the actual choices it makes among alternatives.

The second feature is factorability. While the environment is complex to analyze, not all interactions must be considered at once. Moreover, "simple images of the world can serve very effectively as the basis for predictions, just as simplified models serve to approximate reality in chemistry and physics" (p. 206). The environment provides cues to help in the building of such models: (1) community experts, especially those with enough political power to make their interpretations "stick"; (2) critical events that mobilize public opinion--the effect of Russia's Sputnik on science education being an example; and (3) ready-made models such as professional journals, meetings, and the advice of colleagues.
Dill's third characteristic of the environment is heterogeneity when viewed from different points in the organization. "It matters who discovers that there is a decision to be made. He has special power in defining the problem. By defining it and deciding how to communicate it to others, he determines how it will be handled and what the eventual outcome will be" (p. 208). And finally is the environment's long-run impact on the organization's approach to decision making. "This includes people's decisions to join or stay with the organization, effects on the formal and informal structure of the organization, and effects on the goals and strategies people learn to use in finding, making, and implementing decisions" (p. 208).

Dimensions of environmental influence

No organization is completely independent. In terms of their functions, purposes, resources, and behavior, both public and private organizations are subject to higher level controls. First are the generalized norms of society, as these are expressed by laws, the courts, or the pressure of public opinion. Second is through formal structure—in the case of an educational institution, its board of control, which approves policy, seeks resources from the larger society on behalf of the institution, and helps the larger society understand the institution's contributions. And third are the political arrangements whereby the organization is brought into direct relationship with the larger society, particularly in the matter of financial support (R.F. Campbell, 1964). Other mechanisms of linkage to society are the organization's relationships with people--customers or clients, suppliers of material or manpower, and competitors for markets or suppliers (Duncan, 1972).
Carlson (1964) investigated the extent to which an organization's dependency upon society affects the organization's behavior. The independent variable in his analysis was the element of selectivity in relationships between service organizations and their clients. Organizations in which client participation is mandatory, such as the public schools, were called "domesticated," whereas organizations that are selected by their clients, such as community colleges, were called "wild." Domesticated organizations are seen as necessary to the maintenance of the society they serve; accordingly, their existence is guaranteed. They do not struggle for survival; they are fed and cared for. Wild organizations do struggle for survival, and they can cease to exist. A steady flow of clients is not assured; rather, support for them is closely tied to the quality of performance. Of particular relevance to the present discussion is the importance of adaptation by wild organizations to their changing environments.

Reactions to environmental impingements

According to Chin (1961), an open system in equilibrium reacts to outside impingements in one of three ways. One possibility is to resist the influence of the disturbance by erecting a protective wall or by some other defensive maneuver. By closing its boundaries, however, the system isolates itself from essential resources from the environment and initiates the process increasing entropy (Katz & Kahn, 1966). A second alternative is to restore the initial equilibrium through the action of homeostatic forces. Such is the case when the leadership of an organization convinces itself that an initially perceived problem is not really an issue. Finally, in cases where the environmental impingement is strong enough to overwhelm the homeostatic forces, the third
alternative is for the system to seek a new equilibrium. This reaction is the basis for change or growth, the evolution of internal structure to higher and more complex levels (Buckley, 1967).

Social systems move naturally to incorporate within their boundaries the external resources essential to survival. The result is expansion of the original system, which necessitates supportive subsystems of specialized character that were not required when the system was smaller (Katz & Kahn, 1966). The elaboration of structure to higher and more complex levels was seen by Buckley (1967) as an open-system response to the endless variety of environmental intrusions. Information processing subsystems enable systems to be selective in their interchange with the environment; as systems mature, they become capable of responding, still selectively, to a wider range of environmental details. And the elaboration of structure has also been associated with a system's need to reduce internal and external uncertainty (Rogers & Agarwala-Rogers, 1976). For example, hierarchy provides the expectation that an order will be carried out when passed from superior to subordinate, and a market research department is able to predict changes in customer buying habits.

**Functional unity**

A number of authors have built upon the work of Talcott Parsons (1960), who assigned hierarchical levels to the subsystems of a social organization in terms of function or responsibility. Kast and Rosenzweig (1974), for example, envisioned an operating subsystem level, surrounded by a coordinative subsystem level, surrounded by a strategic subsystem level. Operating subsystems, in the technical core, are concerned primarily with economic-technical rationality, that is, with
accomplishing the stated tasks of the organization effectively and efficiently. The closed-system view is typical at the operating level; systems tend to shield their core technologies from environmental intrusions (J.D. Thompson, 1967); subsystems at the operating level generally "function according to strict programming or highly standardized operating rules" (Miller, 1965, p. 384).

Subsystems at the coordinative level operate between the technical core and strategic level and serve to integrate the specialized activities of both. "Middle management is involved in translating comprehensive plans into operational plans and procedures. It is involved in interpreting the results of the operating system and in focusing existing resources in appropriate directions" (Kast & Rosenzweig, 1974, p. 122). Receiving filtered input from the strategic level, subsystems at the coordinative level further transform "the uncertainty of the environment into the economic-technical rationality necessary for input into the operating subsystems" (p. 120).

Located at the conceptual perimeter of the system, in direct interface with the environment, are the strategic-level subsystems. Strategic subsystems deal constantly with environmental uncertainties and ambiguities and are concerned with long-range, comprehensive planning. The open-systems view is typical at the strategic level—a concentration on adaptation and innovation, that is, on maintaining a moving equilibrium. General processes at the strategic level are not programmable but are more a matter of finding creative solutions to complex, ill-defined problems. The strategic level, and in turn the coordinative level, buffers the technical core against non-routine inputs from the environment (Kast & Rosenzweig, 1974).
Dynamic equilibrium

Unquestionably, a primary function of strategic administration is to assure system stability. But too much stability can become rigidity, a fragile condition prone to disintegration under the stress of disturbances from inside or outside the system (Lonsdale, 1964). Therefore, a second primary function of strategic administration is to assure the flexibility necessary to accommodate disturbances—to initiate new structures or procedures when needed, to revise the organization's goals, in Lipham's (1964) terminology, to rise above administration to the level of leadership. In systems language, the leader must try to promote desirable innovation while at the same time maintaining a state of dynamic equilibrium in the system (Morphet et al., 1982). The ideal is that "median range within which flexibility and stability optimize the capacity for survival" (Stogdill, 1959, p. 286).

Conceptually, a system's boundaries serve to filter and homogenize inputs from the environment, a vital function because it is impossible for an organization to deal with all possible inputs. Moreover, the organization cannot perform an unlimited variety of transformation operations, but must identify its own niche. Thus a system's boundary is seen as filtering outputs also (Kast & Rosenzweig, 1974). To maintain a degree of openness sufficient to cope with charging external conditions, the system has need of boundary-spanning agents or "cosmopolitans" (J.D. Thompson, 1967). These are individuals, primarily strategic administrators, with a relatively high degree of exposure to the environment; their function is to facilitate communications so as to assure a continuous flow of new ideas into the system (Rogers & Agarwala-Rogers, 1976). It has been hypothesized that cosmopolitan
actors are more likely than local actors to initiate change in an organization (Goldner, 1957).

Nature of organizational change

According to Chin (1961) the nature of change in an organization may be understood in terms of four characteristics. Organizational changes have direction; the system is "going somewhere." The direction may be defined by some goal or desired end state or by the process of maturation. In either case, the change proceeds through identifiable states. These may be small almost nondiscernable shifts, or great and sudden leaps, usually brought on by cataclysmic events in the external environment. Four alternative forms of progression are possible: (1) undirectional, with regression viewed as abnormal; (2) spiral, with previously treated problems dealt with at a higher level, that is, with fewer irrational distractions; (3) oscillation between occurring and recurring stages, with no chronological priority; and (4) branching out into differentiated forms, with each subsystem increasing its specialization. Three possibilities exist with regard to the forces causing change: (1) change is an inborn trait, which conditions in the environment simply trigger or release; (2) change is a coping response to new environmental forces; and (3) change can result from internal tensions as well as external ones. Finally, the potentiality for change is built into any current state of the system, and environmental conditions to effectuate change are generally present.

In summary, Chin (1961) incorporated the several characteristics of organizational change into a composite "model for changing," which focuses attention directly upon environmental forces inducing change, views stability in terms of "unfreezing" the relative positions of
subsystems, and assumes that the direction of change is not pre deter-
mined but remains largely a matter of organizational choice.

Problem solving

According to Benne (1961), the key element in effective problem
solving by any social system is the methodology it has institutionalized
for dealing with disequilibration. The norms of optimum re-equilibra-
tion in a social system are as follows:

1. Problem solving should be experimental rather than stereotyped
and inflexible in its modes of response. This requires feedback
mechanisms sensitive to external impacts and subsystem
functioning, "plus adequate coding and coordinating mechanisms
to translate feedback information into appropriate responses"
(p. 231).

2. Problem solving should be collaborative. The leadership
function becomes the achievement of decisive cooperation among
all subsystems, relevant to analyzed conditions in the external
environment.

3. Problem solving should be task oriented. "Channeling of energy
toward maintenance of nonfunctional prestige systems within the
system detracts from the availability of energy for creative
responses" (p. 232). Power should be balanced between sub-
systems for maintenance and adaptation.

4. Problem solving should be educational. The optimization of
future problem solving depends upon the increasing maturity of
the subsystems involved in change.

5. Effective and efficient problem solving requires channels of
communication for undistorted transmission of all relevant data
to every subsystem involved in the processes of orientation, evaluation, and decision.

**Barriers to growth**

Benne (1961) identified the barriers to growth in social systems as deriving from methodological incapacities and other elements of system pathology. These are as follows:

1. Confusion of the ideological image of the system with its actual behavior. **Tension** between the actuality and potentiality of functioning is healthy; **confusion** between them indicates a limited capacity for objectivity.

2. Inadequate or unbalanced feedback processes. Symptoms include mechanisms that transmit partial information, that rationalize away information contrary to the system's self-image, and that are insensitive to disarticulation either among subsystems or between the system and the environment.

3. Suppression of dominant feelings in the process of decision making. This may be manifested as a "scientistic" norm that denies all feelings as irrelevant to decision making, or as an "authoritarian" norm that disregards feeling-data from certain subordinate subsystems.

4. Narrow time perspective. Chronic failure to perceive long-range consequences of decisions leads to a pattern of living from crisis to crisis.

5. Inadequate or unbalanced role differentiation. "Some roles may be too abundant, judged by situational requirements; others may be missing. Coordination among differential roles may be lacking" (p. 233).
6. Inadequate or inaccurate processes for interpreting feedback. Interpretive skills or concepts may be missing or narrowly distributed across the system. Relevant values and criteria may be insufficiently articulated, and spending time on diagnosis and interpretation may be discouraged.

7. Inaccurate perception of limits and alternatives. Actual limitations of potentiality may be ignored or denied; alternative capabilities may be overlooked or dismissed prematurely.

8. "Lack of adequate mechanisms for mediation and adjustment of conflicts between parts of the system and between the system and other systems in the environment" (p. 233).

**Inputs essential for change**

As open systems, educational institutions are subject to a broad range of overlapping influences from the environment. "Educational policy has its genesis in basic social, economic, political, and technical forces; its generation in nationwide antecedent movements . . .; its promotion by educators and lay citizens . . .; and finally, its formalization in legal expression by local, state, or national government" (R.F. Campbell, 1964, p. 290). Accordingly, all information resources of the institution and of the larger society should be employed in analyzing environmental conditions for potential impact upon the instructional program. Decisions to retain or modify programs should also reflect the input of informed sources from both inside and outside the institution. Effective proposals for change must make sense to laymen as well as professionals, for ultimately it is laymen who transform recommended policy into political reality. As politics involves a compromise between what is desirable and what is possible, it
is well to remember that the latter "is largely a perception of what the
people involved can be persuaded to accept" (p. 291). In this regard,
the support of community opinion leaders is essential. "Only with the
help of these laymen will the community respond with resources necessary
for the school enterprise" (p. 292).

Summary

Community colleges are social organizations, a subset of open, living systems. As such, they are acutely dependent upon their external environments for essential resources and the legitimization of institutional goals. While the environment is ambiguous and heterogeneous when viewed from different points in the institution, it is factorable so that interactions may be analyzed one at a time. Sources of information about the environment include community experts, the professional literature, and critical events as interpreted by cosmopolitan actors within the organization.

The essential function of the community college is to define and implement goals recognized as necessary by society. Absent the distinct advantage of domestication, the support of community colleges is closely tied to the quality of institutional performance; accordingly, adaptation to environmental changes is imperative. The accomplishment of such adaptation is clearly the responsibility of strategic level administration. A collateral function is to maintain organizational stability by buffering the technical core from non-routine inputs from the environment. The literature of systems theory provides a number of suggestions to facilitate the accomplishment of this dual role.
Finally, the formulation of institutional change requires the assessment of nationwide antecedents and the input of community experts. Moreover, its transformation into political reality requires the support of community influentials. These concepts guided the design and conduct of the case study of one institution; they underlie the institution's projected usage of the research findings.

Description of the Economic Environment

For purposes of this study, the complex matrix of all possible environmental impingements upon American community colleges was factored to isolate one component of manageable proportions. That component, the economic environment, was further delimited to conditions having direct implications for the nation's present and future training and manpower needs. The following description is partitioned into six sections: (1) The Projected Distribution of Employment, (2) High Technology, (3) The Information Age, (4) International Perspectives, (5) The Changing Labor Force, and (6) The American Skills Crisis.

Projected Distribution of Employment

Every two years, the U.S. Bureau of Labor Statistics publishes employment projections covering roughly 12 years. Recognizing the uncertainty inherent in all such efforts, the Bureau prepares three separate estimates for each industry. Referred to as the low-, moderate-, and high-growth alternatives, these are based on different assumptions regarding availability of energy, technological change, level of imports, consumer desire, unemployment, and the fiscal and monetary policies of the federal government. The latest projections, extending through 1995, are contained in the Occupational Outlook...

In 1982, approximately 66.5 million workers, 71 percent of the civilian workforce, were employed in industries that provide services, such as health care, trade, education, repair and maintenance, business services, transportation, banking, and insurance. By 1995, employment in service-producing industries is expected to increase to 86.2 million workers, or by 30 percent. This increase represents about three-fourths of all new jobs to be created during the 13-year period. Growth within each of the five sectors of service-producing industries is predicted as follows.

Transportation, communications and public utilities. Predicted is an increase from 5.7 million workers in 1982 to 6.9 million workers in 1995, or 21 percent growth. Employment in transportation will increase from 3.5 million to 3.9 million, or by 12 percent. Railroad and water transportation will decline; air traffic, local transit, and trucking will increase. Employment in communications will increase from 1.4 million to 1.9 million, or by 40 percent, the fastest growth rate in the sector, reflecting rising demand for new telecommunications services and divestiture of the telephone company. Employment in public utilities will rise from 868,000 to 1.1 million, or by 25 percent, reflecting increased demand for energy and sanitation services as industry and the population expand.
Trade. Predicted is an increase from 20.6 million workers in 1982 to 26.8 million workers in 1995, or 31 percent growth. Retail will grow faster than wholesale, 33 percent to 22 percent. Employment will rise despite self-service merchandising and computerized inventory systems. The largest number of new jobs will be in eating and drinking establishments.

Finance, insurance, and real estate. Predicted is an increase from 5.4 million workers in 1982 to 7.2 million workers in 1995, or 34 percent growth. This was the fastest growing sector in the service-producing group during the 1970s and early 1980s. Strong growth will continue, but automatic teller machines and computerized banking and stock transactions will prevent employment from growing as fast as output.

Services. Predicted is an increase from 27.5 million workers in 1982 to 37.2 million workers in 1995, or 36 percent growth. This broad sector includes hotels, barber shops, automobile repair, hospitals, engineering firms, business services, schools, and nonprofit organizations. It will provide more new jobs than any other sector in the service-producing group, nearly half the group's total, and 1.6 times as many new jobs as the entire goods-producing group. Business services, particularly data processing, accounting, personnel supply, and commercial cleaning, will expand most rapidly; health, engineering, legal, and social services will increase substantially.

Government. Predicted is an increase from 7.5 million workers in 1982 to 8.0 million workers in 1995, or 8 percent growth. This is the lowest growth rate among service-producing industries, reflecting public
desire to limit the size of government. State and local government will increase more than federal.

In 1982, approximately 27.1 million workers, 29 percent of the civilian workforce, were employed in industries that produce goods through farming, construction, mining, and manufacturing. By 1995, employment in goods-producing industries is expected to rise to 33.0 million workers, or by 22 percent. Constituting 29 percent of all new jobs, much of the increase represents a rebounding by manufacturing and construction to levels existing before the recessions of 1980 and 1981-82. Growth within each of the four sectors of goods-producing industries is predicted as follows.

**Agriculture.** Predicted is a decrease from 3.2 million workers in 1982 to 3.0 million workers in 1995, or seven percent decline. Domestic demand for food will increase slowly; worldwide demand will increase steadily, and U.S. food exports will increase. Due to the use of better machinery, fertilizers, feeds, and pesticides, employment will decrease while production increases.

**Mining.** Predicted is an increase from 1.1 million workers in 1982 to 1.2 million workers in 1995, or 7 percent growth. Mining was the fastest growing goods-producing sector during the 1970s and early 1980s. Growth through 1995 will slow dramatically as domestic gas and oil extraction levels off. Coal mining will continue to grow; other mining industries will regain pre-recession employment levels but experience little growth beyond because of improved technology.

**Construction.** Predicted is an increase from 3.9 million workers in 1982 to 5.8 million workers in 1995, or 48 percent growth. After steady growth throughout the 1970s, employment in construction dropped by
550,000 during the recessions of 1980 and 1981-82. As the economic recovery proceeds, construction employment will regain pre-recession levels and continue to rise due to growth in the number of households, business expansions, and increased demand for maintenance and renovation.

Manufacturing. Predicted is an increase from 18.8 million workers in 1982 to 23.1 million workers in 1995, or 23 percent growth. Recession caused a 2.2 million drop in manufacturing employment between 1979 and 1982. Steel and automobile manufacturing are not expected to regain previous peak employment levels, due to foreign competition and improved productivity. Durable goods manufacturing employment will increase by 29 percent, reflecting increased demand for computers, machinery, and electronic components. Employment in nondurable goods manufacturing will grow by only 14 percent, reflecting strong foreign competition in textiles and apparel.

Thus, the economy is expected to generate 25.6 million new jobs between 1982 and 1995--19.7 million in service-producing industries and 5.9 million in goods-producing industries. But the details of employment growth across the nine sectors of industry tell only half the story--who the employers might be, not necessarily what the employees might be doing. A single large manufacturing company, for example, may employ a wide range of personnel, including scientists, engineers, designers, machinists, assemblers, managers, secretaries, data processors, custodians, and guards. Moreover, managers, secretaries, data processors, and many other classifications are employed throughout the entire spectrum of industry. Job distributions across companies in the nine sectors differ both in kind and in proportion. Because of this,

**Scientists and engineers.** Predicted is an increase from 1.5 million workers in 1982 to 2.2 million workers in 1995, or 47 percent growth. Causitive factors include increased military expenditures, growing demand for computers and electronic equipment, expansion and automation of industry, and continuing emphasis on research and development. Employment for electronic, mechanical, and systems engineers will increase much faster than the average. Competition will be stiff for university positions and those dependent upon federal funding.

**Science and engineering technicians.** Predicted is an increase from 1.2 million workers in 1982 to 1.7 million workers in 1995, or 42 percent growth. Continued growth in the importance of technology to national defense, office work, and manufacturing will cause much faster than average employment growth for this group, particularly electrical and electronic technicians. Little or no change is expected for drafters, due to increasing use of computer-aided design equipment, or for air traffic controllers, due to automation.

**Health professionals.** Predicted is an increase from 2.5 million workers in 1982 to 3.5 million workers in 1995, or 46 percent growth. Employment will grow much faster than average as population growth, especially among older people, increases the demand for health care. Registered nurses, and respiratory, physical, and occupational
therapists will experience the greatest demand. Doctors, dentists, and veterinarians seeking to establish new practices can expect strong competition.

**Health technicians.** Predicted is an increase from 627,000 workers in 1982 to 898,000 workers in 1995, or 43 percent growth. Faster than average growth is predicated upon the assumption that health financing will not change drastically. Substantial changes in reimbursement procedures, affecting the economic incentives of major providers, would decrease employment in most categories, but could increase employment of medical records technicians.

**Other professionals.** Predicted is an increase from 9.8 million workers in 1982 to 12.1 million workers in 1995, or 22 percent growth. Because of the large number of people entering these fields and less than average employment growth, stiff competition for jobs is predicted for social scientists, social workers, teachers, librarians, and counselors. Opportunities for lawyers, accountants, and architects will remain plentiful; opportunities for elementary and kindergarten teachers will improve in the early 1990s.

**Other technicians.** Predicted is an increase from 885,000 workers in 1982 to 1.4 million workers in 1995, or 58 percent growth. This category is dominated by computer specialists, programmers, and systems analysts. Rapidly expanding application of computers across the entire industrial spectrum will generate much higher than average demand for these workers.

**Administrators and managers.** Predicted is an increase from 9.5 million workers in 1982 to 12.2 million workers in 1995, or 28 percent growth. In most of these occupations, employment will increase about as
fast as average for all occupations. Faster than average growth is expected for managerial employment in the health care industry, electronic components manufacturing, data processing services, credit and securities firms, automobile repairs, and social services. Slower than average growth is expected for managerial employment in government and education.

Marketing and sales occupations. Predicted is an increase from 7.0 million workers in 1982 to 8.8 million workers in 1995, or 26 percent growth. Workers in this group sell goods or services. Employment of travel agents, securities salespersons, real estate agents, and wholesalers will grow faster than for others due to growth of the corresponding industries. Both full- and part-time employment in retail sales will remain plentiful, due to large turnover. Competition will be intense for higher paying sales jobs.

Administrative support, including clerical. Predicted is an increase from 19.0 million workers in 1982 to 24.0 million workers in 1995, or 26 percent growth. Workers in this category are employed across the entire industrial spectrum. The fastest growing opportunities will be for data processors and operators of computers, peripheral equipment, and office machines. Due to high turnover and large numbers, opportunities will remain plentiful for bank tellers, bookkeepers, accounting clerks, secretaries, shipping and receiving clerks, and typists.

Craft workers. Predicted is an increase from 11.6 million workers in 1982 to 14.8 million workers in 1995, or 28 percent growth. This broad category includes skilled workers in the metal working, printing, and construction trades, along with mechanics, repairers, and
installers. Employment growth approximating the industrywide average reflects the restoration of pre-recession levels. Much higher than average growth is predicted for employment of computer service technicians and office machine repairers.

Operatives. Predicted is an increase from 9.4 million workers in 1982 to 11.1 million workers in 1995, or 18 percent growth. This category includes assembly line workers and various machine operators in the metalworking, lumber, furniture, garment, and food production industries. Lower than average growth reflects failure to regain pre-recession employment levels in certain large sectors such as the automobile industry. Increased use of automated production techniques is reflected across the board.

Transportation workers. Predicted is an increase from 3.6 million workers in 1982 to 4.3 million workers in 1995, or 19 percent growth. Workers in this category operate the equipment used to move people or materials. Economic recovery is expected to result in average growth in employment for airplane pilots and truck drivers. Increased use of automated materials handling systems will limit opportunities for others.

Service occupations. Predicted is an increase from 15.2 million workers in 1982 to 20.0 million workers in 1995, or 31 percent growth. This category includes a wide range of workers in industries providing protective services, food and beverage preparation, cleaning, and personal services. Guards are expected to realize faster than average employment growth because of increased concern over crime and vandalism; police officers and fire fighters will find fewer opportunities because of slow growth in local government spending. Rising incomes, increased
leisure time, and the growing number of two-job families will contribute to faster than average employment growth among food and beverage preparation and child care workers.

Private household workers. Predicted is a decrease from 1.0 million workers in 1982 to 850,000 workers in 1995, or 17 percent decline. Though opportunities will remain plentiful, employment will decline because of low wages and social status and lack of advancement opportunities.

Laborers. Predicted is an increase from 5.9 million workers in 1982 to 7.1 million workers in 1995, or 20 percent growth. Jobs in these occupations will be plentiful due to the high turnover rate. Availability is sensitive to economic fluctuations, particularly for construction laborers. In the long run, employment growth will slow as more and more routine tasks are mechanized.

Farmers and farmworkers. Predicted is a decrease from 2.7 million workers in 1982 to 2.4 million workers in 1995, or 11 percent decline. The demand for food, fiber, and wood will increase as the world's population grows, but more productive methods will continue to reduce employment as output grows.

Finally, to recover some significant detail lost in the aggregation process utilized in the foregoing summary, Table 2-1 presents specific data on the 40 detailed occupations that are predicted to generate the largest amount of employment growth between 1982 and 1995. It should be noted that, among them, these 40 occupations will produce half of the 25.6 million new jobs predicted for all 1700 recognized occupations between 1982 and 1995 (Silvestri et al., 1983). Table 2-2 presents in
rank order the 20 occupations predicted to generate the largest percentage growth in employment between 1982 and 1995 (Silvestri et al., 1983).
### TABLE 2-1
Forty Occupations Producing largest Number of New Jobs 1982-1995

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Change in total employment (in thousands)</th>
<th>Percentage of total job growth</th>
<th>Percent change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building custodians</td>
<td>779</td>
<td>3.0</td>
<td>27.5</td>
</tr>
<tr>
<td>Cashiers</td>
<td>744</td>
<td>2.9</td>
<td>47.4</td>
</tr>
<tr>
<td>Secretaries</td>
<td>719</td>
<td>2.8</td>
<td>29.5</td>
</tr>
<tr>
<td>General clerks, office</td>
<td>696</td>
<td>2.7</td>
<td>29.6</td>
</tr>
<tr>
<td>Sales clerks</td>
<td>685</td>
<td>2.7</td>
<td>23.5</td>
</tr>
<tr>
<td>Nurses, registered</td>
<td>642</td>
<td>2.5</td>
<td>48.9</td>
</tr>
<tr>
<td>Waiters and waitresses</td>
<td>562</td>
<td>2.2</td>
<td>33.8</td>
</tr>
<tr>
<td>Teachers, kindergarten and elementary</td>
<td>511</td>
<td>2.0</td>
<td>37.4</td>
</tr>
<tr>
<td>Truck drivers</td>
<td>425</td>
<td>1.7</td>
<td>26.5</td>
</tr>
<tr>
<td>Nursing aides and orderlies</td>
<td>423</td>
<td>1.7</td>
<td>34.8</td>
</tr>
<tr>
<td>Sales representatives, technical</td>
<td>386</td>
<td>1.5</td>
<td>29.3</td>
</tr>
<tr>
<td>Accountants and auditors</td>
<td>344</td>
<td>1.3</td>
<td>40.2</td>
</tr>
<tr>
<td>Automotive mechanics</td>
<td>324</td>
<td>1.3</td>
<td>38.3</td>
</tr>
<tr>
<td>Supervisors of blue-collar workers</td>
<td>319</td>
<td>1.2</td>
<td>26.6</td>
</tr>
<tr>
<td>Kitchen helpers</td>
<td>305</td>
<td>1.2</td>
<td>35.9</td>
</tr>
<tr>
<td>Guards and doorkeepers</td>
<td>300</td>
<td>1.2</td>
<td>47.3</td>
</tr>
<tr>
<td>Food preparation and service workers, fast food restaurants</td>
<td>297</td>
<td>1.2</td>
<td>36.7</td>
</tr>
<tr>
<td>Managers, store</td>
<td>292</td>
<td>1.1</td>
<td>30.1</td>
</tr>
<tr>
<td>Carpenters</td>
<td>247</td>
<td>1.0</td>
<td>28.6</td>
</tr>
<tr>
<td>Electrical and electronic technicians</td>
<td>222</td>
<td>.9</td>
<td>60.7</td>
</tr>
<tr>
<td>Licensed practical nurses</td>
<td>220</td>
<td>.9</td>
<td>37.1</td>
</tr>
<tr>
<td>Computer systems analysts</td>
<td>217</td>
<td>.8</td>
<td>85.3</td>
</tr>
<tr>
<td>Electrical engineers</td>
<td>209</td>
<td>.8</td>
<td>65.3</td>
</tr>
<tr>
<td>Computer programmers</td>
<td>205</td>
<td>.8</td>
<td>76.9</td>
</tr>
<tr>
<td>Maintenance repairers, general utility</td>
<td>193</td>
<td>.8</td>
<td>27.8</td>
</tr>
<tr>
<td>Helpers, trades</td>
<td>190</td>
<td>.7</td>
<td>31.2</td>
</tr>
<tr>
<td>Receptionists</td>
<td>189</td>
<td>.7</td>
<td>48.8</td>
</tr>
<tr>
<td>Electricians</td>
<td>173</td>
<td>.7</td>
<td>31.8</td>
</tr>
<tr>
<td>Physicians</td>
<td>163</td>
<td>.7</td>
<td>34.0</td>
</tr>
<tr>
<td>Clerical supervisors</td>
<td>162</td>
<td>.6</td>
<td>34.6</td>
</tr>
<tr>
<td>Computer operators</td>
<td>160</td>
<td>.6</td>
<td>75.8</td>
</tr>
<tr>
<td>Sales representatives, nontechnical</td>
<td>160</td>
<td>.6</td>
<td>27.4</td>
</tr>
<tr>
<td>Lawyers</td>
<td>159</td>
<td>.6</td>
<td>34.3</td>
</tr>
<tr>
<td>Stock clerks, stockroom and warehouse</td>
<td>156</td>
<td>.6</td>
<td>18.8</td>
</tr>
<tr>
<td>Typists</td>
<td>155</td>
<td>.6</td>
<td>15.7</td>
</tr>
<tr>
<td>Delivery and route workers</td>
<td>153</td>
<td>.6</td>
<td>19.2</td>
</tr>
<tr>
<td>Bookkeepers, hand</td>
<td>152</td>
<td>.6</td>
<td>15.9</td>
</tr>
<tr>
<td>Cooks, restaurant</td>
<td>149</td>
<td>.6</td>
<td>42.3</td>
</tr>
<tr>
<td>Bank tellers</td>
<td>142</td>
<td>.6</td>
<td>30.0</td>
</tr>
<tr>
<td>Cooks, short order, specialty and fast food</td>
<td>141</td>
<td>.6</td>
<td>32.2</td>
</tr>
</tbody>
</table>

Note: Includes only detailed occupations with 1982 employment of 25,000 or more. Data for 1995 are based on moderate-trend projections.

Source: Silvestri, Lukasiewicz, and Einstein (1983)
### TABLE 2-2
Twenty Fastest Growing Occupations 1982-1995

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Change in total employment (in thousands)</th>
<th>Percentage of total job growth</th>
<th>Percent growth in employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer service technicians</td>
<td>53</td>
<td>0.2</td>
<td>96.8</td>
</tr>
<tr>
<td>Legal assistants</td>
<td>43</td>
<td>0.2</td>
<td>94.3</td>
</tr>
<tr>
<td>Computer systems analysts</td>
<td>217</td>
<td>0.8</td>
<td>85.3</td>
</tr>
<tr>
<td>Computer programmers</td>
<td>205</td>
<td>0.8</td>
<td>76.9</td>
</tr>
<tr>
<td>Computer operators</td>
<td>160</td>
<td>0.6</td>
<td>75.8</td>
</tr>
<tr>
<td>Office machine repairers</td>
<td>39</td>
<td>0.2</td>
<td>71.7</td>
</tr>
<tr>
<td>Physical therapy assistants</td>
<td>22</td>
<td>0.1</td>
<td>67.8</td>
</tr>
<tr>
<td>Electrical engineers</td>
<td>208</td>
<td>0.8</td>
<td>65.3</td>
</tr>
<tr>
<td>Civil engineering technicians</td>
<td>23</td>
<td>0.1</td>
<td>63.9</td>
</tr>
<tr>
<td>Peripheral EDP equipment operators</td>
<td>31</td>
<td>0.1</td>
<td>63.5</td>
</tr>
<tr>
<td>Insurance clerks, medical</td>
<td>53</td>
<td>0.2</td>
<td>62.2</td>
</tr>
<tr>
<td>Electrical and electronic technicians</td>
<td>223</td>
<td>0.9</td>
<td>60.7</td>
</tr>
<tr>
<td>Occupational therapists</td>
<td>15</td>
<td>0.1</td>
<td>59.8</td>
</tr>
<tr>
<td>Surveyor helpers</td>
<td>23</td>
<td>0.1</td>
<td>58.6</td>
</tr>
<tr>
<td>Credit clerks, banking and insurance</td>
<td>26</td>
<td>0.1</td>
<td>54.1</td>
</tr>
<tr>
<td>Physical therapists</td>
<td>26</td>
<td>0.1</td>
<td>53.6</td>
</tr>
<tr>
<td>Employment interviewers</td>
<td>29</td>
<td>0.1</td>
<td>52.5</td>
</tr>
<tr>
<td>Mechanical engineers</td>
<td>109</td>
<td>0.4</td>
<td>52.1</td>
</tr>
<tr>
<td>Mechanical engineering technicians</td>
<td>24</td>
<td>0.1</td>
<td>51.6</td>
</tr>
<tr>
<td>Compression and injection mold machine operators, plastics</td>
<td>47</td>
<td>0.2</td>
<td>50.3</td>
</tr>
</tbody>
</table>

Note: Includes only detailed occupations with 1982 employment of 25,000 or more. Data for 1995 are based on moderate trend projections.

Source: Silvestri, Lukasiewicz, and Einstein (1983)
High Technology

High technology is a broadly construed expression referring generally to developments and applications closely associated with near-term scientific research and heavily dependent upon workers with advanced education and training (Levin, 1984). Product and process sophistication are other widely ascribed attributes, as reflected in Watcke's (1982-83) list of high technology industries presented in Table 2-3. High technology's relevance to this description of the economic environment stems principally from its implications for employment and its impact upon the operations of business and industry.

TABLE 2-3
High Technology Industries

- Genetic Engineering
- Telecommunications Equipment
- Pharmaceuticals/Health Chemicals
- Energy and Power Supplies
- Bio-Medical Equipment (medical scanners, pacemakers, implants)
- Computer Equipment (peripherals)
- Computer Software and Supplies
- Security Detection Equipment (fire emergency)
- Home Computers
- CAD/CAM Systems
- Mainframe Computers
- Office Automation Equipment (word processing)
- Semiconductors/Integrated Circuits
- Lasers and Infrared Equipment
- CATV (cable television)
- Microwave Equipment
- Military Systems
- Test Equipment (quality assurance)
- Electromechanical Components (robots and numerical control)

Source: Watcke (1982-83)
Used by permission
Employment capacity of high technology industry

That employment in high technology industry is growing rapidly is well known but widely misinterpreted. Between 1972 and 1982, while total employment in America increased by 20.1 percent, employment in high technology industry increased by 39.8 percent, or nearly twice as fast. Between 1982 and 1995, the American economy is expected to produce an additional 25.6 million jobs, an increase of 25.2 percent. During this period, employment in high technology industry is expected to increase by 34.5 percent, but the corresponding 4.3 million jobs will be only about 16 to 17 percent of all new jobs (Riche et al., 1983). Thus while employment in high technology industry will continue to grow faster than for industry overall, the great majority of new jobs will be produced in other sectors. "Displaced workers and others seeking jobs, and governmental and community organizations seeking to attract jobs to their regions, would be well advised not to limit their search to high tech industries only" (p. 54).

Of course, nationwide averages tend to mask regional concentrations. High technology employment can have significant impact on a local economy, as has been vividly demonstrated in California's Silicon Valley and the Route 128 area in Massachusetts and New Hampshire ("America Rushes," 1983). In a relatively short period, these areas have developed substantial employment in high technology industry. In Metropolitan San Jose, which contains Silicon Valley, 37.5 percent of total nonagricultural employment in 1982 was in high technology industry. Between 1975 and 1982, high technology industry generated 43.1 percent of all new jobs in New Hampshire and 35.2 percent of those in Massachusetts. By 1983, high technology industry accounted for 21
percent of total nonagricultural employment in the entire state of New Hampshire; the figure for Massachusetts was 17.2 percent (Riche et al., 1983).

Critical manpower shortages

While high technology workers may be few in comparison to nationwide totals, their contributions are indispensable to the industries in which they are employed. The need for laser/electro-optical technicians is acute on a nationwide basis. To keep up with demand in the materials-working, medical, and telecommunications industries, the laser manufacturing industry has maintained a steady growth rate of about 20 percent per year, and one recent study indicated a rise in demand for technicians from about 9000 in 1980 to 25,000 in 1990 (Gebert, 1982). Between 1973 and 1981, the market for computer-aided design (CAD) systems grew from $25 million annual sales to more than a billion dollars annually. This is expected to reach $6.9 billion annually by 1987, with continuing growth of about 40 percent per year (Stanton, 1985). Winter (1982-83) noted a shortage of 10,000 trained CAD operators in 1983, and Stanton (1985) predicted that an additional 100,000 will be needed by 1990.

But shortages are perhaps most acute and most chronic in the electronics industry. With a phenomenal growth rate of 17 percent annually for more than a decade, the electronics industry has permeated virtually every sector of the economy. Manpower shortages in the electronics industry thus have wide ranging effects. In 1981, the American Electronics Association conducted a survey that elicited a total of 671 responses from member firms, representing one-third of the entire electronics industry in terms of employment and annual sales. The frequently cited conclusion was that the requirement for engineers
and technicians would increase by 76 percent and 102 percent, respectively, in just four years (Choate, 1982; Hubbard, 1982). More recent estimates projected the need for an additional 220 thousand engineers and 230 thousand technicians by 1995 (Silvestri et al., 1983).

Finally, certain "sunrise" industries are so new and so close to the cutting edge that their component occupations are just now being identified. While the manpower requirements are currently small, they are nevertheless critical and expected to grow rapidly. In many cases, formal training programs do not yet exist (Carey & Eck, 1984). Among these new occupations are synthetic materials working, hazardous-waste management, genetic engineering, bionic electronics, and several state-of-the-art applications involving lasers, holography, fiber optics, and robotics (T. Nicholson, 1982). In a list of 29 emerging fields not currently indexed in the Bureau of Labor Statistics' matrix of 1700 occupations, the editors of Occupational Outlook Quarterly included the energy efficiency technician, the nuclear quality assurance inspector, and several others that may be characterized as caretakers of sophisticated high technology equipment ("Emerging Occupations," 1982). Kinnucan (1982) noted the need for personnel trained to interpret the images taken from earth-scanning satellites. And one recent study identified 20 of 26 new and rapidly expanding high technology occupations as being at the technician level (Job Skills Taskforce, 1982).

**Impact on business and industry**

While not classified as high technology industries according to standard definitions utilized in the employment projections cited above (Riche et al., 1983), firms of all sizes and in all sectors are using the products of high technology. On the basis of a 1984 survey, the
Emerging Technologies Consortium estimated that six of every 10 business concerns in central Michigan were using office automation technology. Advanced telecommunications equipment, including data transmission capabilities, was used by 42 percent. Three of every four durable goods manufacturers were using computer-aided design (CAD) technology, and the consensus opinion was that CAD will have virtually replaced manual drafting in their operations by 1990. Half of the durable goods manufacturers and two-thirds of the nondurable goods manufacturers were using computer-assisted manufacturing (CAM) technology, and the same proportions of both groups were using formal quality control systems. Finally, two of every three nondurable goods manufacturers and retail trade firms were using automated materials management systems (Ammon & Robertson, 1985).

Operations in plants applying the new technology are vastly different from traditional ones. For example, at General Electric's jet engine parts facility in Wilmington, North Carolina, computer-aided design terminals receive exacting specifications from distant parts of the country while digital information processors order inventories, control automated warehouses, keep records, and precisely regulate more than a hundred numerically controlled lathes, milling machines, and drills (H. Anderson, 1982). Moreover, the new technology demands very different skills from the workers affected. The fusion splicing of optical fibers, for example, is nothing like the methods traditionally employed by installers of copper and coaxial cable (Stanton, 1984). A computer-assisted design terminal is effectively a word processor for drafters, allowing the advantages of easy corrections, replication, scaling, translation, and rotation. But with the same hardware used to
draft a design, the CAD operator can subject the design to a battery of analytical tests. These computer simulations detect design flaws and greatly cut the lead time to production, yielding more and better products (Stanton, 1985). Whereas the classically trained lathe operator was skilled in the use of one machine, the numerical-control machine tool operator may be responsible for setting up and maintaining several different machines concurrently. Moreover, programming skills have replaced manual dexterity (Nardone, 1985).

Displacement of workers.

Microprocessing and the miniaturization of electronic and mechanical components have made possible the creation of robots, perhaps the spectre most frequently conjured in visions of high technology's potential devastation of the working class. Reprogrammability is the critical feature of modern robots, permitting a flexibility that past generations never had (Martin, 1982). Currently about 70 percent of Japanese robots are not reprogrammable (Rice, 1983), which presents an opportunity for this nation to seize a competitive advantage. But the other side of the coin is that the present generation of robots has the technical capacity to perform nearly seven million existing factory jobs--about one-third of all manufacturing employment. Shortly after 1990, it will become technically possible to replace all operatives in the automotive, electrical equipment, machinery, and fabricated metal products industries with robots--in effect, 65 to 75 percent of all factory workers (Levitan & Johnson, 1982).

Predictions only slightly less dire have been registered for coal miners, longshoremen, automobile mechanics, drafters, typists, newspaper composing-room workers, and many others whose skills may be rendered
worthless by advancing technology (Raskin, 1980). Moreover, displacement by automation can happen even to workers riding the high technology wave, as illustrated by the plight of computer keypunch operators. Their employment is predicted to decline by 43,000, or 16 percent, between 1978 and 1990, as on-line data input through optical scanners and "smart" terminals increasingly replaces slower batch processing methods (Howard & Rothstein, 1981). According to Levin (1984), a significant number of programmers could be displaced as sophisticated software packages become increasingly applicable to broader classes of problems. Moreover narrowly trained programmers and computer operators face displacement by technicians who can work in environments encompassing micro, mini, and mainframe computers (Ammon & Robertson, 1985).

Citing prior studies of automation's impact on the working class, Levin (1984) concluded that high technology must inevitably displace some workers and reduce the skills demanded of others.

This is also logical, since an investment in new capital can only be profitable if it reduces overall costs for any given output. Reduced labor costs can be derived from using fewer people in the production process, using persons with lower skill levels and wages, or some combination of these. (p. 34)

Recalling predictions popular in the 1950s, that 10 percent of the population would be doing all of society's meaningful work by the 1980s, Blake (1983) countered that forecasters habitually neglect to account for new jobs that are created by the advancing technology itself. Moreover, Stanton (1985) held that high technology can be just as plausibly viewed as an enhancement technology rather than a replacement technology, with increased productivity allowing the amount and scope of business to expand, creating more work. Austin and Drake (1985) pointed out that between 1962 and 1982, a period of rapid automation in office
occupations, the employment of clerical workers grew twice as fast as the overall labor force, increasing by eight million workers. Finally, Riche (1982) contended that advancing technology requires workers to acquire new skills, not necessarily lower skills. In any case, there is no turning away from high technology; more jobs will be lost in countries that fail to pursue it vigorously than in those that do. Nations that move swiftly to adopt the technology will derive an enormous advantage in international competition (Friedrichs & Schaff, 1982; Norman, 1981).

The Information Age

In 1956, the U.S. Bureau of Labor Statistics recorded a significant milestone in American history: The number of white-collar workers surpassed the number of blue-collar workers for the first time (Bell, 1973). The nation's economy was undergoing a transformation from predominantly goods producing to predominantly service producing. America was entering what Harvard's Daniel Bell (1973) called the postindustrial society, and what others have since called the information age (Naisbitt, 1982; Porat, 1977).

During the past two decades, more than 86 percent of job growth in America has been in the service-producing sector, which by mid-1982 provided 74 percent of all jobs (Plewes, 1982). Throughout, the proportion of the workforce employed in the traditional service occupations remained a fairly steady 11 to 12 percent. The overwhelming majority of the new service workers are actually engaged in the creation, processing, and distribution of information (Naisbitt, 1982). In 1967, jobs dealing with information accounted for 46 percent of the American Gross
National Product and more than 53 percent of earned income (Porat, 1977).

[Now, the] growing, production, and extraction of things . . . soaks up a good deal less than a quarter of our human resources. Of the rest, which used to be lumped together as "services," more than two-thirds are information workers. By the end of the century, something like two-thirds of all work will be information work. (Cleveland, 1985, p. 15)

Lest such projections seem excessive, it should be pointed out that the prophets of the information age subsume within the knowledge/information category of workers virtually everyone employed in white-collar occupations and many others whose jobs in manufacturing involve dealing with information. Naisbitt (1982), for example, included clerks, secretaries, accountants, actuaries, bankers, brokers, managers, bureaucrats, advertisers, reporters, teachers, librarians, social workers, clergy, doctors, nurses, lawyers, architects, technicians, engineers, computer programmers, and systems analysts. His estimates also included many small businesses, the reproduction rate of which has increased from 93,000 start-ups per year in 1950 to nearly 600,000 start-ups per year today. The mortality rate among small businesses is also large; the success of many hinges upon their providing services involving expertise not widely available (Tucker, 1984).

"Sometime during the 1980s, electronics--undeniably an information industry--will become a $400 billion business, the largest ever created on the planet. Perhaps by then even the skeptics among us will . . . grasp the reality . . . of the new information society" (Naisbitt, 1982, p. 36). The miniaturization of electronics provides power over information in two areas: (1) the ability to manipulate information more rapidly through microprocessors that can store, sort, retrieve, and perform calculations upon data and (2) the ability to transmit and
receive information instantly through telecommunications (Groves, 1985). Computers and telecommunications have merged into a prolific union, which has greatly enlarged mankind's ability to deal with complexity (Cleveland, 1985). Three factors reveal the critical importance of this union: (1) integration, the capability to link and coordinate separate functions in volume and with speed, accuracy, and endurance; (2) pervasiveness, applicability in virtually all industries, current and emerging; and (3) convergence, the creation of new products and processes (Groves, 1985).

While sophisticated technology, such as computers, communication satellites, and cable television, did not create the information age, it has unquestionably accelerated our deeper plunge into it (Naisbitt, 1982). Technology's contribution appears to be somewhat of a mixed blessing. Classic print information doubles every 15 years, yielding more than a six-fold increase of information in a 40-year span. For computerized information, the doubling period is less than two years, which results in more than a million-fold increase of information in the same 40-year span (Koenig, 1982). "We are drowning in information but starved for knowledge" (Naisbitt, 1982, p. 24). The other side of the coin is technology's power to help society deal with the information overload. It has been estimated, for example, that had the computer not been invented, it would now take the entire population of California to conduct the state's banking activity (Blake, 1983). And if the general tendency of technological advancement is to displace some workers and de-skill the jobs of others (Noble, 1984), such is not always the case. In spite of extensive automation and computerization of the telephone
system in the past decade, the Bell network increased its workforce by 400,000 to a total of 1,200,000 (Blake, 1983).

An economy built around information seems less real than one built around the traditional factors of production—land, labor, and capital. Nevertheless, "information is an economic entity because it costs something to produce and because people are willing to pay for it" (Naisbitt, 1982, p. 36). According to Cleveland (1985), the characteristics of information—the-resource are as follows. Information is expandable. It is not consumed when used; rather, it grows. Whole industries have learned to exploit this characteristic, including scientific research, software production, publishing, advertising, and public relations. Information is not resource hungry. This necessitates revision of many classical theories that were based on the assumption that developed nations will consume disproportionate shares of real resources. Information is substitutable. It can and does replace land, labor, and capital. If one can access a mainframe by phone, one need not own it. Information is transportable. Data can be transmitted at the speed of light; transworld business can now be conducted in real time. Information is diffusive. The leakage of information is pervasive and continuous. Monopolizing information is impossible. Information is shareable. Exchange transactions are obsolete. If I sell or give you an idea, we both have it, not just me, and not just you.

The emergence of the information society does not mean that manufacturing and agriculture will cease to exist or become unimportant. It has been manufacturing's relative share of total employment that decreased during the information sector's rapid rise; manufacturing's
absolute strength in numbers continues to increase--by 25 percent between 1952 and 1982, for example (Urquhart, 1984). The information society does not replace, it permeates and regulates, the growing, extracting, processing, manufacturing, recycling, distribution, and consumption of tangible things (Cleveland, 1985). America continues to be a major manufacturer of steel, automobiles, machine tools, and many other products of traditional heavy industry. "The question is how America can improve its performance and compete more effectively in both domestic and world markets, not how to pursue the purposive abandonment of such industries" (Levin, 1984, p. 36). Both agriculture and manufacturing progress by doing more with less through better knowledge and organization (Cleveland, 1985). "In the information age, the focus of manufacturing will shift from the physical to the more intellectual functions on which the physical depend" (Naisbitt, 1982, p. 36). The key to productivity, competitive strength, and economic achievement is more effective utilization of information. Knowledge has become the indispensable industry that supplies the rest of industry the principal resources of production (Drucker, 1980).

**International Perspectives**

In today's world, the destiny of America is shaped to a great degree by external forces.

We live in a world that is increasingly anarchical, increasingly unpredictable, and increasingly a world not of American choosing or of American imagination. We may now find ourselves at one of the great disjunctures of our national history. Event after event brings home the fact that we understand each less and less and clamor more and more for simple answers. The role that education must play in years ahead is inexorable and plain to see. The world has unalterably changed, and so must American education. (Bonham, 1980, p. 3)
"The two most important things to remember about world economics are that yesterday is over and that we must now adjust to living in a world of interdependent communities. Some of us find those ideas hard to accept" (Naisbitt, 1982, p. 55). The following statistics are helpful in comprehending the new environment of interdependence:

Seventy-four percent of all the world's markets lie outside the United States (Groff, 1984).

International trade now accounts for 22 percent of the U.S. Gross National Product (Mensel, 1985).

One-third of American corporate profits are from international activity (Groff, 1984).

One of every five American manufacturing jobs depends on foreign markets (Mensel, 1985).

One of every three acres of American farm land produces items for export (Inouye, 1984-85).

Twenty-five thousand jobs are created by every billion dollars of additional export income earned (Blanco & Channing, 1984-85).

Eighty percent of foreign trade is conducted by one percent (or 2500) of American companies (Groff, 1984).

Forty percent of unemployment during the most recent recession has been attributed to a reduction in American exports (Melone, 1984-85).

By the year 2000, 12 of 13 minerals required for industrial operations in this country will have to be imported (Inouye, 1984-85).

From 1890 to 1970, the United States maintained a positive balance of international merchandise trade each year. Much of the net profit was invested in foreign countries, and the return on that investment also contributed to this country's wealth. Until recently, however, such dealings have represented a relatively small percentage of the Gross National Product. Throughout most of the period since World War II, for example, America consistently exported less than 10 percent of the goods it produced; by 1970, the proportion was only 9 percent. But
by 1975, this had risen to 15 percent, and by 1980, to 20 percent (Wegmann, 1985). "For a country as large as the United States to become this heavily involved in foreign trade, and to do it so quickly, is extraordinary" (p. 42). Though the nation continues to export an increasing volume of goods, its imports have increased faster than its exports, generating a trade deficit that has grown from $42.7 billion in 1982, to $69.4 billion in 1983, to approximately $100 billion in 1984 (Blanco & Channing, 1984-85).

Due initially in large measure to skyrocketing rises in the cost of foreign oil, the United States has failed to realize a merchandise trade surplus since 1975 ("U.S. Imports Top Exports," 1985). Until lately, however, the nation had been able to fall back on its overseas investment earnings to make up for the trade deficit. As recently as 1982, America's investments abroad exceeded foreign investments in America by $169 billion (Wegmann, 1985). This traditional head start no longer exists. Continued failure to balance the federal budget has maintained artificially high interest rates in this country and greatly inflated the value of the U.S. dollar against foreign currencies. The strong dollar has made imports less expensive while driving up the price of American goods on the world market, causing the merchandise trade deficit to reach record highs (Johnson, 1984). In addition, it has greatly increased the attractiveness of investing in American companies and federal debt securities by foreign businessmen and banks. As a result, the U.S. Current Account, a measure that includes investment transfers and debt service as well as goods, posted a record $101.5 billion deficit in 1984 (Magnusson, 1985). Moreover, the investment advantage had been reduced to $28.2 billion by the beginning of 1985.
During the first two quarters of 1985, a current account deficit of $62.1 billion almost certainly wiped out the remaining investment surplus, placing America in a net debtor status for the first time since 1914 ("U.S. Imports Top Exports," 1985).

In 1984, the U.S. Treasury alone paid out $19 billion to foreign creditors. "That outflow will be increasing in the years ahead, as will the stream of stock dividends, corporate bond payments, and profits from foreign-owned American enterprises going back to other countries" (Wegmann, 1985, p. 46). The United States can no longer look to the flow of dividend and interest payments to compensate for trade deficits; for sometime to come, it will actually be paying out more in such investment earnings than it will be receiving. To dig its way out of debtor status, America must recapture its traditional edge in foreign trade. Currently pending in Congress are more than 300 trade bills to provide protection against imports. Moreover, the Reagan administration has recently announced its own initiatives to break down barriers to American goods abroad ("U.S. Imports Top Exports," 1985). But over the long haul, dramatically improved performance in the conduct of foreign trade by the nation's business and industrial sector is clearly essential (Levin, 1984).

The Changing Labor Force

The civilian labor force--people with jobs and people looking for jobs--continues to grow, but not as fast as during the 1960s and 1970s. From 110 million persons in 1982, the labor force will grow to approximately 131 million by 1995, an increase of about 19 percent (U.S. Bureau of Labor Statistics, 1984). The chief cause of growth will be the
continued, though slower, rise in the number and proportion of women seeking jobs. Having increased from about 30 percent of the workforce in the 1940s to more than 50 percent by 1981 (Bednarzik, 1982), women will enter the labor market at the rate of about one million per year, constituting two of every three new entries, during the remainder of the 1980s (Choate & Epstein, 1982). They will compete strongly with young people and minorities and will require training and retraining as they move into jobs traditionally held by men.

A partially countervailing force will be a sharp decrease in the number of 18- to 24-year-olds entering the workforce—a drop of between 16 and 18 percent during the 1980s, with continuing declines until about 1995 (Hemnings, 1982; U.S. Bureau of Labor Statistics, 1982). The effect will be most pronounced between 1985 and 1990, when competition for entry-level jobs should begin to moderate. Some employers, in the retail sales and fast food industries for example, may even experience difficulty in finding enough young workers (U.S. Department of Labor Statistics, 1984). A related concern is that the number of 18- to 24-year-olds participating in postsecondary education will decline by about 23 percent between 1978 and 1993 (Kerr & Gade, 1981).

The celebrated "baby boom" of 1946 to 1964, with its peak in 1957, produced more than 76 million Americans, 70 million of whom survived into the 1980s (Jones, 1980). Most of this group have now entered the 25- to 54-year age bracket, which correspondingly has grown from 40 percent of the workforce in 1970 to 67 percent in 1982 and is expected to reach 75 percent by 1995 (U.S. Bureau of Labor Statistics, 1984). The 25- to 54-year age bracket is considered to be the productive core of the workforce; accordingly, the economic welfare of the nation for
the remainder of the 20th century will be conditioned primarily on the
commitments of the baby boom generation (Choate, 1982). But having
been educated predominantly in the schools and colleges of the 1960s and
1970s, and in spite of being the most highly credentialed group of
Americans in terms of grade-completion level, many possess skills of
questionable utility (Jones, 1980). Fierce competition for jobs and
promotions will send many of them back for retraining to gain the skills
demanded in the contemporary work place.

The median years of education in the labor force increased from 8.1
years in 1910 to 11.1 years in 1952 and 12.7 years by 1980 (Kerr &
general trend toward more education as the requisite for getting a job,
these statistics have serious implications for high school dropouts. In
the past, many dropouts have been able to find employment as operatives,
non-farm laborers, and service workers, jobs that traditionally have not
required the high school diploma. The average educational attainment
among incumbents in these occupations has now risen to well over 12
years. In the future, even for relatively unskilled positions, dropouts
will increasingly face competition from workers with more education
(Young, 1982).

The proportion of workers having four-year college degrees has also
risen: from 3.5 percent of the workforce in 1910, to 8 percent in 1952,
to nearly 20 percent in 1980 (Kerr & Rosow, 1979; U.S. Bureau of Labor
Statistics, 1982). Between 1970 and 1982, while the total labor force
grew by 31 percent, the college graduate work force increased by 103
percent. But one in five of those graduates took jobs not usually
requiring a degree (U.S. Department of Labor Statistics, 1984). The
oversupply of graduates is likely to continue through the mid-1990s. About 15 million new graduates will enter the labor force during the 1980s, but only 12 to 13 million jobs requiring college degrees are projected. The shortfall could reach 300,000 college-level positions per year (Wegmann, 1985).

As revealed by the 1981 Census, the number of births during the 1970s was some 17 percent below the number projected from the 1971 Census; demographers now predict population increases of less than 10 percent during the 1980s and less than 7 percent in the 1990s (Plotkin, 1982). Longevity increased by 3.4 years during the 1970s, rather than the anticipated half year; people 65 and older are now the fastest growing cohort of the American population (Beale, 1982). In 1940, one of 15 Americans was older than 65, compared to one of nine today and a projected one of six by the year 2030 (Rhine, 1980).

The decline of the birth rate has not been uniform across racial and ethnic groups; it has in fact been predominantly a white middle-class phenomenon (Hodgkinson, 1983). The black population increased by 17 percent to 26.5 million by 1980, compared to an 11.4 percent increase for the total population (Plotkin, 1982). Persons of Hispanic origin registered a 61 percent increase during the 1970s, a larger expected figure attributed to a higher birth rate and to immigration, both legal and illegal. Hispanics will very likely outnumber blacks by the turn of the century (Beale, 1982; Plotkin, 1982).

By 1990, minorities of all ages will constitute 20 to 25 percent of the nation's total population. Among youth cohorts, minority proportions will exceed 30 percent, reaching as high as 45 percent in Texas, California, and southeast Florida. Ninety percent of 1990's workforce
is already at work today; of the 10 percent to be added, nearly half will be minorities. Instead of 17 active workers per retiree, as was the case in 1950, there are now fewer than three workers per retiree, and by 1990, the ratio will be even smaller. The secure retirement of today's workers and the economic health of the nation will become increasingly dependent upon the achievement of minority workers (Hodgkinson, 1983).

The Skills Crisis

In 1950, only half of America's youth stayed in school through the twelfth grade. By 1964, the proportion was up to two-thirds, and by 1970, to three-fourths (Cross, 1983). But their relatively greater persistence has not been matched by relatively greater achievement. After nearly two decades on a downward path, the skills of today's high school graduates have declined to about the pre-Sputnik level of the early 1950s (Copperman, 1978). Demonstrating serious deficiencies in the ability to handle the language with facility, to compute, and generally to reason, "about one-third of our youth are ill-educated, ill-employed, and ill-equipped to make their way in American society" (A. Smith, 1982, p. 12).

According to the Condition of Education 1976 (National Center for Education Statistics, 1976), America's high school graduates rank among the lowest from modern nations in mathematics and science, two crucial skill fields for the contemporary technological world. Such statistics are particularly distressing in view of the achievements of nations such as the Soviet Union, our chief political rival, and Japan, our keenest economic competitor. Russian youngsters must take five years of physics, four years of chemistry, five or six years of biology, three
years of mechanical drawing, and six years of foreign languages; mathematics includes two years of calculus. All Japanese high school graduates must complete at least two years of mathematics and two years of science; they study foreign languages extensively. This contrasts sharply with America's modal (not mean, or even median) one year of mathematics, one year of science, and two years of social studies. More than half of American high schools require only one mathematics course or none at all for graduation; only one-third require more than one year of mathematics or science. Nine percent of American students take one year of physics; 16 percent take one year of chemistry; 45 percent take one year of biology, and 17 percent take one year of general science (Bonham, 1981; Kirst, 1981; "U.S. Math, Science," 1981).

Admittedly, access to secondary education in Russia is restricted to a highly selected group of students, but the drop-out rate in that system averages only 2 percent, compared to our approximately 25 percent. In Japan, where almost universal access prevails, some 90 percent of all students graduate, compared to our 75 percent. Moreover, the Japanese school year comprises 225 days, compared to our 180 days, and their students spend twice as many hours on homework as ours. Perhaps most significantly, Japanese students take only a fraction of the nonacademic electives American students choose. While the Japanese and Russian educational systems are highly regimented and in many ways (from the American point of view) pedagogically undesirable, their overall achievements in mathematics and science are among the highest in the world. And they produce technicians and managers outnumbering ours by a considerable margin (Bonham, 1981; Kirst, 1981; "U.S. Math, Science," 1981).
Possibly the most thorough evaluation of American high school students is the ongoing National Assessment of Education Progress. Among other findings, the 1979-80 study discovered that nearly 40 percent of 17-year-olds cannot draw inferences from written material; only 20 percent can write a persuasive essay, and only a third can solve a mathematics problem requiring several steps (Dearman & Plisko, 1981; "For Most 17-Year-Olds," 1981). But more than any other single indicator, it has been the extended decline in college entrance examination scores that has captured the public's attention. Performance on the Scholastic Aptitude Test has achieved particular notoriety. Between 1963 and 1980, nationwide mean scores dropped from 478 to 424 on the SAT verbal exam and from 502 to 465 on the SAT mathematics exam. In 1981, both mean scores held constant from the previous year for the first time in 18 years, and 1982 witnessed the first slight increase--to 426 on the verbal exam and 466 on the mathematics exam ("SAT Verbal, Math," 1982). Numerous experts, including a distinguished panel convened by the College Entrance Examination Board itself (Wirtz, 1977), have cautioned against using such an incomplete instrument as "the sole thermometer for measuring the health of schools, family, and student" (p. 40), but thus is the conventional wisdom of the man on the street. And in this regard, he is in august company, as demonstrated by the recent pronouncements of the National Commission on Excellence in Education (1983).

Perhaps nowhere do the disabilities of the nation's high school graduates stand out more clearly than in college and universities, which by 1970 were enrolling 50 percent of them, twice the proportion served in 1950 (Cross, 1983). A recent report from Cuyahoga Community College
in Cleveland, for example, indicated that 37 percent of incoming freshmen needed remedial English, and 38 percent needed remedial mathematics. For students from Cleveland proper, the numbers were even more disturbing: 66 percent needed remedial English and 55 percent needed remedial mathematics (Stainer, 1982). At Miami-Dade Community College, two-thirds of all entering students recently tested were deficient in at least one of reading, writing, or mathematics; among minority students, more than 90 percent were deficient in one skill and more than two-thirds were deficient in all three (McCabe & Skidmore, 1982). Harvard, Yale, Cornell, Temple, and the City College of New York, along with most of the SUNY system, are just a few of the nation's senior institutions that have recently been obliged to implement some form of remedial instruction (Cohen & Brawer, 1982; Copperman, 1978; Roueche, 1981-82).

Current estimates are that three-quarters of a million students drop out of high school in a given year and another three hundred thousand graduate as functional illiterates (Hunter & Harmond, 1979; Keisling, 1982).

[But] illiterate high school graduates are only the tip of an iceberg that includes auto mechanics unable to comprehend repair manuals, bureaucrats unable to follow written policy changes, technicians unable to read and understand safety precautions for oil pipelines or modern power plants, and anyone else who has found the literacy demands of a job outstripping his or her abilities. (Wellborn, 1982, p. 54)

In the early 1970s, the Adult Performance Level Study at the University of Texas examined adults in terms of their abilities to function regardless of grade-completion level. That study defined functional literacy as the ability to use one's knowledge and skills to meet the requirements of daily living (Northcutt, 1975). At the time,
the APL researchers estimated that one in five adult Americans was incompetent or functioned with great difficulty and that nearly half were merely functional and not at all proficient (Cole, 1977). In the mid 1970s, the U.S. Office of Education applied the APL findings on a nationwide basis and concluded that 23 million persons were in the first category and another 34 million were in the second, for a total of 57 million Americans without the skills necessary to perform basic tasks in society (Hunter & Harmond, 1979). More recently, U.S. Secretary of Education Terrel H. Bell estimated the number of undereducated Americans to be 72 million—26 million functionally illiterate and 46 million more who do not function with proficiency (Deveaux, 1983). Many of these people operate at such low levels of competency they are unable to secure and hold an entry-level job.

By the end of the 1970s, federal programs combating adult functional illiteracy had reached less than 5 percent of the target population of 57 to 60 million persons (Wellborn, 1982). According to the Coalition for Literacy, this costs the nation more than $255 billion per year in incompetent job performance, foregone tax revenue, remedial education in business and the military, welfare payments, and crime (Watkins, 1982b). The American Telephone and Telegraph Company spends about $6 million per year to train employees in basic reading and arithmetic skills, and 35 percent of the nation's other largest corporations responding to a recent survey reported that they would have to provide remedial instruction to their employees in 1982 (Hemmings, 1982). The military now spends nearly $60 million a year in developing basic reading skills (Rickover, 1983), because 27 percent of Army enlistees cannot read seventh-grade level training manuals, and 23
percent of the Navy's recruits read so badly they cannot finish basic training (McGovern, 1980; Wellborn, 1982).

But the figures on functional illiteracy become even more distressing "when to these data we add occupational illiteracy, research illiteracy, information processing illiteracy, management systems illiteracy, economic illiteracy, and scientific and technological illiteracy" (Groff, 1984, p. 45). Nowhere is this more apparent than in the contemporary aberration of jobs' standing vacant during a period of widespread unemployment. In 1982, while 4,508 people lined up for a meager handful of 296 jobs in Chicago ("Over and Out," 1982), the U.S. Department of Labor, about the same time, was listing more than 73,000 positions--from $13,000 per year management trainees to $28,000 per year data processors--that had gone unfilled for several months (Sheler, 1982). "This predicament becomes more acute as the knowledge base continues its rapid expansion, the number of traditional jobs shrinks, and new jobs demand greater sophistication and preparation" (National Commission on Excellence in Education, 1983, p.12).

Summary

The preceding description of the economic environment has revealed a number of conditions with significant implications for the continuing development of conventional occupational education programs and other more specialized forms of training in American community colleges. These are summarized as follows.

1. Between 1982 and 1995, the American economy is expected to generate 25.6 million new jobs. These will be distributed across a wide range of industries and an even wider range of
occupational classifications. Training and retraining at several levels and in numerous fields will be required.

2. The vast majority of new jobs will require training at the high school and community college levels.

3. Relatively few new jobs will require the four-year college degree--fewer than one-fourth of the detailed occupations predicted to create the most new jobs by 1995.

4. The oversupply of college graduates is expected to continue; the shortfall of college degree-requiring positions could reach 300,000 per year.

5. Employment in high-technology industry will continue to grow faster than for industry overall but will provide relatively few new jobs in absolute terms--only 16 to 17 percent of all new jobs through 1995.

6. While high technology workers constitute a small percentage of the total workforce, their contributions are indispensable to the industries in which they are employed, and thus to the nation's economy. Moreover, high technology industry can have a significant impact on a local economy.

7. High technology equipment and processes have permeated virtually all sectors of industry, greatly changing their operations and the skills needed by workers.

8. High technology's long-term net effect upon employment volume is unclear; that it will increase the need for lifelong retraining seems certain.
9. The service-producing sector is expected to continue its rapid ascendency relative to the goods-producing sector, the former generating three-fourths of all new jobs through 1995.

10. The great majority of the new service jobs will involve the creation, processing, and distribution of information, requiring workers with strong cognitive skills.

11. The effective utilization of information, the growth rate of which continues to accelerate, is seen as the key to the nation's future productivity, competitive strength, and economic achievement.

12. International commerce has grown to account for nearly a quarter of America's Gross National Product, an outcome simultaneously representing expanded markets and fierce competition.

13. Record high trade deficits over the past several years have placed the nation in net debtor status for the first time since 1914. Dramatically improved performance in the conduct of foreign trade is clearly essential.

14. For the remainder of the twentieth century, the economic welfare of the nation will be conditioned primarily on the accomplishments of the "baby boom" generation, a group identified as possessing skills of questionable utility in the contemporary workplace.

15. As the knowledge base continues to expand, greatly increasing the cognitive demands of the workplace, the nation faces a skills crisis of the following dimensions: (1) high school graduates whose skills are weak in comparison to traditional standards and to those of their contemporary counterparts in
other developed nations, (2) a backlog of functional illiteracy among the adult population, and (3) a serious mismatch between skills possessed and skills required.

16. America has an aging workforce in place and a diminishing supply of new prospects to train. A much larger proportion of future workers will come from female, minority, and non-English-speaking groups.

17. The nation must make better use of people already in the labor market and do a better job of cultivating the untapped and largely untrained reservoir of worker prospects in the population.
CHAPTER THREE

THE COMMUNITY COLLEGE RESPONSE:
ISSUES AND CURRENT PRACTICE

The following description of economic development activities undertaken by community colleges in response to conditions in the environment is partitioned into four major sections: (1) Conventional Occupational Education Programs, (2) Linkages with Organizations in the Community, (3) State-Sponsored Economic Development Programs, and (4) International Response.

Conventional Occupational Education Programs

The great majority of American community colleges offer one or more credit programs designed to prepare students for immediate employment or work advancement. Cohen and Brawer (1982) cited a number of recent reports and concluded that annual enrollments and graduations in community college occupational programs nationwide have reached parity with those in transfer programs. A survey of 751 accredited community colleges, reported by Thornton (1972), found 4060 two-year occupational programs, an average of about six per college, ranging from a low of zero at 149 colleges to a high of more than 20 at 35 colleges. Thornton's findings plus this writer's review of four institutions' current catalogs (Broward Community College, 1984; Florida Junior College, 1984; Miami-Dade Community College, 1985; Santa Fe Community College, 1984) indicate that community college occupational programs span a broad range:
Business: Secretarial careers, accounting, data processing, sales and retailing, administration and mid-management.

Engineering Technology: Electrical and electronic, mechanical and industrial, architectural, civil, chemical, air conditioning, aeronautical.

Trades and Industry: Electricity and electronics, mechanics, drafting, metal and machine, trade and industrial arts, construction, aviation.

Health Related: Nursing (RN and LPN), dental (assisting, hygiene, and technology), physical and respiratory therapy, emergency medical technology, medical laboratory technology, radiologic technology, vision care technology, other allied health.

Miscellaneous: Agriculture and forestry, teaching, home economics, hotel/motel/restaurant management, physical education and recreation, interior design, fashion design and merchandising.

Specialized: Mortuary science, criminal justice, court reporting, fire science, child care, real estate, cosmotology, gunsmithing, watch repair.

In addition to their two-year associate degree programs, community colleges frequently offer planned certificate programs (typically comprising 24 semester credits) in many of the fields listed above. The breadth of the listing justifies the conclusion that community colleges are fully committed to occupational education. In Thornton's words, "Each college defines its own responsibility for these courses in the light of the demands of its constituency and its own philosophy of junior college education" (1972, p. 186).
While the range of occupational offerings at community colleges across the nation has by now achieved a degree of stability, responsiveness to changes in the local environment is an ongoing commitment, as illustrated by four recent examples. To support the growth of the burgeoning trout-farming industry in its service area, the College of Southern Idaho has recently developed a two-semester certificate program in fish culture technology (Jenkins, 1982). In response to a shortage of trained personnel for area wineries, breweries, distributors, bottlers, and wholesalers, John Tyler Community College in Virginia developed and now offers a new associate of science degree in business management with a major in beverage marketing (Forsythe, 1982-83). Reacting to the need for technically skilled labor to attract industry to a depressed agricultural region, Phillips County Community College in Arkansas recently doubled the volume of its industrial technology and technical business programs (Jones & Beck, 1982-83). And finally, Atlantic Community College has recently established The Casino Career Institute, which includes a culinary arts program for chefs, a casino management program for mid-level supervisors, and assorted training programs for dealers, croupiers, cashiers, slot machine mechanics, and bartenders. The Institute places 90 percent of its graduates who seek jobs, supplying 67 percent of Atlantic City's gaming employees (Lester et al., 1984-85).

Maintaining Dynamic Equilibrium Within the Environment

According to Murphy (1983-84), the effectiveness of community college occupational programs may be determined by asking three questions: (1) Is the training consistent with the tasks found in the labor market? (2) Do graduates find employment in the fields for which
they were trained? (3) Are employers satisfied with the training the students received? Community colleges go to great lengths to ensure that the answers to these questions are in the affirmative. For example, Pietack and Fenwick (1985) described the process utilized by the Community College of Philadelphia for determining the feasibility of instituting a new occupational program as comprising the following steps:

1. A detailed industry survey to establish the existence of employment opportunities and to determine appropriate topical coverage in program courses.

2. A second survey to determine if regional universities offer advanced training providing subsequent educational and career growth.

3. A student interest survey to establish the existence of potential applicants for the program.

4. An assessment of expected program costs, including space needs, faculty requirements, supply and capital equipment requirements, and support course needs.

5. A determination that qualified faculty are available and that support course departments are capable of meeting the demands of the program.

6. A review of special funding opportunities for which the program may qualify.

Once a program has been adopted, it is subject to periodic evaluations to ascertain if revision or possibly elimination is appropriate. Fox Valley Technical Institute of Wisconsin, for example, utilizes a five-year cycle with annual mini-audits, conducted by teams composed of
college personnel and local employers. The process employs a cross-check methodology, similar to that used in anthropological field studies, to validate or filter out "maverick" recommendations (Paris, 1985). A typical community college program audit includes an analysis of at least four years' data describing enrollment patterns, completion rates, costs per student compared to the collegewide average, student evaluations, performance of program completers, continued employment opportunities, and evidence of community support (Pietack & Fenwick, 1985).

Occupational programs in community colleges are fully articulated with entry-level programs in feeder high schools to provide a smooth transition for students from one level to the other without unnecessary delays or duplication of effort (Woelfer et al., 1980). In Virginia, a state-funded articulation project has generated 2 + 2 high school/community college occupational programs for high-level technicians and written program articulation agreements that are signed by secondary school superintendents and community college presidents (Parnell, 1984). In Kentucky, the state vocational schools and community colleges have formalized articulation to the point where credit earned in the former can be applied toward an associate degree in the latter (Stumpf & Lee, 1982). Moreover, community college occupational programs are frequently articulated with advanced programs in senior-level institutions, sometimes resulting in students' receiving credit at the three and four hundred level for technical courses taken at the one and two hundred level in a community college (Klemm & Philbin, 1980).
Distinctive Characteristics

According to the Illinois Office of Education (1978), the goals of any occupational program are (1) to provide basic skills for employment, (2) to provide competencies necessary for job proficiency, (3) to provide sufficient breadth of learning to foster crosstraining, and (4) to provide competency upgrading for advancement. To achieve these goals, occupational programs in community colleges have adopted a number of distinctive characteristics that set them apart from more narrowly focused programs in high schools and proprietary schools.

Developmental education

By the late 1960s, virtually every community college in the nation was offering an array of remedial courses in reading, writing, and mathematics (Roueche, 1968). The movement expanded throughout the 1970s (Roueche & Kirk, 1973) and by the 1980s had even spread to highly selective universities and liberal arts colleges (Stadtman, 1980). The relevance of developmental education to this study derives from two considerations: (1) it represents the community college's first line of response to the skills crisis in contemporary society, and (2) it is as necessary for students in occupational programs as it is for students in university-parallel programs.

Regarding the first consideration, McCabe (1985) has aptly pointed out that if America is to retain its competitive edge, all its human resources must be developed. A number of states have recently attempted to improve the quality of higher education by restricting admissions to only those students of proven ability (Watkins, 1982a). McCabe (1985) characterized this as shortsighted and counterproductive, not only destructive of human dignity, but wasteful of human talent needed in our
society. He identified the key to improving the quality of instruction to be mandatory developmental education's effect in reducing the excessively broad range of academic ability within classrooms, a serious defect in the traditional open-flow model. Moreover, since the remedial work is done first in a well ordered program, even those students who prove incapable of completing a formal degree receive some basic functional literacy skills necessary for effective participation in contemporary society.

Regarding developmental education's specific contributions within occupational programs, two nationwide studies (Richardson & Martens, 1982; Roueche & Comstock, 1981) have shown that the reading requirements in occupational programs like accounting, computer science, electronics, automotive mechanics, nursing, and allied health are among the most demanding of all curricula, frequently in excess of the twelfth grade level. Mobley (1982) pointed out the value of teaching basic mathematics skills in the context of technical subject matter, a provision that helps students understand early on how the various mathematical techniques relate to their chosen fields. Monroe (1972) cited an example where students were introduced to entry-level technical skills while enrolled in developmental education. Both of these were seen as strong motivators, and both are compatible with Glaser's (1984) contention that "general self-regulatory skills" (i.e., the abilities to think and reason) should be "exercised in the course of acquiring domain-related knowledge" (p. 102). And Perry (1983) noted developmental education's effect in reshaping students' habits of promptness, dependability, and self-discipline, which are closely related to what Lancaster (1985) called "employability skills"--effective interpersonal
relations, good work habits, appropriate personal appearance, and successful application techniques.

Finally, a recent nationwide study (Roueche et al., 1984) has identified the following elements as correlated with success in developmental education: (1) strong administrative commitment, (2) mandatory assessment and placement, (3) individualized diagnostic testing for specific learning prescriptions, (4) structured courses, strict attendance policies, and course-load limitations commensurate with a student's family and work responsibilities, (5) award of transcripted credit (not necessarily applicable toward a degree), (6) individualized pacing toward mastery within a predetermined maximum time for completion, (7) multiple learning systems, (8) volunteer instructors trained in learning theory and strategies for teaching nontraditional populations, (9) peer tutors, but professional counselors and advisors, (10) continuous monitoring of performance, with specific interventions as required, (11) course content based on the requirements of subsequent programs, and (12) continuous program evaluation, focusing on student success in further academic work.

General education

In response to numerous calls for greater exposure to humanistic content in occupational programs (Wright, 1983), community colleges have (1) designed and required interdisciplinary courses (M.A. Parsons, 1978), (2) created specialized humanities courses with content targeted to specific occupational programs (Ashton, 1983), (3) developed and installed humanities modules with content pertinent to specific occupational areas (Nettleship, 1979), and (4) utilized guest lecturers and special resource materials such as anthologies and study guides.
(Beckwith, 1981). To foster the attainment of strong academic skills, increasingly recognized as the critical vocational skills in today's information age (McCabe & Skidmore, 1983), and to increase career/technical students' adaptability and awareness of life experiences, a number of community colleges have established general education core requirements for degree-seeking students in occupational programs (J.L. Campbell, 1982; Roark, 1984-85). Others have instituted reading-and writing-across-the-curriculum requirements applicable to all credit courses, including occupational courses (McCabe, 1983).

**Career ladders**

Monroe (1972) explained the traditional ladder concept in terms of placing each area of occupational training in a vertical arrangement so that skills learned at one level would be preparatory for the next higher level. Under such an arrangement, a student unable to qualify for a restricted admissions program could start at a lower level with the expectation that job experience, matured knowledge, and continued study would enable him/her eventually to enter the higher level program and succeed. From such beginnings, the ladder concept has taken an added significance as the best way to accommodate the needs of individuals to cycle in and out of the college for training and retraining throughout their working lives (Robb, 1984). If the desire for career advancement has traditionally motivated people to engage in lifelong learning (Taylor, 1979), the pervasive change associated with industry's technological revolution--change that creates new jobs overnight and eliminates other just as quickly--has rendered lifelong learning a necessity just to stay employed (Owen, 1984).
Boyle (1983) called for community college career ladders to be characterized by "total flexibility... in the timing of, entrance to, and exit from educational experiences" (p. 17). Ammon and Robertson (1985) added the need to accommodate differential learning needs, styles, and schedules, and Bolles (1979) recommended a strong career counseling component. In these regards, Link's (1981) nationwide research revealed that community college occupational education programs have made extensive use of such provisions as open entry and open exit, variable credit, individualized pacing, mastery learning, open laboratory arrangements, and techniques to break away from the constraints of the lock-step semester system. While the attachment of credits has sometimes been seen as hindering flexibility (Ammon & Robertson, 1985), it is also the case that community college credits are transferrable from institution to institution as workers move about seeking new opportunities, and their accumulation on a student's transcript can serve as a motivator to complete a formal degree (Sigler, in press).

Crosstraining

Monroe (1972) reported the existence of a community college trend toward grouping occupational curricula into clusters of programs that have many elements in common. By concentrating the common core of studies in the first year, these cluster programs allowed students to explore several occupations before making the decision to specialize in a particular area during the second year. Galambos (1983) viewed this in the broader perspective of avoiding a proliferation of isolated specialized programs and encouraging an individual's adaptation across a wide range of applications. Starting as early as 1966, a succession of commission reports has called for more generic training in occupational
skills families and for instruction focusing upon transferable competencies firmly rooted in mathematics and science (Groves, 1985). Preparing workers to function in more than one area—in horizontally structured networks, for example—has even acquired its own label: crosstraining (Ammon & Robertson, 1985). But though community colleges have attempted for more than a decade to develop programs that train for families of occupations (Thornton, 1972), and while a few have recently outlined course objectives for high-technology training that is "universal and transferable," there remains considerable room for progress in this area (Owen, 1984, p. 30).

Career counseling and job placement

Nearly two decades ago, Gleazer (1968) enunciated the position that assisting students to find postcompletion employment is one of the essential elements of a comprehensive community college program. Lunneborg and Lunneborg (1976) reported that former community college students share that opinion. Several studies have raised concern that community colleges may be taking this high-sounding aim for granted. Graduates of a Maryland community college gave a low rating to the institution's job placement services (Gell & Armstrong, 1977), and a survey of students in Pennsylvania found similar opinions (Selgas, 1977). Cohen and Brawer (1982) concluded that "such assistance seemed to be given through the occupational programs themselves rather than through collegewide job placement services" (p. 208). Based on survey responses from 71 institutions, McGrath and Hyatt (1981-82) found evidence that small, rural community colleges may be more committed. Of the colleges in their sample reporting that a majority of their students were enrolled in occupational programs, nearly 40 percent assigned at
least one full-time staff member to placement. Moreover, 63 percent of the colleges located more than 50 miles from major employment centers reported spending in excess of $10,000 annually for placement. There is some evidence to suggest that employers feel community colleges have a responsibility to help students choose occupations that will be personally and not just monetarily rewarding (Ammon & Robertson, 1985). Lorain County Community College (1985) has recently instituted a job placement service that includes career counseling and self-assessment and utilizes a computerized national search system for job opportunities. This service is available to community residents as well as students.

Cooperative education

Another feature of community college occupational programs, one that has been particularly well received by constituents, is the cooperative work experience component. In cooperative education, students spend part of their time in classes on campus and part of their time working in the occupations for which they are preparing. College staff arrange for the students' placement, monitor their work performance, and grant elective credit for successful completion of assignments (Thornton, 1972). Students can work and study on a concurrent part-time basis, or they may alternate full-time work and full-time study across several semesters, depending on their own and their employers' needs. Most often they are paid for their work, but volunteer assignments are also available (Cooperative Education Program, 1985). Brightman (1973) reported that cooperative education students displayed more positive attitudes toward education, attempted and completed more courses per semester, persisted longer, and required no longer to complete their
degrees than their nonparticipating classmates. Patterson and Mahoney (1985) listed cooperative education's benefits to all constituents. For students, these include exposure to practitioners and potential employers in a chosen field, opportunities to explore career alternatives, experience in occupation-specific settings or with specialized equipment not available in the classroom, and the chance to earn college credit while receiving pay for work. For faculty, cooperative education brings the curriculum closer to the demands of the workplace, establishes liaison with community resources, and creates opportunities for professional development. Employers are able to influence the design and content of college curricula, preview potential employees before hiring them permanently and train them while they are still in formative stages, achieve public relations goals, and create a continuous supply of trained manpower to meet changing needs.

**Linkages With Organizations in the Community**

The past decade has witnessed a dramatic increase in the number and scope of linkages between community colleges and other organizations in their service areas. "This development has been driven by the recognition that more effective attention to human resource development is an imperative if organizations are to remain competitive and effective" (Deegan & Drisko, 1985, p. 14). Human resource development travels a two-way street, with the colleges as well as the organizations benefiting from the exchange. In the following discussion, college-community linkages are detailed in terms of (1) Contract Training Programs, (2) Faculty/Staff Exchange Programs, (3) Cooperation with Unions, (4) Cooperation with Professional Organizations, and (5) Articulation with Noncollegiate Training Institutions.
Contract Training Programs

In today's harsh and competitive economic environment, organizations of all sizes and types increasingly recognize the importance of effective training and retraining. At the same time, many have concluded that they do not wish or cannot afford either to establish in-house training programs or expand such programs they currently operate (Boyle, 1983; Jackman & Mahoney, 1982; Parnell, 1982-83). Hence, most prominent among the expanding community linkages has been the advent of contract training programs--cooperative arrangements through which community colleges provide instruction and services customized to the specific needs of client organizations.

A nationwide survey of community colleges and technical institutes by Deegan and Drisko (1985) revealed two predominant management schemes for the delivery of contract training. The strengths of the community services integrated model are effective communication and coordination with other units of the college and flexibility in responding to a variety of client needs. Its weaknesses are the lack of a strong visible image, the absence of its own staff and resources, and uncertainties about priorities and about its status within the institution. These weaknesses are corrected in the business institute model, which typically has a high-level director and an advisory board composed of the chief executive officers of local corporations.

Contract programs vary widely in terms of emphasis and clientel served. General Motors Corporation has contracted with 43 community colleges across the nation to train automobile service technicians in the complex procedures required by the sophisticated technology of its current product line. The program utilizes company facilities and
college facilities, company staff and college staff, and state-of-the-art equipment provided by the company (Parnell & Vorhes, 1982). Northern Virginia Community College's campus-based business institute packages concentrated employee training programs in seminar format, designed to be employer or industry specific (Jackson, 1985). Florida Junior College has assigned a dean to become intimately involved in Jacksonville's industrial recruitment effort. When necessary elements of the local workforce are found to be missing, the dean can commit the college to pre-employment training contracts with in-coming businesses (Mosby, 1985). Almost 200 employees per month are trained in skill development courses taught by Valencia Community College at the education center of a local bank (Shirah, 1985). Digital Equipment Corporation has implemented a cooperative arrangement with 23 community colleges across the nation to train service technicians for minicomputers. Digital trains the faculty, assists in curriculum planning, and donates instructional materials (Forsythe, 1984b). Colorado Mountain College has contracted with the coal mining firm of Mid-Continent Resources to upgrade the skills of the company's heavy equipment mechanics. The college provides instructors and specialized training materials, along with grade reports and transcripts for participants. The company supplies a classroom, a shop, and the machinery to be repaired, and pays a per-student-credit-hour surcharge to supplement the college's regular enrollment-driven funding (Telinde, 1982). And finally, Lane Community College's business assistance center specializes in the needs of small businesses, contracting a wide range of management assistance services, including business counseling, short-term workshops
and seminars, and support resources such as a small business library (Cutler, 1984).

Deegan and Drisko (1985) estimated that nearly 70 percent of American community colleges and technical institutes were involved with contract programs as of spring 1983. The extent of this involvement ranged from one to five contracts per year for 37.7 percent of their sample to more than 20 contracts per year for 27.8 percent; fully 10.4 percent of the sample reported more than 50 contracts per year. More than 60 percent of all contracts were delivered at job sites; only 29 respondents provided no programming at client facilities. Noncredit programming predominated over credit programming by a 60:40 ratio; 73 contractors provided only noncredit instruction, while 46 provided only credit, and the remaining 221 provided a mixture. Business and industry produced the most common clients (69 percent), followed by health care institutions (13.7 percent), government agencies (13.2 percent), and an "other" category (4.2 percent) that included labor unions, service agencies, and private industry councils. The most frequently cited problems associated with contract programs were (1) lack of qualified instructors, (2) difficulties in scheduling facilities and time periods, (3) low level of support within the college, (4) lack of sufficient lead time for program development, and (5) poor marketing strategies. The most frequently cited benefits to the college from participation in contract training were (1) transcendent benefits (increased opportunities for job placement, identification of part-time faculty, and equipment donations), (2) increased revenue to the college, (3) opportunities to expand the college's mission, (4) more visibility and beneficial public relations, and (5) greater "real world" contact for college faculty.
Faculty/Staff Exchange Programs

A basic problem of rapidly escalating severity in community colleges is the need to retrain faculty in occupational programs in order to improve the institution's response to changing economic conditions, shifting labor market needs, and rapid advances in technology. Between 1968 and 1981, student enrollment in business, engineering, technical, and allied health fields increased by nearly 100 percent to account for approximately half of total freshmen enrollment by 1981 (Cooperative Institutional Research Program, 1982). Faced with declining resources and academic policies prohibiting the dismissal of tenured faculty without cause, community colleges have placed considerable emphasis upon retraining as a method for redistributing faculty to areas of understaffing (Shawl, 1983). The general format of faculty development programs in community colleges includes released time to take courses and to observe current practices in industry, seminars and workshops, and assistance by specialists in the preparation of course materials (O'Banion, 1982). But such programs have typically been unsuccessful in cases requiring major transitions in instructional content and methodology.

Alfred and Nash (1983) have proposed an Industry-Education Exchange Model in which faculty selected for retraining in occupational programs are placed in business or industrial settings for periods of six to twelve months during which time they are trained in new skills and practices and contribute to the productive capacity of the participating firms once trained. Concurrently, professionals and technicians from the participating firms are placed at the college where they absorb full- or part-time teaching loads and plan, evaluate, and modify
occupational curricula in accord with the current demands of business and industry and emerging technology. An additional function is to prepare academic departments for the return of the retrained faculty from the industrial setting. Alfred and Nash (1983) contend that their model will provide stagnant occupational programs with "valuable information about the quality of their resources and products--their teaching faculty, curriculum organization, instructional strategies, equipment inventories, program planning and evaluation processes, academic support services, and student outcomes" (p.7).

Cooperation with Unions

A largely untapped source of new students for community college occupational programs is that represented by workers eligible for education benefits that have been offered as incentives by major employers or negotiated by large blue- and white-collar unions over the past two decades. "The union halls are becoming classrooms. Unions are becoming more involved in the quality of life of their members, and offering schooling as a benefit is part of the new movement" (Danto, 1982, p. 17). Estimates of the number of workers covered by such plans vary. Peterson and Cross (1978) found 280 negotiated contracts offering tuition assistance to several million. Including non-negotiated incentive plans, Barasch (1981) estimated that at least five million workers may now be eligible for $2.5 billion worth of paid education.

Unions are interested in cooperation with community colleges for a variety of reasons. Monroe (1972) reported that a number of community colleges had made agreements with labor unions to assist with their apprentice training. This has been especially prevalent in Michigan (Parnell, 1982-83). District Council 37 of the American Federation of
State, County, and Municipal Employees (AFSCME) in New York City is concerned with the rapid transformation of that city's economy from a manufacturing base to a service base. While AFSCME is a service workers' union, its leadership recognizes that its membership cannot qualify for numerous currently-unfilled higher-level service positions requiring office skills, computer skills, and all kinds of technical and administrative skills. Accordingly, District Council 37 has attempted to create promotional lines for its members, with training as the mainstay of the effort. The union's own teaching staff provides basic skills instruction leading to high school equivalency certification, and every member is entitled to $450 per year in higher education tuition reimbursement. With a negotiated education budget exceeding $2 million annually, District 37's most highly publicized effort is the establishment, in collaboration with the College of New Rochelle, of a college campus within union headquarters, enrolling more than 400 students per year (Gotbaum, 1979).

The need to find ways to provide retraining, counseling, job search, and placement assistance to workers displaced by new technologies recently motivated the United Auto Workers and Ford Motor Corporation to embark upon a massive Employee Development and Training Program in cooperation with Henry Ford Community College in Dearborn, Michigan. Funding for the program is established under the UAW-Ford collective bargaining agreement at five cents per hour worked. The agreement designates "the community colleges of America as the principal training institutes for unemployed Ford workers throughout the United States" (Bundy, 1982-83, p. 22).
Less well known but possibly the oldest union-sponsored education program is the Educational and Cultural Fund of Local Three (New York City), the International Brotherhood of Electrical Workers. Negotiated contracts have provided higher education benefits to members and their families since 1949, and in 1964, Local Three negotiated 2 percent of the industry's gross payroll for educational and cultural use. The Fund sponsors a number of cultural, human development, and citizenship programs and a college tuition reimbursement plan for members and spouses. The union has proceeded largely on its own, but Empire State College has designed and taught courses on request (Barasch, 1981).

Most negotiated education plans provide tuition reimbursement after a worker has successfully completed a course (Barasch, 1981), but some, notably the National Vocational Retraining Assistance Plan by UAW-Ford, actually pre-pay tuition (Bundy, 1982-83). About 13 percent of plans provide study leaves, and another 6 percent offer study loans or scholarships. Less than 3 percent of eligible workers currently participate in available plans, a condition attributed by management to a lack of employee interest in further education (Barasch, 1981). Gotbaum (1979) provided convincing evidence of employee motivation, however, and Cross (1978) identified the inflexible nature of some plans, poor cooperation by some schools, and psychological barriers as the more likely culprits. College Board studies (cited in Barasch, 1981) attributed low participation rates among blue- and pink-collar (female) personnel to lack of information about eligibility, application procedures, and appropriate courses of study. The comprehensive community college is well experienced and well equipped to handle such problems.
Cooperation between community colleges and professional organizations provides similarly significant benefits to all participating parties. Three examples will suffice to demonstrate the scope and nationwide acceptance of such cooperation. In the Northeast, an ongoing relationship between the Community College of Rhode Island and the Rhode Island/Southeastern Massachusetts Chapter of the National Tooling and Machining Association responds to the Association's desire to attract more young people to machine-work occupations. Machinist apprentices sponsored by member firms are earning college credit toward associate degrees while fulfilling the training requirements for journeyman's certificates (Liston & Ward, 1984; Winter, 1982-83). In the Far West, the International Society for Hybrid Microelectronics has collaborated on curriculum development with faculty from Pima Community College in Arizona and Portland Community College in Oregon. This has resulted in the establishment at both colleges of a microelectronics process technology program that trains workers to install, adjust, and repair the complex subminiature devices used in calculators, computers, and aircraft controls (Forsythe, 1982). And in the South, Miami-Dade Community College has cooperated with a professional nursing association, a funeral home owners' association, and the local affiliate of the American Management Association to develop training programs for potential members along with retraining, upgrading, and license renewal programs for current membership. Two of Miami-Dade's most successful ventures are with the American Institute of Banking and the Institute of Financial Education. Both organizations provided significant input to the development of specialized training programs, and the College
frequently hires part-time faculty from the membership to teach program courses. In 1983-84, these courses generated more than 4000 student credits (Sigler, in press).

**Articulation with Noncollegiate Training Programs**

Occupational training at the postsecondary level is not the exclusive province of formally chartered and accredited institutions of higher education. In 1973, the Carnegie Commission on Nontraditional Study (1973) estimated that about 7.7 million adults per year were being trained in programs operated by corporations, unions, and federal, state, and municipal agencies. In 1975, the nation's 7500 largest private corporations spent more than $2 billion on employee training, $1.6 billion worth of which was conducted in-house (Lusterman, 1977). With the addition of programs in the public sector sponsored by the Comprehensive Education and Training Act (CETA), now replaced by the Job Training Partnership Act (JTPA), the volume of noncollegiate training has grown tremendously. A current estimate of the dollar value of in-house training in private industry alone exceeds $100 billion per year (Linck, 1983).

Noncollegiate training is not all of uniformly high quality, but a substantial amount of it closely parallels that provided in community college occupational programs. Most noncollegiate programs are designed to meet immediate needs; they are generally not responsive to the participants' needs for further advancement and seldom provide credentials for participants to document their achievements (Eveslage, et al., 1980). Over the years, most community colleges have developed internal procedures for recognizing students' noncredentialed prior learning; those involving a formal examination frequently award credit when test
results justify, and those of a more subjective nature usually only allow exemptions from corresponding courses without awarding credit (Hillsborough Community College, 1985; Miami-Dade Community College, 1985). On a larger scale, the Commission on Accreditation of Service Experience (CASE) evaluated military programs and recommended actual course equivalencies (Miller & Sullivan, 1974). In addition, two other large-scale projects have developed articulation guidelines that an individual college can use to evaluate noncollegiate programs and translate their offerings into transfer credit or advanced standing. The University of the State of New York and the American Council on Education's (1976) project focused primarily on business and industry programs, and Southern Illinois University's project, subsidized by the Fund for the Improvement of Postsecondary Education, focused on agency programs—chiefly CETA at the time (Eveslage, et al., 1980). Through all these processes for recognizing prior learning, community colleges encourage participants in noncollegiate programs to seek further advancement, help them accelerate that advancement, create an expanded market for the colleges' own programs, and positively influence the quality of those noncollegiate programs that seek formal articulation agreements.

State-Sponsored Economic Development Programs

How best to maintain or strengthen the economies of the several states is a question increasingly on the minds of governors and legislators. There is growing recognition among state planners that the availability of skilled workers, or the capacity to train them, is one of the most significant factors in an effective state economic
development policy (Campbell & Faircloth, 1982). Several states have effectively utilized their occupational training delivery systems to assist in attracting new industry and revitalizing existing ones. As a prominent component of these systems, the community college has become centrally involved in state economic development efforts (Garrison, 1985).

Since 1975, the Center for the Study of Higher Education at Pennsylvania State University and the National Council of State Directors of Community and Junior Colleges have cooperated in publishing annual reviews of state legislation affecting community colleges. The latest report (Martorana & Garland, 1984) revealed that in 1983, 21 of the 50 states addressed the theme of economic development by way of partnerships between community colleges and business and industry. This entailed 77 separate pieces of legislation encompassing a wide variety of activities: actions aimed at particular groups or classes of individuals, actions designed to create or modify programs, actions aimed at creating structures or mechanisms, and actions designed to provide incentives. To account for the unprecedented volume, Martorana and Garland looked beyond the broad goal of enhancing economic development and identified continuing high unemployment, the incentives provided by the federally-sponsored Job Training Partnership Act, and rapid transformation to high technology in industry as major motivators. Finally, they concluded that "the intensity of the public policy makers' interest in economic development and their moves to capitalize on the ready and able resources available in the two-year colleges . . . creates a new limelight for expression and recognition of the commitment
these institutions have to serving local business and industry's needs for a trained workforce" (p.19).

As community college leaders look for more effective roles their institutions can play in state economic development efforts, their attention focuses on the experience of several trend-setting states. A review of the literature describing that experience reveals five key factors for success: (1) Commitment from the Top, (2) Legitimization of the Community College Role, (3) Statewide Coordination with Local Autonomy, (4) Strong Financial Support, and (5) Active Participation by Business and Industry. The following discussion treats each of these in turn, and following that is an overview of the specific contributions made by community colleges in the areas of (1) Recruitment of New Industry, (2) Strengthening the Domestic Industrial Base, (3) Reducing Unemployment, (4) High-technology Training, (5) Technology Transfer, and (6) Direct Service to Business.

**Commitment from the Top**

Referring to the North Carolina community college system as "the most innovative in the nation," Governor James B. Hunt stated that one of the first steps he took toward the development of a comprehensive state approach to skills training was to specify "that the community college system should be the presumptive deliverer of skill training in our state" (cited in Parnell, 1982, p. 4). "That means that training should be done in one of those 58 institutions across the state, unless we find a good reason otherwise" (cited in Blake, 1981, p. 16). On another occasion, Governor Hunt characterized North Carolina's community colleges as "the backbone of our economy . . . the single most important element in this program of economic development" (cited in Campbell &
Faircloth, 1982, p.18). Governor Charles S. Robb of Virginia stated, "I have asked the community colleges of Virginia to be responsible for meeting the training and manpower needs of new and expanding businesses and industries" (cited in Parnell, 1984, p. 11). Calling attention to rapid social, demographic, economic, technological, and political changes, Governor Robb urged community colleges leaders to recognize that amidst such changes, the original mission of community colleges is still educationally sound in that it enables those colleges to capitalize upon the flexibility of the mission to provide high quality, accessible programs that meet both state and citizen needs. The ablest of these leaders will maintain a keen sense of the state's interests in community colleges and adjust programs so that they meet these interests. Fundamental to the community college leaders of the future is the development of a solid partnership with business and industry. (p. 12)

During Rhode Island's gubernatorial race in 1984, the Democratic candidate pledged to strengthen the community college role in economic development through strong state support and targeted funding for customized training programs. His Republican rival expressed a commitment to expand the community college's role in job training and in the provision of programs tailored to the needs of new and expanding businesses (Liston & Ward, 1984). And demonstrating that both actions and words speak loudly, Governor Richard Celeste of Ohio referred to the inauguration of Lorain County Community College's Advanced Technologies Center, the construction of which his administration was instrumental in achieving, as "the beginning of Ohio's progress in advanced technology" (Lorain County Community College, 1985, p. 6).

Legitimization of the Community College Role

In states where community colleges have not been politically sanctioned to play a key role in economic development, funding for their industry-specific programs may be scarce and its propriety seriously
questioned. Breneman and Nelson (1981), for example, recommended public support for highly specific industrial training in community colleges only when the programs are part of a state's formal economic development plan. Otherwise, they insisted, the costs should be borne by industry alone. Governor Charles S. Robb, this time in his capacity as the 1984-85 chairman of the Education Commission of the States, set as the Commission's immediate top priority "to address the corporate and union interest in education policy generally and attempt to find essential consensus on how schools and colleges can respond to a new set of needs" (cited in Parnell, 1984, p.10).

Even with official confirmation, however, community colleges are rarely alone in the economic development arena. Drawing on the considerable experience of Cuyahoga Community College in Cleveland, Eadie (1982-83) provided cogent advice to the community college that would venture "outside its conventional occupational/technical credit program onto the terrain of nontraditional job skills training" (p. 42). That advice was to conduct an organizational network analysis of the service area to identify and assess the "myriad of actual and potential relationships with other organizations and institutions in the immediate environment that are likely to have . . . impact on the implementation of the strategies" (p. 42). Such a survey should characterize other agencies as actual or potential "(1) resource providers, (2) competitors, (3) partners in joint ventures, or (4) legitimators/facilitators of directions" (p. 42).

Lapin (1982) drew on past linkages with CETA prime sponsors to develop a set of recommendations for future linkages under the Job Training Partnership Act (JTPA). He emphasized communication, trust,
and commitment between partners; focusing upon the benefits that result from linkage; understanding and coping with contrasting operating structures and styles; clarification of responsibility and authority; and a careful determination of the programmatic functions a college can provide consistent with its mandate in the community. And when a community college reaches out to lay the groundwork for interagency cooperation, the effort is likely to be recognized by policy makers. Responding to the proactive stance taken by the Maricopa Community College District, the Arizona Legislature recently designated each of the state's community college districts as the coordinator of vocational planning in its county, responsible for determining what training programs will be conducted and by whom (Landrum & Gluss, 1983).

Statewide Coordination with Local Autonomy

The consequences of lack of coordination are perhaps most visible at the national level. Garrison and Korim (1982) pointed out that for 205 years the United States has never developed a national policy on human resource development specifically aimed at increased productivity and competitiveness, much less at high-technology re-industrialization. The policies of our strongest international rivals, Japan and West Germany for example, have greatly enhanced their relative standing, often at the expense of American workers. Much more coherent planning is evident at the state level, however, where those making the most progress toward economic development have all adopted a consistent model: establishing an agency responsible for statewide coordination while retaining the responsibility for initiative and implementation at the local level.
North Carolina created a Board of Economic Development, composed of high level business and industry leaders, to guide its efforts. Next, the state reorganized its Department of Commerce to include an Industrial Development Division with seven regional offices dedicated exclusively to industrial training (Parnell, 1982). These offices coordinate closely with the five regional centers of the Department of Community College's Industry Services Division (Holdsworth, 1984). The success of the North Carolina approach is largely attributable to the formal ties that have been created between the Department of Community Colleges and the Department of Commerce. Their staffs work together and with banks, utility companies, and other community entities to recruit new industry and provide the necessary training services. Such close coordination assures that the services needed by industry can be properly planned and produced, and the colleges are able to avoid being put in the position of reacting after the fact to impractical designs (Campbell & Faircloth, 1982).

But North Carolina has managed to retain at the local level a great measure of autonomy over what is taught, reflecting what business and industry in the community need in the way of skills training. The decentralized approach facilitates clear and easy communication and strengthens the linkage between the colleges and localized economic development priorities (Holdsworth, 1984). Moreover, it has worked to diversify the economy and make new jobs available in all parts of the state (Campbell & Faircloth, 1982).

With minor modifications, the successful North Carolina approach has been closely replicated in (1) Virginia, where the community college system's Division of Industrial Training works closely with the
Department of Economic Development (Parnell, 1984); (2) Illinois, where a network of economic development centers, operated by all 39 of the state's community college districts, is coordinated by the Department of Commerce and Community Affairs (Burger, 1984); (3) Arizona, where community colleges, as the state's officially designated delivery system for advanced technical training, maintain close coordination with the Governor's Office of Economic Planning and local chambers of commerce (Landrum & Gluss, 1983); and (4) California, where the state's Employment Training Panel, with the assistance of progressive community colleges throughout the system, has established partnerships with business and workers to foster job training that creates a more competitive and productive economy (Duscha, 1984).

**Strong Financial Support**

If a firm commitment to improved economic development is to have practical effect, then a breakthrough must be made in targeting funds toward the upgrading of a skilled workforce (Wilson & Davis, 1982). Breneman and Nelson (1981) called for strong state support for high-quality equipment and instruction that would enable conventional community college occupational programs to adapt to changing labor markets and student interests. Beyond this, Campbell and Faircloth (1982) added special state appropriations for (1) high-technology equipment, (2) pre-funded priority programs to address critical manpower shortages, (3) cooperative skill training centers to provide colleges greater flexibility in contracting with industry for in-plant training and apprenticeships, and (4) leave with pay for periods up to 12 consecutive weeks for faculty to return to industry for update training.
The several states have devised a variety of mechanisms to establish a dedicated war chest for their economic development efforts. Three examples are sufficient to illustrate the diversity. North Carolina has taken the position that the majority of the funds to provide, repair, and upgrade training equipment must come from the state. Moreover, the training programs administered by the community college system are offered at little or no cost to the participating companies (Parnell, 1982). More than 70 percent of the system's budgeted enrollment is in job training, with an extremely low tuition and fee schedule of $51 per quarter for full-time enrollment. For the 1983-85 biennium, the North Carolina General Assembly authorized $28.8 million to replace worn-out equipment, $2 million for need-based scholarships, $6.4 million for new-industry and high-technology training, and $26.3 million for facilities construction. And in 1983 alone, the system spent $60 million to train 108,450 persons employed by the home-grown cornerstone industries of apparel, furniture, machinery, textiles, and tobacco production (Holdsworth, 1984).

In Illinois, the costs are shared more evenly between the state and the participating industries. For 1983-84, the business centers/ economic development offices operated by all 39 Illinois community college districts were financed by a $2.7 million special state appropriation, supplemented by another $5 million from training fees, donations, other state grants, and disbursements from the regular system operating budget (Burger, 1984).

And perhaps not surprisingly, California has concocted what surely is the most unusual plan of all. That state reduced its unemployment insurance tax and imposed a new state tax for an exactly compensating
amount on the same employers. (Federal law prohibits the direct expenditure of unemployment insurance funds for training.) From this springs the operating budget of California's Employment Training Panel (ETP). The ETP can work directly with business and industry, but community colleges are active in more than 50 of its projects to train nearly 7000 workers at a total cost of more than $20 million. In addition, the ETP has committed $3 million for agricultural training programs through the community college system (Duscha, 1984).

On a smaller scale, it is not unusual to find cases where a state has appropriated special funds for specific economic development activities at an individual community college. For example, Maine provided special funds for Southern Maine Vocational Technical Institute to start a machinist apprentice program to meet a severe manpower shortage created by industrial expansion (Warren, 1982); Ohio supplied $5.4 million to build and equip the previously referenced Advanced Technologies Center at Lorain County Community College (1985); and Florida, through its Department of Education, provided $67,000 to purchase equipment that Florida Junior College (FJC) used in developing a training program designed specifically to persuade the Bendix Corporation to relocate in Jacksonville (McKinnon, 1982).

Encouraged by the success of the FJC-Bendix experiment, the 1985 Florida Legislature created the Sunshine State Skills Program "to act as a catalyst to bring together community colleges and employers with specific training needs related to new, expanding, or diversification of business and industry" (State Board of Community Colleges, 1985, p. 8). With first year funding of $750,000--$2 million is requested for 1986-87 --the program is to be administered by the State Board of Community
Colleges in cooperation with the Department of Commerce. It is expected to stimulate the state's economic development, especially with respect to attracting high-technology industry. Participating firms must match the grant amounts provided from state funds, and training will be designed to respond rapidly to the needs of employers, terminating when the needs are met (State Board of Community Colleges, 1985).

Active Participation by Business and Industry

In the literature associated with community college participation in state economic development efforts, no message comes across more clearly than that the key to success is an effective partnership with business and industry. A 1982 survey of the membership of the AACJC's Council for Occupational Education (Philbin, et al., 1982) identified the two top priorities for improved performance to be (1) developing mechanisms to expand and improve articulation with business, industry, and labor, and (2) developing alternatives for financing postsecondary training programs. Warmbrod (1982) amplified the articulation theme, calling for good clear communication, active advisory committees, industry's support and guidance in developing programs, and the contribution of time and resources by key industrial personnel. Wilson and Davis (1982) recognized industry's monetary and in-kind support as a significant alternative for finance, calling on Congress to enact a broad-based program of tax incentives to encourage such support.

Rarely has an issue of the Community and Junior College Journal, in recent months, failed to cite at least one example of a significant contribution of material, money, advice, or technical assistance from an industry source to a community college (Bailey, 1985; Forsythe, 1982-83;
1984a; 1984-85). But in the matter of effective partnerships, as noted earlier in the matter of coordination, the state of North Carolina is clearly the bellwether. In that state, business and industry are involved in training decisions at every step of the way (Holdsworth, 1984). The Board of Economic Development, which directs the statewide effort, is composed of top-level business and industry leaders. When the State Board of Community Colleges was first established in 1981, Governor Hunt stacked that board with industry representatives, including Carl Horn, the chief executive officer of Duke Power Company, as chairman. And the training programs at the local level are guided by advisory councils, again composed predominantly of business and industry leaders from the community (Parnell, 1982).

The college-industry partnerships in North Carolina have been greatly enhanced by investments the companies have made in the system (Holdsworth, 1984). Working together, Governor Hunt and Chairman Horn appealed to more than 5000 firms to donate equipment or allow the on-site or off-site use of equipment for training. The North Carolina Department of Revenue contributed a ruling that such loans could be tax deductible at the value it would cost a college to rent the equipment. By 1982, the drive had produced $1.5 million in donations (Parnell, 1982), and by 1984, the total had climbed to $7.1 million in equipment, scholarships, and industry-supplied training for college instructors (Holdsworth, 1984).

Recruitment of New Industry

According to the Fantus Corporation, a worldwide supplier of advice to firms considering relocation, the number one reason a company chooses either to remain in a community or to relocate is the availability of
training and skilled workers—not tax advantages, not workers' compensation policies, nor any of the other factors traditionally associated with site location decisions (J.A. Anderson, 1982). Recognizing this, community colleges are increasingly more involved with state and local agency efforts aimed at convincing companies to locate, remain, or expand in their districts. Each year, community college representatives travel with Arizona's governor and industrial development leaders on "prospecting" tours to attract high-technology industry to the state (Landrum & Gluss, 1983). Specific examples of customized training programs developed by community colleges, along with the positive results they have produced, have been cited by Burger (1984), McKinnon (1982), Warren (1982), and Duscha (1984), among others.

But without doubt, the top marks for industrial recruitment go to the community colleges and technical institutes of North Carolina. That system gives concrete reality to the state's well publicized commitment to meet new industry's needs for training—"no matter how large a workforce is required, or where the industry will locate in the state, or how unique its training requirements" (Blake, 1981, p. 16). The response flows generally as follows. Having identified a company wishing to relocate in North Carolina or expand its current operations there, the Department of Commerce immediately calls in the Department of Community College's Industry Services Division. The company to be served specifies the numbers and types of skilled workers needed, and the staffs of the Division and the institution serving the area where the company is moving design a training program drawing on the best expert advice available domestically or abroad. A budget is prepared, and funds are transferred from the state to the local institution
providing the training. Typically, the training is synchronized with the construction schedule of the targeted firm's new or enlarged plant, with job candidates trained and ready to start work by the time the facility is completed. As provider of the initial customized training, the local community college acquires an ongoing responsibility to meet the new resident firm's needs for retraining and upgrading (Blake, 1981).

Through continual replication of this process throughout the state, North Carolina has become the nation's most successful recruiter of new industry in recent years. Between 1978 and 1984, 5237 companies either relocated or expanded operations in that state, creating 234,715 new jobs and investing more than $14 billion of new capital. By way of comparison, South Carolina realized approximately $15 billion in new capital investment in the past 20 years, during which it launched 16 two-year technical colleges ("High Tech Brings," 1983). Returning to North Carolina, in 1983 alone, new and expanding businesses announced plans for $1.1 billion in new facilities, creating 29,700 new jobs; this included more than two-thirds of the nationwide total of plants financed by foreign capital (Holdsworth, 1984). Moreover, North Carolina's balanced growth policy has spread this investment to all parts of the state. Nearly 80 percent of recent development has occurred in non-urban areas, and 90 percent of it has produced jobs in higher-paying categories (Campbell & Faircloth, 1982).

**Strengthening the Domestic Industrial Base**

In an increasingly competitive world, the continued existence of many industrial firms and hundreds of thousands of jobs depends upon a successful transition to highly efficient methods of production. In
most instances, current employees must be retrained before state-of-the-art equipment and processes can be brought on line (Groff, 1984). Such retraining accomplishes the dual task of meeting critical manpower shortages in industry and providing new skills to workers in danger of displacement due to obsolescence (Campbell & Faircloth, 1982).

A number of states have encouraged partnerships among community colleges, corporations, and workers to promote retraining that creates a more productive and competitive domestic industrial base (Bender & Lukenbill, 1984). Of these, the best documented example is unquestionably the state of California acting through its previously referenced Employment Training Panel (ETP). One ETP-sponsored project--a partnership among three community colleges of the Los Angeles District, a consortium of aerospace companies, and two unions--retrained 700 classically trained and soon-to-be-displaced machinists in the latest techniques of computer numerical controlled machining. The ETP and the consortium financed the purchase of training equipment, and the colleges provided the instruction via a mobile laboratory; the retrained workers continued with their previous employers (Garrison, 1985). A second partnership between the ETP and the Los Angeles District retrained employees of Fairchild Control Systems Company in the techniques of computer-assisted design and manufacturing (Winter, 1982-83). And a third retrained garment makers in computer-assisted apparel production, retrained surplus telephone company employees to function as electronics technicians, and retrained draftsmen in the techniques of computer-assisted design (Duscha, 1984).

Community colleges throughout the state are participating in similar ETP-sponsored projects. The College of San Mateo retrained
laid-off Ford Motor Company assembly workers to become microwave technicians. These workers are now available to meet manpower shortages in other companies. North Orange County Community College District retrained 990 Hughes Aircraft workers to operate a new computerized production management system, allowing Hughes to double the size of its ground systems group. And the Los Rios District along with the nearby Yuba District pioneered the ETP's programs to retrain farm workers in equipment maintenance, welding, management, and other valuable skills (Duscha, 1984).

Reducing Unemployment

Participation in projects affiliated with the Comprehensive Employment and Training Act (CETA) provided many community colleges their first experience with programs designed specifically to reduce unemployment. A federally-funded program to provide training for the economically disadvantaged, CETA was widely recognized as beneficial to the colleges as well as to the students and community. Lapin (1982) identified a number of college-accrued benefits associated with CETA linkages and set these forth as inducements for participation in programs sponsored by CETA's replacement, the Job Training Partnership Act (JTPA). Among these were (1) serving a portion of the community traditionally under-represented in higher education, (2) building a new constituency for the college as successful participants seek further advancement, (3) obtaining seed money for high-cost occupational/technical programs, (4) curriculum development that bridges the gap between education and work, (5) deployment of faculty in new growth areas, and (6) strengthening ties with the private sector.
Community colleges are actively involved in programs sponsored by JTPA (Parnell, 1984). Nowhere is this more evident than in Illinois, where numerous community colleges are primary providers, and others participate in programs administered by the state. Community college personnel serve on 23 of the 26 private industry councils in Illinois, and a number of them serve on the statewide Job Training Coordinating Council required by JTPA regulations. Community colleges administer 15 of the 19 dislocated worker centers in the state. As of January 1, 1984, 5000 of the 7500 dislocated workers enrolled in JTPA-Title III programs nationwide were in Illinois. And the placement rate for dislocated workers trained in Illinois community colleges has been an impressive 70 percent, compared to the mandated rate of 50 percent (Burger, 1984).

Representative of the services provided to recently unemployed individuals by JTPA-sponsored programs is the South Carolina Technical College model described by Lancaster (1985). The first component comprises approximately 70 hours of basic training in which participants receive help in (1) assessing their current strengths and limitations, (2) exploring new career options before narrowing their goals prematurely, (3) developing employability skills, (4) facing and coping with the psychological, domestic, and financial stress of being unemployed, and (5) acquiring some generic entry-level work skills. "The general purpose of this training is to foster a realistic assessment of the relevance of one's skills to a changing labor market and to structure an effective strategy for adapting to unemployment and achieving subsequent re-employment in a different occupation or environment" (p. 1). After basic training, some participants are ready to look for work with the
assistance of college placement offices. Others undertake additional training to develop academic competencies—the emphasis is upon reading, writing, and mathematics. Following this, some qualify for new employment, and others move on to advanced vocational and technical training in the regular college curriculum. In all, 78 percent of program participants enter new employment.

Beyond JTPA, the states address unemployment through programs of their own design and sponsorship. The community college-based activities of California's Employment Training Panel (ETP) are described more fully elsewhere in this review, but it should be noted here that the only workers eligible to participate in ETP programs are those either currently unemployed or judged to be soon in danger. Moreover, no training is supported by the ETP until employers are consulted about the adequacy of the training and agree to hire those trained (Duscha, 1984). Winter (1983-84) cited a similar case in Illinois, and most of the community college training programs sponsored by the Illinois Department of Commerce and Community Affairs are designed for industry retention, which protects payrolls and prevents further unemployment (Burger, 1984).

**High Technology Training**

Transforming a significant portion of a state's industrial base to high-technology status is a massive undertaking for which few clear guidelines exist. The model that has worked in North Carolina comprises a strong university complex for research and development, an adjacent industrial park to facilitate the cross-fertilization of research results and practical applications, and a dynamic community college system to create the corps of technicians and skilled workers needed for
implementation across the state (Holdsworth, 1984; Parnell, 1982). Ohio is attempting to replicate such an arrangement (Lorain County Community College, 1985), and Arkansas has taken some preliminary steps in that direction (Jones & Beck, 1982-83), but the citizens of Rhode Island recently voted four-to-one against an enabling initiative that had been spearheaded by their governor (Liston & Ward, 1984).

The principal difficulties associated with the implementation of high-technology training in community colleges can be summarized in one word: cost. In North Carolina, for example, as the community college system expanded the scope of its occupational programs to include high-technology training, the statewide average cost per trainee increased more than four fold (Parnell, 1982). Gebert (1982) identified the dimensions of high cost as follows: (1) Faculty qualified to teach the relatively exotic course content are not readily available; (2) up-to-date curriculum materials are hard to find; (3) training equipment is expensive and quickly becomes outmoded; and (4) facilities must be constructed or extensively remodeled.

Of these, securing and retaining a staff of seasoned professionals is arguably the thorniest problem. It is difficult for a college to compete with the salaries they can earn in industry, and while the short service life of training equipment may generate costs periodically, faculty salaries generate costs continuously, and these escalate rapidly. Recognizing this, many corporations lend personnel to serve as instructors or provide opportunities for faculty to be trained in industrial settings (Campbell & Faircloth, 1982; Warmbrod, 1982; Watcke, 1982-83). But the bottom line remains, "You get what you pay for." In states that mean to have high-technology training, community colleges
have been able to hire and keep a well qualified faculty (Branch & Hoppe, 1985; Lorain County Community College, 1985).

Regarding instructional materials, the Aerospace Education Foundation has made some progress in disseminating materials developed by the Air Force and industry during the Apollo Project (Nisos, 1982), and Watcke (1982-83) identified several other federal, corporate, and foundation sponsors that have begun to address the shortage.

Regarding equipment and facilities, the cost figures are shocking. One computer-assisted design (CAD) terminal, for example, costs between 25 and 35 thousand dollars. A CAD laboratory comprising only eight stations would require an investment of between 250 and 350 thousand dollars. Production-capable robots range in cost from $35,000 to $75,000, and a full-fledged robotics laboratory supported by a well equipped electronics laboratory and a hydraulic/pneumatic power laboratory, could easily cost more than half a million dollars, just for equipment (Watcke, 1982-83).

Such expenditures are unquestionably beyond the reach of standard budgets for procurement and capital improvements. But all things are possible if sponsors are determined. Ohio's Lorain County Community College (1985) secured special state funding to construct and equip its Advanced Technologies Center and has augmented its inventory through donations and loans from manufacturers eager to have their products used and seen in this environment. In partnership with such governmental and corporate giants as the Tennessee Valley Authority and General Electric, Chattanooga State Technical Community College has created a completely automated, integrated, high-technology manufacturing system for training (Branch & Hoppe, 1985). And with strong state and corporate support,
the community colleges and technical institutes of North Carolina have constructed multi-use buildings that accommodate a variety of fixtures and equipment that can be cycled in and out for a succession of high-technology training programs (Blake, 1981). In each case the effort is to create a "microcosm of the main plant, complete with the exact same machines" to be utilized by the industrial client/partner (Holdsworth, 1984, p. 25).

Finally, with regard to program specifications, community colleges can only hope to "fast follow" emerging technology until such time as they and industry become more cognizant of each other's needs and capabilities. Citing a functioning example at Maricopa Community College in Arizona, Landrum & Gluss (1983) identified the best mechanism for such articulation to be the high-technology advisory council composed of representatives from industry, the chamber of commerce, banks, utility companies, and government. Typically, the advisory committee assists the college in determining local manpower shortages, technical specialties and skill levels needed, and optimal locations for training sites. Other valuable sources of guidance include the cross-fertilization made possible by college-industry staff exchange programs and consultation with colleges that already have high-technology programs in place (Watcke, 1982-83).

Technology Transfer

In general, the nation's research and development sector is not responsive to local needs; its attention is focused in Washington where the funding is. As a result, the dissemination of federally sponsored research results is slow and often ineffective. Parallel to the cooperative agricultural extension service based at land grant colleges
with counties as its substructure, Grote (1982-83) envisioned a cooperative technology extension service based at two-year colleges with communities as its substructure. This service would provide a communication loop, transferring federally funded research results to the free enterprise system and the problems of business and industry back to be targeted for future research.

While it may be true that community colleges have traditionally followed rather than led local industry (Branch & Hoppe, 1985), as the high-technology era has progressed, a number of community colleges have accepted responsibility for preparing their service areas to meet the challenges. In Ohio, a network of 11 community colleges, in cooperation with Ohio State University, provides technical assistance and information to companies on the use of modern technology. In this technology transfer model, Ohio State serves as the "wholesaler," and each community college as "transfer agent" (Warmbrod, 1982). The Advanced Technologies Center at Lorain County Community College (1985) provides an excellent illustration. That facility is set up to simulate the most realistic and up-to-date environment found in industry. Industrial clients as well as students have opportunity to see and operate the most advanced high-technology equipment available. As an added feature, the center maintains a technology transfer resource area, which houses a library of current high-technology information in print and audiovisual formats and provides access to key industrial data bases.

The Center for Productivity, Innovation, and Technology at Chattanooga State Technical Community College is actively engaged in the business of solving problems brought in by local manufacturers, and this center boasts an impressive list of clients. In one instance, the
center helped the duPont Company automate its Chattanooga facility through the use of robotics in process control applications (Branch & Hoppe, 1985). Technology transfer is also a recognized objective of the Community College of Rhode Island's Department of Technical and Industrial Studies. There a wide range of high-technology equipment, including an industrial robot, is made available to industry representatives wishing to test its applicability to their processes. Staff members consult on the applications under consideration (Liston & Ward, 1984). A similar service is provided by Michigan's Oakland Community College, whose high-technology demonstration center also serves as the setting for regional and national industrially related conferences and short-term intensive seminars for industry (Rice, 1983). In all these illustrations, the emphasis is to facilitate the transfer of technology and to assist in the direct application of technology, rather than on teaching per se.

Direct Services to Business

A consistent theme in the literature related to community college participation in state economic development efforts is that of providing direct services to business. Clearly, the community college activities cited above as technology transfer qualify as direct service, and another specific example was found in Illinois. At the urging of the Illinois Department of Commerce and Community Affairs (1983), community colleges are having a significant impact on the state's economy by providing assistance to area businesses in the procurement of federal contracts for goods and services. Five colleges operate comprehensive procurement assistance programs, devoting at least one full-time
professional to the effort, and another 17 colleges are coming on strong (Burger, 1984).

But beyond these, community college efforts related to direct service appear to focus predominantly on small business. Lane Community College, acting on its own, established a small business center in 1982, and that operation was such a resounding success that the 1983 Oregon Legislature appropriated $500,000 to establish a statewide network of centers in all 15 community colleges, modeled on the original (Cutler, 1984). All 33 Illinois community colleges serve small businesses (Burger, 1984), as do all 58 system campuses in North Carolina (Holdsworth, 1984), and Eliason (1982-83) reported that "during the past two years, AACJC's National Small Business Training network has linked 186 two-year colleges to the district offices of the U.S. Small Business Administration to organize and deliver more than two million hours of high quality short-term training in 47 states" (p. 32).

Cutler (1984) described the services provided in the Oregon network as including (1) free business counseling by college staff, paid consultants, and volunteers from the Service Corps of Retired Executives (SCORE) and the Active Corps of Executives (ACE); (2) seminars, workshops, and classes that focus on current business issues; (3) access to resources, including print and audiovisual reference materials, data banks, and microcomputers; and (4) referral information, including lists of attorneys, consultants, accountants, and agencies providing specialized assistance. Eliason's review (1982-83) demonstrated that such services are typical of the offerings in community colleges across the nation. For instructional materials, a common practice is to adapt and package modified versions of conventional business administration
courses (Burger, 1984); fostering the entrepreneurial spirit and providing survival skills are primary emphases (Eliason, 1982-83). In addition, the AACJC's National Small Business Training Network has contracted with the U.S. Small Business Administration to develop ten modular curriculum packages. Programs are designed around the time constraints of small business operators; nighttime offerings and breakfast seminars are most popular (Burger, 1984; Keyser & Nicholson, 1982-83).

**International Response**

Historically, the community college has concentrated its efforts upon serving the local community, and this local focus has sometimes acquiesced to a conservative orientation in many communities and prevented some administrators from promoting global concerns (Adams & Earwood, 1982). As recently as 1981, 52 of 64 respondents in a survey of the AACJC's Council for Occupational Education rated the matter of increasing international linkages as very unimportant or least important--the lowest priority assigned to any of the seven issues queried (Philbin, et al., 1982).

There has, and I've heard it, been a shocking attitude in higher education that it is somehow illegitimate for our community colleges to concern themselves with global education. It's been snobbishly proposed that this is senior college turf--as if 35 percent of our higher education students can be cut off from the significant issues of our time. I absolutely reject such disturbing nonsense. Indeed, I'm convinced that the two-year colleges not only have a right to establish international linkages, they should lead the way. (Boyer, cited in Fersh & Greene, 1983, pp. 29-30)

Following a year of hearings, research, study, and consultation, the President's Commission on Foreign Languages and International Studies (1979) presented its report to President Carter in 1979. Far
from outdated, the report's recommendations are more relevant than ever. Pertinent to the present discussion was the following:

Colleges and universities in general should strengthen and improve the structure, quality, coverage, and utility of their undergraduate offerings in the field of international studies, and should relate these offerings more directly to vocational as well as cultural and intellectual goals [emphasis added]. (1979, p. 71)

Recognizing that community colleges are the most active institutions in "Citizen Education," the Commission recommended that they "receive special attention in expanded international education efforts to reach all citizens" (p. 23).

International education has been broadly defined in the literature. Shannon (1978) described it as "any activity which fosters an awareness of problems of transnational or transcultural significance and encourages understanding of other nations, peoples, and cultures" (p. 1). Koch (1978) offered "any one or combination of deliberately designed learning activities . . . the goal of which is the development of attitudes, knowledge, and behavior on matters international and global" (p. 30). In keeping with the delimitations of this study, the present treatment of international education is restricted to its several manifestations within community college initiatives aimed directly at economic development of the community, where "community" is taken first in the literal sense and second in the sense of its more recently acquired connotation of an interdependent world community writ large.

Domestic Initiatives

Burn (1985) has written convincingly about "the increasing need for Americans to have a cross-cultural knowledge that equips them to live and work [emphasis added] in an increasingly interdependent world" (p. 48). No less than U.S. Senator Daniel K. Inouye (1984-85) of Hawaii
has held that "as the largest national effort directed at education and training for entry-level and career advancement opportunities," American community colleges are ideally situated to create a "technically competent workforce for an internationally competitive economic environment" (p. 35). In the following discussion, this contention is treated first in terms of formal curriculum and second in terms of training and services for small businesses.

Occupational curricula related to foreign trade

Blanco and Channing (1984-85) have contended that international trade education is emerging as a vital new curriculum area for American community colleges. But the evidence to date suggests that the phenomenon is still in its infancy. This review of the literature revealed only two specific examples. Bronx Community College in New York offers courses in International Marketing and International Travel, seen as an important first step in integrating global perspectives into the areas of business, industry, and travel (Shannon, 1978). Cape Cod Community College's business division has developed international modules for its secretarial program, "illustrating cultural differences and professional requirements of German and Japanese employers" (Adams & Earwood, 1982, p. 13). In addition, the latter school has introduced a cross-cultural simulation game in a number of business related courses.

The most thorough investigation of the extent to which topics related to the conduct of foreign trade have infused the occupational curriculum was conducted in 1984 by the Office of International Programs at Cuyahoga Community College in Cleveland, Ohio (Vassiliou, 1984-85). Based on 432 responses from 1110 two-year postsecondary institutions (a 38.9 percent return), that survey revealed the following. Only 13.9
percent of the responding schools offered any formal curriculum related to international trade. Thirty colleges taught international business or banking (enrollments ranged from eight to 120 students), and another 22 colleges taught international economic theory or policy (enrollments ranged from eight to 150 students). Only 18 colleges provided a course specifically tailored to foreign trade. In addition, 13 colleges reported specialty courses or seminars in import/export traffic or documentation or international marketing, distribution, or transportation.

Of the colleges offering courses related to international trade, only 34 percent required students in business programs to take such courses, and even fewer required business majors to develop proficiency in a foreign language. Presumably, the students elected such courses out of interest or perceived need. These figures suggest that international trade does not yet figure prominently in the curriculum at most community colleges. Several respondents did note, however, that related topics were incorporated in other more general courses (Vassiliou, 1984-85). Mt. Hood Community College in Oregon (Harris, 1980) and Monroe Community College in New York State (Adams & Earwood, 1982) are two institutions engaged in building international and cross-cultural components into existing courses, some of which are taken by students in occupational educational programs. But if the bottom line is, as Greene (1984-85) concluded, that students in occupational education programs gain even less exposure to international/intercultural course content than students in general, it is reasonable to ask whether American community colleges have been more active in carrying global perspectives directly to business and industry.
Training and services for small business

Blanco and Channing (1984-85) cited U.S. Department of Commerce estimates that no more than 5 percent of American small businesses are currently involved in foreign trade, while as many as 25 percent plausibly could be. They pointed out further that these are the very firms that community colleges have traditionally been most successful in helping. R.S. Nicholson (1984-85) saw international trade as one of the most outstanding future opportunities for small businesses and called for community colleges to offer seminars in international trade and relations to help local businesspersons develop skills for international marketing. Mensel (1985) advocated courses and programs that stimulate small and medium-sized firms to trade their goods and services abroad and further advised community colleges to create direct linkages with firms currently engaged in international operations.

By way of prescriptions for such training, Tang (1984-85) emphasized that businesspersons must not only be knowledgable of business techniques, but equally sensitive to the social, cultural, and political surroundings in which their business would be conducted. Providing such insight is an especially important task for community colleges, in view of Klitgaard's (1981) contention that the intellectual product of university-based area-study centers has not trickled down to the general public. Melone (1984-85) added the requirement for training in the metric system of measurement used by most of the world's manufacturers outside the U.S. Finally, Inouye (1984-85) characterized as invaluable the service that community colleges could provide in illuminating the causes and effects of our international trade deficit.
But in answer to the question posed above, one must conclude from available evidence that the provision of training and services directly to small businesses currently or potentially engaged in foreign trade is also a phenomenon still in its infancy. Vassiliou's (1984-85) survey discovered that a few schools offer noncredit seminars and workshops in international trade tailored to local business needs, and pointed out that the trend is strongest in colleges in border/coastal areas. Two-thirds of the respondents in Andrews' (1985) survey thought community colleges were doing little to educate local constituencies about international trade, and this study may have discovered the ingredient necessary for expansion: All respondents reported a willingness to develop such programs if external funding could be made available.

Currently, the most approachable source of such support is the International Programs Office established under Title VI-B of the Higher Education Act. This title has existed for several years, but Congress appropriated funds for it for the first time in 1983 (Blanco & Channing, 1984-85). In 1983-84, more than 160 colleges and universities submitted proposals under Title VI-B, and one-third of the 24 proposals funded were from community colleges (Mahoney, 1984). Another five community college proposals were funded in 1984-85 (Inouye, 1984-85). Mahoney's (1984) report of the first-year group's accomplishments included the following:

1. Providing direct assistance to small and medium-sized firms, including counseling and brokerage services.

2. Providing long- and short-term training in foreign trade, including opportunities for internship experiences.
3. Offering short-term intensive courses in foreign languages and cultures.
4. Sponsoring national, regional, and local conferences; workshops; and community forums.
5. Establishing information resource centers and special libraries.
6. Creating networks for the exchange of international trade information among local businesses.
7. Establishing a national clearinghouse for information and resources useful to other colleges attempting to start or expand international trade assistance programs.
8. Developing the skills of related college faculty through graduate courses, internships with governmental agencies and firms in foreign countries, and attendance at international business conferences.
9. Consolidating all services and programming into a regional international trade institute.

**International Economic Development**

The principal emphasis in graduate level education is upon proficiency in the research methodology peculiar to a chosen discipline—abstractions and procedures frequently of limited utility in environments of exigency. Foreign nationals so trained, on returning home, typically end up as administrators in the national bureaucracy rather than as practitioners in the field (Glick, 1978). Several observers have pointed out that the more immediate and pressing need faced by developing nations is for technical manpower and personnel trained in middle management (Joma, 1983; Newman, 1981; Verma, 1981). Among the
specific vocations most in demand, Rinehart (1984-85) listed agriculture, health-related technology (nursing in particular), business occupations/entrepreneurship, forestry, water and wastewater treatment, passive design construction, environmental education, resource management, animal husbandry, industrial arts, accounting, and medical laboratory technology. Training programs and expert practitioners in all these areas are widely available in American community colleges. Fersh (1981) has called on them to share with the world the kinds of educational leadership and services they have pioneered in this country.

Community college participation in federally coordinated international economic development programs is of relatively recent origin. Harrington (1978) attributed this to two factors: (1) The movement began shortly after the end of World War II when community colleges were preoccupied with a tremendous wave of incoming students, and (2) for a long time thereafter, the federal officials administering programs simply overlooked the capabilities of community colleges. But by 1982, according to Andrews' (1985) estimate, 20 percent of American community colleges had become involved with international development, though federal agencies continue to provide less support than foreign clients or sponsors. As depicted in the literature, the community college effort comprises two major thrusts: (1) providing technical assistance to foreign educational institutions and (2) training students from foreign countries.

Technical assistance to foreign educational institutions

Newman (1981) and Verma (1981) have alluded to long-lasting colonial traditions attaching great prestige to classical university training while ascribing much lower status to technical training, in
spite of the latter's more immediate utility and potentially greater monetary rewards. Nevertheless, policy makers in underdeveloped nations are increasingly, if belatedly, receptive to the idea that middle level technology training provides the most practical approach to modernization and economic growth (Joma, 1982; Nwokeji, 1981). In many cases, however, because of elitist postsecondary education systems, neither the training nor even the preparation of instructors can occur without external technical assistance (Breuder & Adama, 1981).

Henriquez-Villegas (1983) pointed out that educational institutions in developing nations need help in (1) establishing the appropriate distribution of courses and programs (not only what should be offered, but also what should be eliminated, and when); (2) deciding on the number of students to be enrolled, given the specifics of supply and demand, to avoid underemployment and unemployment of graduates; (3) determining the necessary number and qualifications of faculty; and (4) controlling the direct and indirect costs of educational programs. Decisions made in these areas are likely to have great impact and wide visibility in a small country. Accordingly, Inouye (1984-85, p. 35) cautioned that to intervene successfully in a nation's "human development infrastructure" requires acute sensitivity to that nation's cultural and political traditions as well as its immediate economic and educational needs. Such is a hallmark of the American community college. Recognition of and adaptation to forces and influences in the local environment are skills so long practiced as to appear innate.

A partial list of community college leadership capabilities directly applicable to technical assistance in developing nations includes the following:
the capacity to provide short-cycle vocational and technical training matched to the needs of a nation; strength in creating a practical management approach to delivering identified services; ability to provide specialty programs cost effectively for nontraditional learners at the local level; and experience in a variety of educational specialty areas in demand in developing countries, including agriculture, industry, communication, construction, transportation, and health-related occupations. ("The International Frontier," 1984-85, p. 16)

To these, Fersh (1981) added help in planning facilities and training occupational faculty, and Martinez (1982) added the sharing of resources, instructional materials, and course designs.

Training students from foreign countries

The Institute of International Education (Adams et al., 1984) reported that 338,894 foreign students attended American colleges and universities in 1983-84. Of these, 43,337 (12.8 percent) attended two-year institutions. According to Deiner (1980), foreign students experience a number of problems related to inadequate information on institutional policies, difficulty in securing on-time payments of tuition by their home governments, and slow adjustment to cultural and climatic differences, but overall they find the community college environment congenial. On the basis of a Florida survey, Blankenship (1981) concluded that foreign students have a positive economic impact on the college and community. He also found agreement among administrators, faculty, and domestic students that their impact on the educational and cultural environment is positive, promoting better understanding and acceptance of cultural differences and similarities.

The fields of study selected by foreign students in American community colleges are as varied as their cultural backgrounds. The most popular choices are university-parallel programs in engineering, business and management, mathematics and computer science, physical and
life sciences, and social sciences. Less than 15 percent are enrolled in two-year technical programs (Adams et al., 1984). The most notable examples of foreign student participation in occupational programs involve technical assistance arrangements between this and other nations. Three examples illustrate the variety of such arrangements.

Breuder and Adama (1981) reported a cooperative arrangement between the Republic of Suriname and a consortium of nine American community colleges in eight states. Starting in September, 1980, 132 Surinamese were trained, for periods ranging from eight weeks to 32 months, in programs tailored to the expressed needs of the Suriname government. The vocational areas covered were agriculture; automotive and diesel mechanics; building construction; and electrical, electronic, and mechanical engineering technology. Beyond training in a major field, most of the students received specially designed teacher training, in preparation for their return to Suriname as technical instructors.

Bannon and Kraemer (1984-85) reported on the U.S. Congress/German Bundestag Young Professionals Exchange Program. One component of this program provided 84 young Germans a quarter or semester of study in an occupational curriculum at a community college, a half year of paid internship in an American company, and a whole year residency with a local host family. The reciprocal component sent 50 American community college students to Germany for similar experiences. In this country, 43 community colleges in 25 states participated in the program, the largest exchange program ever conducted that exclusively involved work-experienced students in occupational/technical studies.

And finally, the most thoroughly documented example was the Nigerian Manpower Project, a joint effort of the U.S. Agency for
International Development and the Nigerian government. The project started in September, 1977, with the placement of 489 Nigerian students in 68 American community colleges in 30 states and the District of Columbia (Jacobsen, 1979). Other contingents followed in January 1978, August 1978, and August 1979; they enrolled mainly in community college programs in agriculture, construction, surveying, electro-mechanics, and allied health technology (Peuse, 1981). The project's objective was to prepare a substantial number of Nigerians for mid-level technical employment in their home country (United States Agency for International Development, 1978). Possibly its most significant outcome was to illustrate the absolute necessity of adequately articulated program goals. As recounted by Peuse (1981), a significant number of the Nigerian students came with their own goals of eventually acquiring four-year degrees in business or engineering. Yet the community college programs were of terminal design, and student transfers to American universities were specifically forbidden by the Nigerian government. Although elective engineering and business courses were added to conventional occupational curricula in some instances, these adjustments did not quell student dissatisfaction. Differences in perceptions regarding the value of vocational training and lack of congruity between individual and project goals "evoked conflict that, to the very end, was never adequately resolved" (Peuse, 1981, p. 54).

Summary

The economic development activities undertaken by American community colleges demonstrate the behavior of an open system adapting to
conditions in its economic environment. These activities are conveniently described in terms of four major thrusts.

Conventional occupational education programs lie at the heart of the community college economic development effort. These fill the need for training at less than the baccalaureate level across a broad range of occupational specialties. A number of feedback processes have evolved for maintaining them in a state of dynamic equilibrium within the environment. These include detailed feasibility studies to determine the need for new programs, continuing program audits to ascertain the need for revision, and articulation with feeder high schools to insure a smooth transition of students from one level to the other. Developmental education components provide a humanistic influence and respond directly to the cognitive demands of the information age. Broad initial training and access to lifelong retraining provide means of coping with the highly changeable nature of the contemporary world of work. And finally, the provision of cooperative work experience opportunities, career counseling, and job placement services seeks to improve the match between skills possessed and skills required.

Linkages with organizations in the community are further evidence of adaptation to environment. Contract programs respond to a broad range of highly specialized training and retraining needs identified by client firms. Cooperation with unions and professional organizations spans the entire range from developmental education, to information skills, to high technology training. Faculty/staff exchanges provide essential inputs—updated competencies for current faculty, specialized skills in short supply, and feedback relative to the design and management of programs. And articulation with noncollegiate training
programs increases the flow of another valuable resource, students with prior training potentially eligible for advanced placement and program acceleration.

State sponsored economic development programs illustrate several systems theory concepts. The state, as suprasystem, provides essential inputs in the form of targeted funding and official confirmation of the community college role. Sensitivity to feedback from resource providers, competitors, potential partners, and facilitators is required to legitimize that role within the community. Statewide coordination promotes functional unity among all institutions participating in the effort; various specialized subsystems have evolved to accomplish this. The retention of local autonomy addresses each institution's need for boundary maintenance and homeostatic control of its internal processes. Active participation by business and industry provides other essential inputs, including monetary and in-kind contributions, the identification of training needs, and technical assistance in program development. And equifinality is illustrated by the variety of strategies with which the states through their community colleges have attempted to attract new industry, revitalize existing ones, reduce unemployment, assimilate high technology, and improve the performance of small businesses.

Finally, as depicted in the literature, the community college response to international impingements within the economic environment, while expanding, is still a phenomenon in its infancy. The nation's need for improved performance in the conduct of foreign trade has been addressed at two levels. Some community colleges have introduced courses or modules related to foreign trade into the occupational curriculum, thereby reaching students preparing to enter the workforce.
Others have carried global perspectives directly to business and industry. Finding sparse financial resources at the state and local levels for such endeavors, the latter colleges have depended primarily on support from the next higher level of the suprasystem, the federal government. Limited attempts have been made to export the benefits of mid-level technical training to the world community. This has involved the provision of technical assistance to foreign institutions engaged in occupational education and the training of foreign technicians and teachers in this country. The effort has depended almost exclusively upon federal and foreign sponsorship.
CHAPTER FOUR
PRESENTATION AND ANALYSIS OF CASE STUDY FINDINGS

To demonstrate the feasibility of determining a single institution's economic development mission through a formal investigation of its environment, a case study of one comprehensive urban community college was undertaken. Chapter One of this report describes the design and procedures employed in the case study survey, including (1) the selection of Miami-Dade Community College as subject of the study, (2) the development of the survey instrument (see Appendix for the final version), (3) the selection of an expert jury, and (4) the collection and treatment of data. In this chapter, the findings of the case study survey are presented and analyzed, first, in terms of general trends and second, on an item-by-item basis. The chapter concludes with an interpretive summary.

Presentation of Findings

Table 4-1 presents the several measurements used to analyze the jury's response on the "Important to Do" dimension for each of the survey instrument's 31 items. Column four contains the arithmetic average of all 100 individual importance ratings for each of the 31 items, from highest to lowest; accordingly, ranks ranging from one to 31 are listed in column one. Columns two and three, respectively, list the item identification number (from the survey instrument) and a short verbal description of each item. Column five contains the percentage of positive responses (calculated from the sum of "agree" and "strongly
### TABLE 4-1

Measurement of the "Important to Do" Dimension

<table>
<thead>
<tr>
<th>Rank(a)</th>
<th>Item Number</th>
<th>Item Description</th>
<th>Mean</th>
<th>Percent Positive(b)</th>
<th>Percent Undecided</th>
<th>Percent Negative(c)</th>
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(a) Tied ranks are listed in before-rounding order.
(b) Sum of "Agree" and "Strongly Agree"
(c) Sum of "Disagree" and "Strongly Disagree"
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(a) Tied ranks are listed in before-rounding order.
(b) Sum of "Agree" and "Strongly Agree"
(c) Sum of "Disagree" and "Strongly Disagree"
agree" ratings) for each item. Column six contains the percentage of "undecided" votes for each item. And column seven contains the percentage of negative responses (calculated from the sum of "disagree" and "strongly disagree" ratings) for each item.

Table 4-2 presents the corresponding measurements for the jury's response on the "Support with Tax Funds" dimension for each of the survey instrument's 31 items. The significance of the horizontal partition lines on each table is explained in the following discussion of general trends.

**General Trends**

As judged by their mean scores, all items received positive support on the "Important to Do" dimension (Table 4-1). Indeed, items through rank 18 (upper solid line) scored means above the 4.0 level, indicating strong approval. Items ranked 19 through 27 (lower solid line) scored means between 3.5 and 4.0, still solid approval, but somewhat lower priority than for the first grouping. Finally, items ranked 28 through 31 scored means below 3.5, but still above 3.0, indicating acceptance but lowest priority. It is also significant that positive vote ("agree" plus "strongly agree") proportions exceeded 75 percent for items through rank 21. Moreover, these remained at 50 percent or higher through rank 29, falling below 50 percent only for ranks 30 and 31. The significance of means, ranks, and vote proportions is analyzed below on an item-by-item basis. For now, it is sufficient to point out that all items were recognized as legitimate fields of endeavor for the college, some more enthusiastically than others.
With regard to the "Support with Tax Funds" dimension (Table 4-2), the first point to recognize is that each item's tax support mean is a smaller number than its importance mean. This was entirely predictable; philosophical support is always easier to garner than financial support. Moreover, the slippage is consistent with the findings of Doucette (1983), who surveyed several constituencies of the Arizona community college system, asking the same two questions about a different selection of items. The implication is that the "Support with Tax Funds" dimension must be interpreted on the basis of all available evidence, rather than in terms of means alone.

Table 4-2 contains three significant landmarks. The first is between ranks 17 and 18 (broken line), where means shift from above to below the 3.0 level. The second is between ranks 13 and 14 (upper solid line), where the proportion of positive votes (the sum of "agree" and "strongly agree") shifts from above to below 50 percent. The third is between ranks 24 and 25 (lower solid line), where the proportion of negative votes (the sum of "disagree" and "strongly disagree") shifts from less to more than 50 percent. These landmarks define three regions. From rank one through rank 13 is considered the range of positive approval for tax-based support—as indicated by means safely above 3.0 and majority positive response proportions. From rank 25 downward is considered the range in which tax-based support is clearly disapproved—as indicated by low means and majority negative response proportions. A review of the verbal descriptions in this range reveals items of two types: (1) items of highly localized benefit and (2) items of benefit to foreign individuals or institutions. In both cases, the
jury clearly judged the associated costs not to be the responsibility of the domestic public tax base.

Finally, from rank 14 through rank 24 defines a grey area; the means and the positive and negative response percentages fail to establish a clear mandate. Furthermore, the percentage of undecided votes achieves its maximum value within this range and is comparatively high throughout. A review of the corresponding verbal descriptions reveals (1) items that, in spite of their more detailed descriptions on the questionnaire, may not have been well-understood (e.g., Crosstraining, Credit for Prior Learning), (2) items of a highly nontraditional nature (e.g., Technology Transfer, Intensive Courses in Foreign Language/Customs), and (3) items for which benefits are obviously shared between the public and private sectors (e.g., Cooperative Education, Faculty Training in Local Business/Industry). Two overall interpretations seem reasonable: (1) Financial support should be shared between tax-based sources and user fees, and (2) the college would be well advised to expend some effort in clarifying these issues for community influencers, especially regarding items ranked 18 through 24, for which the tax means are less than the 3.0 level.

**Item by Item Analysis**

In the following discussion, the unabridged wording of each item statement from the survey instrument is presented along with the corresponding importance and tax means and ranks. When germane to the subsequent analysis, positive, negative, and undecided response proportions are cited from Tables 4-1 and 4-2. Cross-item comparisons are included when appropriate.
1. Offer credit instruction in occupational areas to prepare students of traditional college age for immediate employment: 
   Importance Mean = 4.48 (rank 3), Tax Mean = 3.97 (rank 2).

   The means alone are sufficient for analysis here. Unquestionably, there is strong support, philosophically and financially, for this the heart of the college's economic development effort. It should be noted, however, that the item did not measure the extent to which the range of program offerings is perceived as compatible with local demands. Achievement of such compatibility is an ongoing responsibility of strategic-level administration.

2. Offer credit instruction in occupational areas to prepare students older than traditional college age for immediate employment: Importance Mean = 4.39 (rank 6), Tax Mean = 3.77 (Rank 4).

   Again, the means alone are sufficient for analysis. The college was clearly authorized to include working-age adults in the population eligible for participation in occupational education programs. The legitimacy of tax-based support for the effort was also confirmed.

3. Offer developmental programs to enable students with serious basic skills deficiencies to prepare for occupational programs: 
   Importance Mean = 3.90 (rank 21), Tax Mean = 3.73 (rank 6).

   As indicated by a tax mean of sixth rank and a two-thirds majority positive vote, the panel clearly recognized the provision of remedial education as a public obligation. That the corresponding importance mean achieved only 21st rank, however, suggests the jury's considerable reservation that such is a college-level responsibility, an interpretation corroborated by several written-in comments to that effect. This
is an issue about which the college should exert no small effort in cultivating community understanding.

4. Coordinate its occupational programs with those offered by local high schools, to assure a smooth transition of students from one level to the other without unnecessary delay or duplication of effort: Importance Mean = 4.38 (rank 7), Tax Mean = 3.73 (rank 6).

The strong importance and tax means speak for themselves. That high-level business and industry leaders would recognize the necessity of coordination is hardly surprising; their willingness to pay for administrative overhead, however, is gratifying.

5. Allow students to cycle in and out of the institution for training and retraining throughout their working lives, for continuing development and advancement: Importance Mean = 4.15 (rank 17), Tax Mean = 3.06 (rank 17).

This item demonstrates that sole reliance on ranks is as futile as sole reliance on the absolute values of means. Both means achieved 17th rank in their respective distributions, which suggest lukewarm approval on both dimensions. The value of 4.15 achieved by the importance mean, however, represents a strong rating in absolute terms. The slippage to just above the 3.0 level by the tax mean reflects the panel's feeling that access to lifelong retraining is an individualized benefit, the cost of which should at least partially be borne by the recipient. The enfranchisement of the working-age population at public expense, noted in item two, may be restricted to an initial opportunity.
6. Teach broad technical skills that are transferable from one job to another: Importance Mean = 3.99 (rank 19), Tax Mean = 3.20 (rank 15).

Both means indicate solid, if not overwhelming, support. The slippage of the importance rank for this item, compared to item five, may reflect the jury's feeling that lifelong retraining is a more feasible approach to dealing with the changeable nature of the work world than initial broad training. In any case, the relatively high undecided vote percentages (indeed, the single largest on the tax dimension) reveal considerable confusion here. The concept needs clarification in the community.

7. Include a general education component--communications, humanities, and social sciences--in all occupational degree programs: Importance Mean = 4.14 (rank 18), Tax Mean = 3.48 (rank 11).

This item should be interpreted primarily on the basis of means, where both indicate solid support. That the tax rank is noticeably higher than the importance rank is a statistical artifact; several items scoring higher than item seven on the importance dimension fell below it on the tax dimension, artificially raising its tax rank. The absolute value of item seven's tax mean remained below that of its importance mean as expected; the rank displacement does not indicate a changed priority.

8. Teach "employability skills"--effective human relations, good work habits, appropriate personal appearance, etc.--in all occupational certificate and degree programs: Importance Mean = 4.52 (rank 2), Tax Mean = 3.80 (rank 3).
The means and ranks speak for themselves. The subtle message here is that the traditional socialization effects of college attendance may have been perceived as not enough. The jury has pointedly asked that a special effort be made.

9. Emphasize the information skills of reading, writing, and computation in all occupational courses and programs: Importance Mean = 4.64 (rank 1), Tax Mean = 3.98 (rank 1).

There is little room for interpretation here; again the means and ranks speak for themselves. Reading, writing, and computation skills were perceived as providing the basis upon which all higher ordered skills are built, the best hedge against technical obsolescence in the rapidly changing world of work. Naisbitt's (1982) information age has unquestionably dawned in Miami/Dade County.

At this point, it is convenient to compare the jury's importance ratings for item seven (the general education component) and item nine (information skills). As depicted in the literature, general education usually refers to courses in communications, humanities, and the social sciences, the rationale being to increase students' adaptability and awareness of life experiences (J.L. Campbell, 1982). But these are also the courses in which freshmen and sophomores have traditionally done the most reading and writing, which along with computing have lately achieved prominence as information skills (McCabe, 1983). As the concepts tend to overlap, item nine was included specifically to isolate the information skills from the life skills nested in item seven. In ranking the two, the jury expressed a strong bias toward pragmatism, as expected, clearly favoring the information skills. Amidst this overwhelming demonstration of support for information skills, however, one
should not lose track of the still strong rating accorded to life skills in the absolute terms of an importance mean solidly above the 4.0 level.

10. Provide career counseling and job placement services to students in occupational programs: Importance Mean = 4.18 (rank 13), Tax Mean = 3.41 (rank 12).

Means and ranks indicate solid support on both dimensions. This is the second case where tax support was strongly recommended for a non-teaching activity that will clearly generate overhead costs. The strength of these ratings may provide partial confirmation of Ammon and Robertson's (1985) contention that employers concerned about high rates of turnover are increasingly desirous that community colleges accept responsibility for helping students choose occupations that are personally as well as monetarily satisfying— that is, occupations with which they are likely to remain contented over the long term.

11. Cooperate with local business and industry to provide opportunities for students to work concurrently in the occupations they are preparing for: Importance Mean = 4.48 (rank 3), Tax Mean = 3.16 (rank 16).

The unexpectedly high value and rank of this item's importance mean is corroborated by its achieving the largest single positive vote proportion of 99 percent, with one undecided vote and no negatives. Cooperative education was clearly recognized as a legitimate function of the college. The decline to 16th rank of the corresponding tax mean is simply a reflection of the jury's entirely reasonable conclusion that the employers benefit as much as the interning students and thus should pay a fair share of the associated costs.
12. Contract to provide specific training needed by local companies: Importance Mean = 4.18 (rank 13), Tax Mean = 2.45 (rank 25).

The strong importance mean confirms the college's license to operate in the arena of contract programs, and, further, it reflects positively on the quality of the training provided to date. The low tax mean in combination with a 52 percent negative vote simply indicates that the client companies will be expected to pay for the services rendered.

13. Provide opportunities for occupational faculty to update their competencies by working in local business and industry: Importance Mean = 4.17 (rank 15), Tax Mean = 2.57 (rank 24).

As indicated by an importance mean above the 4.0 level and a positive vote proportion of 82 percent, the jury clearly recognized the necessity of recurrent real-world experience for occupational faculty. The drop of the tax mean to the lowest rank of the grey area is consistent with the idea that the employing company realizes considerable benefit from the productive effort of the interning faculty member and thus should be willing to pay a substantial share of the associated costs.

14. Locate and hire industry personnel with special competencies to serve as instructors in occupational courses: Importance Mean = 4.43 (rank 5), Tax Mean = 3.36 (rank 13).

The absolute value and rank of the importance mean indicate a high priority here; clearly the jury recognized the value of injecting a practical orientation into the classroom experience, along with an exposure to state-of-the-art industrial techniques. Hiring industry
experts on a part-time basis may also have been recognized as the most practical way to staff some of the more exotic program offerings for which demand is a small but important to meet. The tax mean's location in the range of solid approval reflects the obvious reality that paying faculty salaries is a public responsibility. Its drop in rank relative to the importance mean may indicate the jury's feeling that industry bears some responsibility to help; the more industry-specific the college's programs are, the more likely it will be that industry can reduce its in-house training expenditures. In any case, it will be difficult for the college to compete with the salary scales paid in industry.

Together, items 13 and 14 constitute both branches of a faculty-staff exchange program. In view of the mutual public-private benefits flowing from such exchanges, and considering the jury's reactions to the separate components discussed above, it seems reasonable to project a preferred funding arrangement for exchanges: namely, that the college and the participating firm should each continue to pay the salaries of their respective agents.

15. Cooperate with unions in the development and implementation of apprenticeship training programs: Importance Mean = 3.54 (rank 27), Tax Mean = 2.38 (rank 26).

An importance mean above the 3.5 level coupled with nearly a two-thirds majority positive vote indicates approval of the concept; the importance rank of 27th, however, indicates very low priority. Probably the explanation here is a natural management bias against unions coupled with the lack of a strong union tradition in the area. In any case, the tax mean, its rank, and the negative vote proportion of 58 percent
clearly indicate that this was perceived to be a highly localized benefit for which the participating union should pay the major share of costs.

16. Cooperate with unions in the development and implementation of educational benefits for their members: Importance Mean = 3.38 (rank 28), Tax Mean = 1.97 (rank 31).

This is an entirely predictable result based on the discussion for item 15 above; again, all importance measures indicate approval of the concept, but very low priority. The even lower tax mean and ranking (in fact, the lowest of all) clearly indicate the jury's feeling that this is a private benefit that should be paid for by the recipient.

17. Cooperate with professional organizations in the development and implementation of specific training programs for their members: Importance Mean = 3.97 (rank 20), Tax Mean = 2.18 (rank 28).

An importance mean of nearly 4.0 coupled with a positive vote proportion of 83 percent provides substantial authorization to operate in this arena. Jury participation by a significant number of identifiable professionals plus the inapplicability of the union bias here probably accounts for the higher ranking of this item compared to the previous two. Nevertheless, the very low tax mean and ranking coupled with a 66 percent negative vote reaffirm the contention that user fees are the expected source of financial support for private benefits.

18. Develop processes for students to earn credit for their prior learning, as a means to accelerate completion of degree requirements: Importance Mean = 3.78 (rank 22), Tax Mean = 2.86 (rank 18).
An importance mean substantially above the 3.0 level coupled with a positive vote proportion of nearly three-fourths establishes solid support of the concept, though the 22nd rank suggests a weak priority. The tax mean's position below the 3.0 level probably reflects lack of enthusiasm for administrative overhead, but coupled with the relatively large undecided vote proportion (27 percent), it may also indicate the jury's confusion over whether this is a public or private benefit. Further reticence may have resulted from the item description's forced choice of "credit" as the means of accomplishment--the idea that the public was being asked to pay twice for the same learning. The college would be well advised to clarify this issue in the community and determine if methods utilizing course exemptions or advance placement, for example, would be more acceptable.

19. Develop and offer specialized training programs to attract new industry to Dade County: Importance Mean = 4.22 (rank 10), Tax Mean = 3.61 (rank 9).

Means and ranks indicate strong approval on both dimensions, a clear recognition of the need backed up by willingness to provide the necessary financial support. This result constitutes a clear mandate for program expansion, a prospect that meshes smoothly with the legislature's recently enacted Sunshine State Skills Program (State Board of Community Colleges, 1985).

20. Develop and offer specialized training programs to meet critical manpower shortages in Dade County: Importance Mean = 4.37 (rank 8), Tax Mean = 3.72 (rank 8).

Virtually the same interpretation projected for item 19 applies here. Strong support on both dimensions indicates the existence of
critical manpower shortages and recognizes the college's ability to remedy them--another clear mandate for action.

21. Develop and offer specialized training programs to help employees of local firms meet changing job requirements: Importance Mean = 4.19 (rank 12), Tax Mean = 2.73 (rank 20).

The strong importance mean and rank indicate solid support of the concept. The tax mean's position below midway in the grey area coupled with a negative vote proportion of almost one-half reveals substantial reservations about public support, however. As primary beneficiary, the parent firm will be expected to pay a substantial share of the associated costs.

22. Develop and offer specialized training programs to reduce unemployment among target populations: Importance Mean = 4.17 (rank 15), Tax Mean = 3.75 (rank 5).

An importance mean above the 4.0 level in combination with a tax mean substantially above the 3.0 level unquestionably authorizes the college to operate, with public resources, in this arena. But the obvious superiority of the tax rank over the importance rank cannot be ignored. While smaller here than for item three, the difference is too large to dismiss as simple rank displacement as in item seven. The extremely strong tax rank clearly indicates the jury's concern over the problem of high unemployment among disadvantaged groups and its willingness to support the use of public funds in attacking the problem. The much lower importance rank may reflect the feeling that comprehensive programs, such as those sponsored by the federal Job Training Partnership Act, are the preferred avenue of approach. On balance, the college
should probably place more emphasis upon cooperative participation in the comprehensive programs than upon proceeding alone.

23. Develop and offer specialized programs to retrain workers with obsolete skills to work in new occupations: Importance Mean = 4.21 (rank 11), Tax Mean = 3.52 (rank 10).

The interpretation projected for items 19 and 20 applies here also. Strong support on both dimensions indicates that the problem is real and chronic, that the college is well qualified to deal with it, and that public funding for the effort is legitimate—another clear mandate for action.

At this point it is convenient, and very worthwhile, to compare and contrast the jury's responses to items 23, five, 21, and 12. The verbal descriptions of these items were carefully worded to suggest the following distinctions among beneficiaries of training to be provided by the college: item 23, the worker who has been displaced by technological advancement; item five, the worker attempting to climb the career ladder; item 21, the local firm struggling to keep up with changes in the economic environment; and item 12, the local firm seeking to improve its competitive position. College-supplied training for each group was solidly and equally approved: All four importance means round to the same number, 4.2; that the corresponding ranks range from 11 to 17 is essentially meaningless. But the jury established a clear set of priorities with regard to the utilization of public funds for this training: The tax means, in the order the items are listed above, are respectively 3.52 (strong), 3.06 (marginal), 2.73 (weak), and 2.45 (disapproved). It is important for college representatives to keep
these predispositions clearly in mind when building a case in the community for increased financial support of college programs.

24. Develop and offer training programs in high-technology occupations: Importance Mean = 4.23 (rank 9), Tax Mean = 3.21 (rank 14).

Solid support on the importance dimension, mean and rank, indicates perceived necessity and recognition of the college as a capable provider. Slippage of the tax mean to the top position in the grey area reflects apprehension over the potentially high cost and perhaps a feeling that industry itself should share responsibility here.

25. Provide exposure to high-technology equipment so that local business and industry personnel may test its applicability to their operations: Importance Mean = 3.58 (rank 26), Tax Mean = 2.58 (rank 23).

The low ranking of the importance mean coupled with a 20 percent undecided vote indicates considerable uncertainty over a very new concept. The possibility of an 81 percent positive vote, if the undecideds could be swung to positive, suggests that clarification of the technology transfer concept within the community could be a very productive effort. Nevertheless, the low tax mean coupled with a maximum possible positive vote of only 50 percent indicates that participating firms will be expected to pay a substantial share of the associated costs.

26. Provide direct assistance and consultation on matters related to operating a small business: Importance Mean = 3.74 (rank 23), Tax Mean = 2.72 (rank 21).
An importance mean closer to the 4.0 level than the 3.0 level coupled with a two-thirds majority positive vote suggests substantial potential for increased college activity in this area. The low importance rank may reflect the jury's awareness of Florida International University's official primacy. In any case, the low tax mean clearly indicates that the small business operators will be expected to share the costs.

27. Offer special courses related to the conduct of foreign trade: 
   Importance Mean = 3.64 (rank 24), Tax Mean = 2.77 (rank 19).

An importance mean well above the 3.5 level provides solid encouragement to proceed; however, its low rank suggests a modest priority for this new undertaking. The undecided vote of 24 percent, third largest on the importance dimension, suggests some confusion over the concept but holds the possibility of an 89 percent positive rating after sufficient promotion in the community. The tax mean, which shows some rank displacement, is disturbingly low for something intended primarily as an elective for regular students; the jury may have interpreted this item as a service to business. That the item requires considerable clarification in the community is further indicated by yet another large undecided vote--30 percent, second highest on the tax dimension.

28. Provide direct technical assistance to local firms engaged in foreign trade: Importance Mean = 3.18 (rank 30), Tax Mean = 2.23 (rank 27).

An importance mean above 3.0 but second from lowest suggests weak acceptance of the college's participation in this very nontraditional activity. Several factors could be responsible, including the considerable reputation of Florida International University in this arena and
the low representation of foreign trade interests on the jury. The jury may have viewed foreign trade more in terms of competition than opportunity, an interpretation consistent with the current wave of protectionist sentiment sweeping the nation ("U.S. Imports Top Exports," 1985). In any case, the third highest proportion of undecided votes (24 percent) indicates that substantial clarification and promotion will be necessary to legitimize this activity in the minds of community influentials, and this could be a difficult task in view of a declared negative vote proportion approaching one-third. The one clear-cut finding for this item is that the participating firms will be expected to pay for services rendered.

29. Offer short-term intensive training in the language and customs of foreign countries: Importance Mean = 3.64 (rank 24), Tax Mean = 2.65 (rank 22).

The importance mean's position above the 3.5 level plus a two-thirds majority positive vote provides solid encouragement to proceed, but once again a low importance rank implies a modest priority. This rating may have suffered from some of the same environmental obstacles postulated for item 28, and an additional handicap may have been the community's continuing bitter controversy over the issue of bilingualism ("'English plus' a plus," 1985). The jury correctly identified this item as a service to business; the tax mean's position in the low range of the grey area clearly indicates that participating firms will be expected to contribute substantially toward the associated costs.

30. Offer occupational certificate and degree programs to students from foreign countries: Importance Mean = 3.36 (rank 29), Tax Mean = 2.09 (rank 29).
The importance mean's position safely above the 3.0 level indicates that the concept was at least marginally accepted as a college function, but with extremely low priority in view of the third-from-last importance rank and a positive vote proportion of only 50 percent. A concerted promotional effort in the community will obviously be necessary if philosophical support is to be enhanced; the negative vote proportion of only 20 percent gives some reason for optimism. In any case, the tax mean and rank coupled with a two-thirds majority negative vote leave no question that foreign sponsors will be expected to support such activities.

31. Provide direct technical assistance to educational institutions in foreign countries: Importance Mean = 3.11 (rank 31), Tax Mean = 2.03 (rank 30).

Virtually the same interpretation projected for item 30 applies here. An even larger undecided vote (in fact, the largest) on the importance dimension suggests an even greater need for clarification and promotion in the community, with perhaps less reason for optimism in view of the declared negative vote proportion exceeding one-quarter. Again, support from the domestic tax base was clearly judged as unacceptable.

Summary

To summarize the findings of the case study survey, it is convenient and informative to consider the items in four groups.

Group one (items one through 11) contains items describing conventional occupational education programs, including the distinctive characteristics that have evolved in response to conditions in the
economic environment. For quick reference and comparison, the importance and tax means scored by the 11 items in group one are listed as follows:

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<th>Item</th>
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<td>I Mean</td>
<td>4.48</td>
<td>4.39</td>
<td>3.90</td>
<td>4.38</td>
<td>4.15</td>
<td>3.99</td>
<td>4.14</td>
<td>4.52</td>
<td>4.64</td>
<td>4.18</td>
<td>4.48</td>
</tr>
<tr>
<td>T Mean</td>
<td>3.97</td>
<td>3.77</td>
<td>3.73</td>
<td>3.73</td>
<td>3.06</td>
<td>3.20</td>
<td>3.48</td>
<td>3.80</td>
<td>3.98</td>
<td>3.41</td>
<td>3.16</td>
</tr>
</tbody>
</table>

Group one scored a composite importance mean of 4.30 and a composite tax mean of 3.57. These represent clear approval of the college's programs as currently arrayed and strong financial support for their continued growth. The programs should be available to traditional college-aged students (item one) and to older adults as well (item two). Remedial education for students unprepared to enter occupational programs directly was reluctantly approved (item three). The college's programs should be closely coordinated with those offered at the secondary level, in spite of the administrative overhead costs this obviously entails (item four). Lifelong training and retraining (item five) and broad initial training (item six) should be provided; the former may be the more plausible for coping with the rapidly changing demands of the workplace. That students' horizons be broadened by general education components is highly desirable (item seven); that they develop strong information skills in the process is imperative (item nine). Moreover, a special effort should be made to instill in students the traditional work ethic, lately described in terms of "employability skills" (item eight). Finally, to secure a better match between skills possessed and skills demanded, career counseling and job placement services (item 10) and opportunities for cooperative work experience (item 11) were solidly approved.
Group two (items 12 through 18) contains items describing linkages between the college and various organizational sectors of the community, representing further adaptation to the environment. The importance and tax means scored by the seven items in group two are listed as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Mean</td>
<td>4.18</td>
<td>4.17</td>
<td>4.43</td>
<td>3.54</td>
<td>3.38</td>
<td>3.97</td>
<td>3.78</td>
</tr>
<tr>
<td>T Mean</td>
<td>2.45</td>
<td>2.57</td>
<td>3.36</td>
<td>2.38</td>
<td>1.97</td>
<td>2.18</td>
<td>2.86</td>
</tr>
</tbody>
</table>

Group two scored a composite importance mean of 3.92, a more modest level of approval for community linkages than for conventional programs, but still substantial approval in absolute terms. The composite tax mean was 2.54, which reflects the predominance within group two of items for which user fees were judged to be the appropriate source of support. The latter category includes contract arrangements for providing specialized training needed by local companies (item 12), cooperation with unions in their apprenticeship (item 15) and educational benefit programs (item 16), and cooperation with professional organizations in the provision of special training for their members (item 17). The college was strongly encouraged to seek the participation of industry experts as instructors, and the legitimacy of tax-based funding for their salaries was recognized (item 14). The necessity of providing opportunities for current faculty to update their skills by working in industry was also recognized; it was deemed appropriate that the firms benefiting from the productive efforts of the interning faculty pay a fair share of costs (item 13). Finally, it was judged appropriate to recognize students' prior learning in noncollegiate training programs. Students should pay a substantial share for this highly individualized benefit, and whether credit or perhaps course exemptions is the preferred medium was unresolved (item 18).
Group three (items 19 through 26) contains items described in the literature as components of community college participation in state-sponsored economic development programs. The importance and tax means scored by the eight items in group three are listed as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Mean</td>
<td>4.22</td>
<td>4.37</td>
<td>4.19</td>
<td>4.17</td>
<td>4.21</td>
<td>4.23</td>
<td>3.58</td>
<td>3.74</td>
</tr>
<tr>
<td>T Mean</td>
<td>3.61</td>
<td>3.72</td>
<td>2.73</td>
<td>3.75</td>
<td>3.52</td>
<td>3.21</td>
<td>2.58</td>
<td>2.72</td>
</tr>
</tbody>
</table>

Group three scored a composite importance mean of 4.09 and a composite tax mean of 3.23. These represent solid approval of college participation and, with the exceptions noted below, equally solid approval of tax-based support for the effort. The college received a clear mandate for the development of customized training programs to attract new industry (item 19), relieve critical manpower shortages (item 20), help reduce unemployment among disadvantaged groups (item 22), and retrain displaced workers for new occupations (item 23). High technology training was enthusiastically supported (item 24), technology transfer more modestly (item 25), both with the expectation of cost sharing by the benefitting firms. Retraining to help employees of local companies meet changing job requirements received substantial approval with limited public assistance (item 21). And finally the college gained solid encouragement for increased participation in the area of direct services to small businesses, again with the clear understanding that the small business operators would pay for services rendered (item 26).

Group four (items 27 through 31) contains items describing the college's potential responses to international impingements in the economic environment. The importance and tax means scored by the five items in group four are listed as follows:
<table>
<thead>
<tr>
<th>Item</th>
<th>27</th>
<th>28</th>
<th>29</th>
<th>30</th>
<th>31</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Mean</td>
<td>3.64</td>
<td>3.18</td>
<td>3.64</td>
<td>3.36</td>
<td>3.11</td>
</tr>
<tr>
<td>T Mean</td>
<td>2.77</td>
<td>2.23</td>
<td>2.65</td>
<td>2.09</td>
<td>2.03</td>
</tr>
</tbody>
</table>

Group four scored a composite importance mean of 3.39, which, in absolute terms, provides some encouragement to proceed, but, in relative terms, establishes a very low priority. The composite tax mean was only 2.35, a clear rejection of public funding for the group overall. Within the group, strongest approval attached to the provision of special courses in the conduct of foreign trade (item 27) and to short-term training in the languages and customs of foreign countries (item 29). The former was intended to describe an elective for regular college students; considerable clarification of the concept within the community will be required to improve its tax-support rating. As a service to business, the latter was appropriately slated for mainly private support. Direct assistance to local firms engaged in foreign trade (item 28) was approved in principle, as long as the firms pay for services rendered. Finally, the provision of technical assistance to foreign institutions engaged in occupational education (item 31) and the provision of occupational training to students from foreign countries (item 30) were recognized as legitimate college functions. But the associated costs must definitely be borne by foreign sponsors.
CHAPTER FIVE
SUMMARY AND RECOMMENDATIONS FOR FURTHER RESEARCH

Summary

The problem addressed in this study was an application of concepts derived from general systems theory to an investigation of the relationship between the American community college and its economic environment. The study was conducted in four steps:

1. The conceptual framework was developed from a review of the literature related to general systems theory.
2. The economic environment of American community colleges was described on the basis of a second review of the literature.
3. The community college response to conditions in the economic environment was compiled from a third review of the literature; elements of system-like behavior were identified.
4. A case study was conducted to determine the environmentally sanctioned mission of one comprehensive, urban community college with regard to the economic development of its service area.
   (a) A 31-item survey instrument was distilled from the universe of possibilities set forth in the third review of the literature.
   (b) An expert jury rated each item in terms of its perceived importance and eligibility for tax-based support.
   (c) The data were analyzed and interpreted; implications for policy were discussed.
Conceptual Framework

Community colleges are social organizations, a subset of open, living systems. As such, they are acutely dependent upon their external environments for vital resources and such higher level supports as prestige and legitimization of the institutional mission. The essential function of the community college is to define and implement goals recognized as necessary by society. Absent the favored status of domestication, the support of community colleges is closely tied to the quality of institutional performance; therefore, adaptation to environmental changes is imperative.

The environment is ambiguous and heterogeneous when viewed from different points in the institution; nevertheless, it is factorable, so that interactions may be analyzed one at a time. Moreover, the environment provides cues to assist the analyst. These include nationwide antecedent movements, the advice of colleagues and community experts, the professional literature, and critical events as interpreted by cosmopolitan actors within the organization. The formulation of institutional change and its transformation into political reality require the input and support of community influencers.

The accomplishment of institutional change in response to environmental impingements is clearly the responsibility of strategic level administration. A collateral function is to maintain organizational stability by buffering the technical core against non-routine inputs from the environment. These concepts guided the design and conduct of this research; they underlie the case-study institution's projected use of the findings.
Description of the Economic Environment

For purposes of this study, the complex matrix of all possible environmental impingements upon American community colleges was factored to isolate one component of manageable proportions. That component, the economic environment, was further delimited to conditions having direct implication for the nation's present and future training and manpower needs. A review of the literature yielded the following.

Between 1982 and 1995, the American economy is expected to generate approximately 25.6 million new jobs. These will be distributed across a wide range of industries and an even wider range of occupational classifications. Relatively few of the new jobs will require the four-year college degree; indeed the nation is currently confronted with an over-supply of college graduates that is predicted to worsen. The more pressing need is for mid-level technical training and retraining across a broad range of fields.

Employment in high technology will continue to grow faster than for industry overall but will provide relatively few new jobs in absolute terms. Nevertheless, high technology industry will have a significant impact on selected local economies. Moreover, the contributions of high technology workers are indispensable to the industries in which they are employed, and thus to the nation's economic development. High technology has permeated virtually all sectors of business and industry, greatly changing the skills needed by workers. Its long-term effect upon employment volume is unclear; that it will increase the need for life-long retraining seems certain.

The service-producing sector is expected to continue its rapid ascendency relative to the goods-producing sector. The great majority of
current and future service jobs will entail the creation, processing, and distribution of information, requiring workers with strong cognitive skills. The effective utilization of information is seen as the key to the nation's future productivity, competitive strength, and economic achievement.

International commerce has grown to account for nearly a quarter of America's Gross National Product, an outcome simultaneously representing expanded opportunity and fierce competition. Record high trade deficits over the past several years have placed the nation in net debtor status for the first time since 1914. Dramatically improved performance in the conduct of foreign trade is clearly essential. Amid a wave of strong protectionist sentiment, America is hard pressed to maintain its traditional generosity toward developing third-world nations experiencing a severe shortage of personnel trained for mid-level technical occupations.

For the remainder of the twentieth century, the economic welfare of the nation will be conditioned primarily on the accomplishments of the "baby boom" generation, a group identified as possessing skills of questionable utility in the contemporary work place. Other elements of weakness include the inadequate skills of current high school graduates, a backlog of functional illiteracy in the adult population, and a serious imbalance between skills possessed and skills demanded. As the workforce ages and the supply of 18-year-olds dwindles, a much larger proportion of future workers will come from female, minority, and non-English-speaking groups. America must make better use of people already in the labor market and do a better job of cultivating the reservoir of untrained prospects in the population.
The Community College Response to Environment

Conventional occupational education programs lie at the heart of the community college economic development effort. These fill the need for training at less than the baccalaureate level across a broad range of occupational areas. They are maintained in a state of dynamic equilibrium through environmental feedback channels, including detailed feasibility studies for new programs, continuing program evaluation, and articulation with feeder high schools. Developmental education components have been added in response to the continuing skills crisis. General education components respond directly to the cognitive demands of the information age. Broad initial training and access to lifelong retraining provide means of coping with the changing demands of the workplace. And the provision of cooperative work experience opportunities, career counseling, and job placement services improves the match between skills possessed and skills required.

Linkages with community organizations are further evidence of community college adaptation to the economic environment. Contract training programs respond to a broad range of highly specialized training and retraining needs identified by clients, including business firms, unions, and professional organizations. Faculty-staff exchanges provide essential inputs--updated competencies for current faculty and outside experts to teach in special courses and advise on the design and management of programs. And articulation with noncollegiate training programs increases the flow of students with prior training potentially eligible for advanced placement and program acceleration.

Community college participation in the state-sponsored economic development programs illustrates several systems theory concepts. The
state, as suprasystem, provides essential inputs in the form of targeted funding and official confirmation of the community college role. Sensitivity to feedback from resource providers, competitors, potential partners, and facilitators is required to legitimize that role. State-wide coordination promotes the functional unity of all subsystems contributing to the effort, while the retention of local autonomy addresses each institution's need for boundary maintenance and homeostatic control of its internal processes. Active participation by business and industry provides other essential inputs, including monetary and in-kind contributions, well-identified training needs, and technical assistance in program development and operation. And equifinality is illustrated by the variety of strategies through which the states and their community colleges have attempted to attract new industry, revitalize existing ones, reduce unemployment, assimilate high technology, and improve the performance of small businesses.

Finally, the community college response to conditions in the global environment, while expanding, remains a phenomenon in its infancy. Several community colleges have instituted courses or modules related to foreign trade for students preparing to enter the workforce. Others have carried international perspectives directly to local business and industry. The latter have depended in large measure on support from the federal government. Limited attempts have been made to export the benefits of mid-level training to the world community. This has involved the provision of technical assistance to foreign institutions engaged in occupational education and the training of foreign technicians and teachers in this country. The effort has depended almost exclusively on federal and foreign sponsorship.
Findings of the Case Study Survey

The survey findings reflected clear approval of the college's conventional occupational education programs and of strong tax-based support for their continued growth. These programs should be made available to traditional college-aged students and to older adults as well. Remedial education for students unprepared to enter occupational programs directly was reluctantly approved. The college's programs should be closely coordinated with those offered at the secondary level, notwithstanding the administrative overhead this will generate. Broad initial training and lifelong retraining should be provided. That student's horizons be broadened by general education components was judged desirable; that they develop strong reading, writing, and computing skills was deemed imperative. A special effort should be made to teach students the importance of effective human relations, good work habits, and appropriate personal appearance. And finally, career counseling, job placement services, and the provision of opportunities for cooperative work experience were solidly approved.

Expanded linkages with community-based agencies were approved but accorded a modest level of priority. The college was authorized to engage in contractual agreements for providing specialized training needed by local firms, cooperate with unions in their apprenticeship and educational benefit programs, and cooperate with professional organizations in the provision of special training for their members. In all three cases, user fees were judged to be the appropriate source of financial support. The college was strongly encouraged to seek the participation of industry experts as instructors; the legitimacy of tax based funding for their salaries was clearly recognized. The necessity
of providing opportunities for current faculty to update their skills by working in industry was also recognized; the firms benefitting from the productive efforts of the interning faculty will be expected to pay a fair share of costs. Finally, it was judged appropriate to recognize students' prior learning in noncollegiate training programs, with the understanding that the students would pay a substantial share of the costs associated with this highly individualized benefit.

The college received a clear mandate for the development of customized training programs to attract new industry, relieve critical manpower shortages, help reduce unemployment among disadvantaged groups, and retrain displaced workers for new occupations. The use of tax-based funding for these developments was solidly supported. High technology training was enthusiastically supported, technology transfer more modestly, both with the expectation of cost sharing by the benefitting firms. Retraining to help employees of local companies meet changing job requirements received substantial approval with limited public assistance. And finally, the college gained solid encouragement for increased participation in the area of direct services to small businesses, again with the clear understanding that the small business operators pay for services rendered.

The provision of special courses related to the conduct of foreign trade and short-term intensive training in the languages and customs of foreign countries attracted substantial approval. Support for the utilization of tax-based funding in these efforts was weak. As the former was intended as an elective for regular college students, considerable clarification of the concept within the community will be required to improve the acceptability of tax-based support. Direct
assistance to local firms engaged in foreign trade was approved in principle, as long as the participating firms pay for services rendered. Finally, the provision of technical assistance to foreign institutions engaged in occupational education and the provision of occupational training to students from foreign countries were recognized as legitimate college functions. But the associated costs must definitely be borne by foreign sponsors.

Recommendations for Further Research

A number of topics for further research are suggested by this study. The following are recommended.

Specific to Miami-Dade Community College:

1. During the analysis of data, several issues were identified as requiring clarification within the community. Moreover, the general funding priorities deduced from the jury's responses must now be translated into specific recommendations (to the state) of public and private shares. A cooperative study involving educative give and take between college personnel and community influentials is recommended for this.

2. The college should replicate the methodology of the case study survey in other mission areas; the community education, public service, and developmental education missions are highly recommended, due to the controversy currently surrounding them.

3. Considering the highly publicized image of Miami as the "Gateway to the Americas," the jury's ratings on items related to foreign trade education and training were surprisingly low. A
study should be conducted to determine barriers preventing greater acceptance of this mission.

To community colleges in general:

1. Other community colleges should replicate the methodology of this study to determine their own environmentally sanctioned missions. If not the actual survey instrument developed in this study, then the review of nationwide antecedent movements in Chapter Three should be helpful in studying the potential economic development mission.

2. Preliminary to such efforts, many institutions will need to conduct studies to determine the identity of useful key-informants and community influentials.

3. Community colleges should expend more effort on follow-up studies to assess the subsequent performance of participants in their occupational education and customized training programs. The review of literature describing such programs detected a paucity of objective evaluation, at least in published form.
APPENDIX

BUSINESS AND INDUSTRY SURVEY
Dear Business Leader:

Miami-Dade Community College is undertaking a major study of its mission, with the goal of better matching its services to the needs of our community. The first step of that study is a survey of the business and industry community of Dade County.

I am requesting that you participate in the survey because of your extensive knowledge of the County's economic environment and your familiarity with the College. The questionnaire has been designed and distilled to require the absolute minimum of your time. I urge you to complete and return it in the accompanying postage-paid envelope today. Please be assured that Miami-Dade will use the data generated by this questionnaire; your response will make a difference in what we do.

Sincerely,

Robert H. McCabe
President

Miami-Dade is an equal access/equal opportunity community college and does not discriminate on the basis of handicap.
MIAMI-DADE COMMUNITY COLLEGE
Business and Industry Survey

Directions: For each item, please mark one box labeled "Important to do" and one box labeled "Support with tax funds."

Miami-Dade Community College Should:

1. Offer credit instruction in occupational areas to prepare students of traditional college age for immediate employment.
   Important to do: [1 2 3 4 5]
   Support with tax funds: [1 2 3 4 5]

2. Offer credit instruction in occupational areas to prepare students older than traditional college age for immediate employment.
   Important to do: [1 2 3 4 5]
   Support with tax funds: [1 2 3 4 5]

3. Offer developmental programs to enable students with serious basic skills deficiencies to prepare for occupational programs.
   Important to do: [1 2 3 4 5]
   Support with tax funds: [1 2 3 4 5]

4. Coordinate its occupational programs with those offered by local high schools, to assure a smooth transition of students from one level to the other without unnecessary delay or duplication of effort.
   Important to do: [1 2 3 4 5]
   Support with tax funds: [1 2 3 4 5]

5. Allow students to cycle in and out of the institution for training and retraining throughout their working lives, for continuing development and advancement.
   Important to do: [1 2 3 4 5]
   Support with tax funds: [1 2 3 4 5]

6. Teach broad technical skills that are transferable from one job to another.
   Important to do: [1 2 3 4 5]
   Support with tax funds: [1 2 3 4 5]

7. Include a general education component—communications, humanities, and social sciences—in all occupational degree programs.
   Important to do: [1 2 3 4 5]
   Support with tax funds: [1 2 3 4 5]
**Miami-Dade Community College Business and Industry Survey**

**Directions:** For each item, please mark one box labeled “Important to do” and one box labeled “Support with tax funds.”

<table>
<thead>
<tr>
<th>Miami-Dade Community College Should:</th>
<th>Important to do</th>
<th>Support with tax funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Teach “employability skills”— effective human relations, good work habits, appropriate personal appearance, etc.— in all occupational certificate and degree programs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Emphasize the information skills of reading, writing, and computation in all occupational courses and programs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Provide career counseling and job placement services to students in occupational programs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Cooperate with local business and industry to provide opportunities for students to work concurrently in the occupations they are preparing for.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Contract to provide specific training needed by local companies.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Provide opportunities for occupational faculty to update their competencies by working in local business and industry.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Locate and hire industry personnel with special competencies to serve as instructors in occupational courses.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Cooperate with unions in the development and implementation of apprenticeship training programs.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IR-10/85
MIAMI-DADE COMMUNITY COLLEGE
Business and Industry Survey

Directions: For each item, please mark one box labeled “Important to do” and one box labeled “Support with tax funds.”

Miami-Dade Community College Should:

16. Cooperate with unions in the development and implementation of educational benefits for their members.

17. Cooperate with professional organizations in the development and implementation of specific training programs for their members.

18. Develop processes for students to earn credit for their prior learning, as a means to accelerate the completion of program requirements.

19. Develop and offer specialized training programs to attract new industry to Dade County.

20. Develop and offer specialized training programs to meet critical manpower shortages in Dade County.

21. Develop and offer specialized training programs to help employees of local firms meet changing job requirements.

22. Develop and offer specialized training programs to reduce unemployment among target populations.

23. Develop and offer specialized programs to retrain workers with obsolete skills to work in new occupations.
### Directions:
For each item, please mark one box labeled “Important to do” and one box labeled “Support with tax funds.”

<table>
<thead>
<tr>
<th>Miami-Dade Community College Should:</th>
<th>Important to do</th>
<th>Support with tax funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>24. Develop and offer training programs in high-technology occupations.</td>
<td>Important to do</td>
<td>Support with tax funds</td>
</tr>
<tr>
<td>25. Provide exposure to high-technology equipment so that local business and industry personnel may test its applicability to their operations.</td>
<td>Important to do</td>
<td>Support with tax funds</td>
</tr>
<tr>
<td>26. Provide direct assistance and consultation on matters related to operating a small business.</td>
<td>Important to do</td>
<td>Support with tax funds</td>
</tr>
<tr>
<td>27. Offer special courses related to the conduct of foreign trade.</td>
<td>Important to do</td>
<td>Support with tax funds</td>
</tr>
<tr>
<td>28. Provide direct technical assistance to local firms engaged in foreign trade.</td>
<td>Important to do</td>
<td>Support with tax funds</td>
</tr>
<tr>
<td>29. Offer short-term intensive training in the language and customs of foreign countries.</td>
<td>Important to do</td>
<td>Support with tax funds</td>
</tr>
<tr>
<td>30. Offer occupational certificate and degree programs to students from foreign countries.</td>
<td>Important to do</td>
<td>Support with tax funds</td>
</tr>
<tr>
<td>31. Provide direct technical assistance to educational institutions in foreign countries.</td>
<td>Important to do</td>
<td>Support with tax funds</td>
</tr>
</tbody>
</table>
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For most 17-year olds, interpretation of literature is a puzzle: NAEP. (1981). Phi Delta Kappan, 63, 227.


King, J.W. (1985). Post secondary institutions' role in meeting the training needs of high technology industries. Dissertation Abstracts International, 45, 2738A. (University Microfilms No. 84-27, 858)


Winston Boos Richter, Jr., was born on January 22, 1941, in Albany, Georgia. In 1944, he moved to Spring Hill, Tennessee, with his parents, who supervised the Tennessee Orphan Home. Winston, in reality, grew up with 200 brothers and sisters. He graduated from David Lipscomb High School in 1959 and from David Lipscomb College in 1963, with a major in chemistry. In 1963, Mr. Richter also married Suzanne Richter. He received his M.A. in physics from Florida State University in 1966 and then taught at Florida A & M University.

Winston Richter began his career at Miami-Dade Community College in 1968, as a teacher of physics. He has remained at M-DCC since that time in various teaching and administrative capacities. At present, he is the assistant to the president.

Winston Richter lives in Miami with his wife and eleven (at last count) cats.
I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

James L. Wattenbarger, Chairman
Professor of Educational Leadership

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Ralph B. Kimbrough
Professor of Educational Leadership

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Albert B. Smith, III
Professor of Educational Leadership

This dissertation was submitted to the Graduate Faculty of the College of Education and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

David C. Smith
Dean, College of Education

May, 1986

Dean, Graduate School