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STATE-LEVEL COLLABORATION AMONG GOVERNMENT, EDUCATION, AND PRIVATE INDUSTRY FOR ECONOMIC DEVELOPMENT IN NORTH CAROLINA AND OHIO: AN ECOLOGICAL PERSPECTIVE

The Ohio State University

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STATE-LEVEL COLLABORATION AMONG GOVERNMENT, EDUCATION, AND PRIVATE INDUSTRY FOR ECONOMIC DEVELOPMENT IN NORTH CAROLINA AND OHIO: AN ECOLOGICAL PERSPECTIVE

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

Ernest L. Fields, B.A.

* * * * *

The Ohio State University
1984

Reading Committee: Approved by

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William E. Nelson, Jr.

School of Public Administration
To Iris, Chad, and Marka, without whom this achievement would have little meaning.
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CHAPTER I

THE PROBLEM

INTRODUCTION

Over the decade of the 1970s, the United States has faced threats to its economic and social vitality from three fronts. Private industry, and particularly manufacturing, has been marked by sluggish productivity and loss of markets to foreign competition. Education has been faced with declining competence by students in basic skills, low output of undergraduates and graduates in technical and scientific fields, and shrinking revenues for research. Finally, there has been confusion over government's role and public disenchantment with its ability to address effectively societal problems. But while the three sectors have traditionally sought independent solutions to their problems, there is a growing sense that their troubles may be related—that there is the potential for a symbiotic relationship among them.

The vulnerability of each sector grew more apparent with the structural changes in the economy of the United States which became manifest from about the time of the oil crisis in 1973—changes which had been occurring quietly,
though, over a much longer period. Three of the changes brought inadequacies in the educational systems into focus clearly: (1) the United States had shifted from a manufacturing to a service economy; (2) technological and scientific advances were occurring in a number of fields, such as computer technology, microelectronics, biotechnology robotics, and fiber optics, and were, in turn, revolutionizing processes in a number of other areas, particularly manufacturing; and (3) foreign advances in technology and productivity were opening United States markets to international competition. Taken together, these changes had the impact of skewing-up sharply the quality of educational skills demanded in the workforce.

The structural changes in the economy have had uneven impact on the states as some manufacturers either closed operations or pared and shifted them from the industrial Midwest to the South and Southwest. Nevertheless, all states are being affected by the necessity to accommodate more sophisticated industries than they had heretofore with more highly skilled populations. Now, as states seek to meet the challenge of attracting, retaining, revitalizing or generating industries, a burgeoning effort is underway to facilitate new collaborative relationships among government, education, and private industry to aid in those processes.
A beginning appreciation for the complex problems involved in developing intersectoral collaboration, and ultimately a major impetus for this dissertation research, was provided through the author's involvement in studies with the City of Columbus in 1980 and for the State of Ohio in 1981 of linkages between government, education, and economic development. An impediment that became apparent at both the local and state levels was that a history of pursuing adversarial, competitive, or simply independent paths to goal attainment has left little experience at cooperation upon which to build. Students and practitioners of economic development have shown concern with the scant progress states have made nationally in applying collective organizational resources to economic development (Wilson, 1981; Brandt, 1982; Rosenfeld, 1982).

An examination of the scholarly literature in organization theory shows that it has offered little practical use to organization managers and policy makers in the formation of cooperative relations. In fact it has been more a reflection of current practices in interorganizational relations than a guide for change. Organization theory as it relates to policy analysis, therefore, has been labeled by Charles Lindblom (1972) as "conservative" because it does not ask radical questions about the fundamental features of the social structure; "superficial," not because it is badly done, but because it considers only
those ways of dealing with policy that are close cousins to existing practices. The focus, then, has been on managerial strategies for advantage in the competition among organizations over assumed, limited resources.

But, important to our concepts of the nature of organizations, the forces controlling them, and, by extension, their appropriate behavior, are the images which have been developed to shape our thinking. Traditionally, organization theory centered on the single organization conceptualized as a mechanical-like system, closed to, and operating independently of, its environment. Internal components necessary to its operation, including human resources, were regarded as objects of independent manipulation by managerial authority for arriving at maximum efficiency in operation.

Theoretical advances (Barnard, 1938; Selznick, 1949) recognized the inability of the closed system concept to account for outside influences on the operation of the organization. An alternative conceptualization saw the organization as an open organic system exchanging its products with elements in its environment for resources required for its survival. Rather than abandoning the mechanical imagery, however, it has been retained by modern theorists as a contingency for guiding managerial practice when deemed appropriate (Lorsch and Lawrence, 1970).
Whether the context has been an open or closed system, though, the single organization perspective has dominated research.

The inability of more limited organization studies to account for the connectedness of events in complex industrial or postindustrial societies has prompted an increasing number of researchers over the past couple of decades to widen the boundaries of analysis to include the interorganizational network. And, with the expanded focus, a number of conceptual devices have been introduced, e.g., exchange theory (Levine and White, 1961), political economy (Benson, 1976), and dialectics (Zeitz, 1980).

With the wider perspective, the organic imagery has also been broadened to consider populations of organizations using ecological concepts drawn from Charles Darwin's theory of biological evolution. A feature of the ecological approach is that it provides an elegant conceptual framework for examining interactive processes and connections between events at all organizational levels— that is, between (1) the single organization and its internal components, (2) the single organization and other organizations in the environment, and (3) among populations of organizations. The interactive focus calls attention to the organization's contributions to the quality of the environmental relations which, in turn, constrain organization action. Moreover, it provides a dynamic rather than static
perspective of society.

The ecological concept is used in this dissertation as a lens to provide a focus at different levels of relations between organizations in the private industry, education, and government sectors.

The Purpose of the Study

The purpose of the dissertation is to contribute to a broader understanding of the nature of organizational interdependence, particularly among the state-level government, education, and private industry sectors for purposes of human resource and economic development. The intersectoral focus moves the unit of analysis to a level beyond the simple interorganizational network to explore the unique factors and problems of relations between given categories of organizations.

The intersectoral relations will be explored within the context of the interorganizational literature with special attention to ecological concepts as an imagery for directing thinking about interdependent relationships both between the organization and its components, and among organizations.

If those with policy and management responsibilities in state government, education, and private industry are to be instrumental in moving the sectors from adversarial and competitive to collaborative relationships, a greater sensitivity to the nature and extent of their interdependence
will be required. A review of the organic and ecological literature suggests that it might provide a powerful conceptual tool for exploring those interdependencies as well as providing alternatives to concepts resigned to the inevitability of interorganizational conflict.

Drawing on existing interorganizational concepts and ideas in the literature, an intensive review of actual cooperation will be undertaken in two states, North Carolina and Ohio. The objectives of the dissertation are to derive from this review:

(1) descriptive conclusions about the nature of inhibiting and facilitating factors in state-level intersectoral initiatives for human resource and economic development efforts in North Carolina and Ohio;

(2) an enhanced conceptual and theoretical understanding of organization theory, in general, and of that which relates to interdependent relations among organizations in complex industrial societies, specifically;

(3) prescriptive recommendations for viable approaches to the design of collaborative processes among organizations in different sectors; and

(4) an improved understanding of the prospects and limitations of alternative research methods as tools for analysis in complex and highly interdependent societal settings.
Practical Problems from Organizational Concepts

The individualistic ideal which has guided relations between private industry, education, and government has provided the three sectors with little more than arms length interactions, hence with little opportunity to develop a sensitivity to the degree to which they are interdependent. As a result, relationships between actions in one sector and their effects in another tend to be obscured. But, a number of studies suggest that differences in perceptions about those relationships can have a profound bearing on the rate of technological advancement and the degree of economic and social well-being which societies enjoy. Some of the functional relationships are presented here as background to the structural economic changes to which the states are attempting to adjust.

The functional interdependence between industry and education which affected their mutual advancement has, in its wake, fostered profound changes in industrial organization. With the spread of industrialization, values and organizational principles evolved geared to developing the concentration of resources, organizational scale, and efficiency regarded as necessary to its processes. These values and principles were embodied in three organizational and managerial concepts which built upon and reinforced each other: (1) administrative management theory, (2) the bureaucratic model, and (3) scientific management.
Departing radically from the organic solidarity of families and small work groups which provided a highly personalized context for man's relations to his work prior to industrialization, the three concepts fractionalized relationships by departmentalizing the work organization, specializing functions, and standardizing tasks.

Collectively, the concepts organized relations in a pyramidal hierarchy from the single entrepreneur/manager at the top through expanding layers of supervisors and subordinates to the workers performing actual production operations at the bottom. The organization was held together with singular authority from the top derived through the owner's rights of private property and delegated to managers in sufficient amounts to maintain control. Ideally, impersonality guided relations, rules governed rights and duties of positional incumbents, technical competence determined selection and promotion, and the machine provided the pace and rhythm for workers. Extrinsic rewards, regarded as the sole work incentive, fueled the operation.

Rothwell and Zegveld (1981) point out that as this century, and particularly the post World War II period among industrialized nations, reached unprecedented levels of prosperity, a number of changes were taking root which threatened the economic gains. Ironically, some of the changes were due to the increase in education and personal wealth brought on by industrial growth. As education and
per capita income rise, there is a corresponding rise in concern with those aspects of quality of life less easily satisfied through simple increases in private consumption. Thus, in the late 1960s, the Western industrialized nations and Japan found themselves faced with the reactions of a more highly educated generation of workers to the monotony and psychological stress associated with the assembly line process.

Driven by different needs, other industrialized nations responded differently from the United States. Pehr Gyllenhammar of Sweden, Volvo's president, relates (1977) that visits to the United States at the time revealed similar conditions of worker alienation in the two countries, manifested in job hopping, absenteeism, antagonisms, apathy, and sabotage. Annual worker turnover rates were as high as 50 percent in U.S. industrial plants. Sweden, facing a labor shortage, began to move away from many of the principles which had become standard in industrial organization. Alternatives were introduced which contained significant features of 19th century organic work group relations--e.g. job rotating, communal work efforts, mutual criticism, shared ownership, equality of compensation, participatory decision making, infusion with spiritual values, integration with domestic life (Ouchi, 1980)--features that were also becoming characteristic in other industrialized nations, particularly the other Scandinavian
countries and Japan. The United States, in contrast, faced a labor surplus allowing managers to view the turnover rate as relatively unimportant.

Paralleling the increased manifestations of worker dissatisfaction in the United States was a precipitous decline in the rate of industrial productivity—a measure of output, or Gross National Product (GNP), over the input of person hours of labor in a given time period. Productivity was significantly higher in those industrialized nations with more widespread adoption of organic measures. A steady and relatively high rate of productivity growth of 3.3 percent per year was enjoyed in the United States between the end of World War II in 1945-46 and 1967. The decline began in 1967 when the growth rate averaged 2.2 percent per year until 1978. In those same years, Japan's productivity was growing at 9 percent, Sweden's by 6 percent, and West Germany's by 5.5 percent annually. In 1978, United States productivity declined to 1.8 percent and in 1979 to a negative 1.9 percent, the first negative growth rate in productivity since the Great Depression of the 1930s (Sullivan, 1981; Musick, 1980).

The relative decline in United States productivity has allowed foreign industries to offer goods at lower prices, thus successfully competing in markets formerly dominated by the United States at home and abroad. Robert Reich (1983) emphasizes the impact of rapid
internationalization on the economy. In the early 1960s when only 8 percent of the United States' economy was subject to foreign competition, the similarity in production processes allowed capital and labor to be shifted easily from declining to growing industries. Consumers also had fewer product choices.

Today, over 70 percent of United States goods face foreign competition (Magaziner and Reich, 1982). The rise of more flexible industrial systems in foreign countries with higher productivity reflected in lower costs for superior goods has allowed the consumer greater choice. Moreover, in the United States, with lower productivity and declining opportunities for growth outside of skill intensive production, newly freed labor and capital are not shifted easily, but instead result in plant closings and unemployment (Reich, 1983).

The impact of the combination of structural changes on the heavy manufacturing states prompted some observers to suggest resignation to an inescapable protracted economic decline—"not [a] recession lasting for months or even years, but . . . hard times lasting for several decades" (Flint, 1981).

But a number of other factors flowing from a value system favoring independent pursuit of organizational objectives have been identified as contributors to a drag on the nation's potential economic and social progress on a
wider scale. Articles tracing direct and indirect consequences of the independent outlook both within and among the sectors have been increasing over the last few years. For example, it has been revealed that hampering revitalization in several industries in the United States is an internecine conflict between union and management, fueled by a history of chronic mistrust which precludes either group from trading concessions on extrinsic rewards for the mutual benefit to be derived from the company's survival (Easterbrooke, 1983).

Within management, it has been pointed out, there has been a premium on financial and legal rather than production oriented education. Too often, an emphasis on short-term growth and a "fast-track" mentality regarding job mobility combine to favor decisions resulting in high short-term profits against long-term company health (Bauer, 1981). The emphasis on legal maneuvering among corporations has been seen as influencing a "massive diversion" of some of the brightest young students from pursuing other socially valuable careers to top law schools. The schools, in turn, serve as conduits to lucrative positions in the largest firms. Meanwhile, there has been a growing concern among some law students and administrators that there is little interest in teaching the relationship of law to fundamental social issues (Margolick, 1983).
Historically, independent paths in university-industry relations are seen as having contributed to a slowed pace in technological development. Shapero (1979) notes that university-industry relations, over the years, have been characterized by discordant value systems and time perspectives. Years of federal support for basic research in universities allowed them to show little concern for practical application, while industry was oriented to short-term projects that offered quick and safe returns. The availability of highly skilled engineers has been affected by industry competition over the short supply, serving to bid up starting salaries. As a result, incentives have been for students to pursue graduate education thus lowering the supply of teachers and in turn contributing to the shortage (Stockton, 1981).

Similarly, at the level of public instruction, industry and education have worked in different directions. Industry's "shadow" educational system, with a budget estimated to be at least comparable to that of the educational appropriations of the combined fifty states, lacks any conscious coordination with public education (Lynton, 1981). But, even within the public education system, a study of education reveals routine tracking of students into separate vocational and academic streams with little coordination to offer the students the needed features of each (Weisberg, 1983).
Historically, state governments have also failed to tap fully educational resources for their economic development programs. Though some states coordinated training efforts with vocational or technical education programs to attract industry, Wilson observed at the time of her study (1981) an almost complete absence of relationships between state departments of economic development and postsecondary academic institutions.

The loss of markets to foreign competition in recent years has directed new attention to alternative organizational concepts. Organic and cooperative concepts have been applied increasingly in private industry to resurrect operations which were failing under more mechanistic forms. In the process, traditional assumptions of a single-direction dependency of workers on management have started giving way to those of interdependence and partnership. For example, in production, Ford, General Motors and Chrysler corporations, along with United Auto Workers, have introduced organic measures characteristic of Japanese and Scandinavian manufacturers, including guaranteed lifetime employment, worker-centered technology, lower status differentiation, and employee participation in production decisions (Holusha, 1983); and in food retailing, the Great Atlantic and Pacific Tea Company (A&P), became the nation's first major chain to give employees a share in management and a percentage of gross sales (Diamond, 1983).
In intersectoral relations, there are also signs of change. There is some evidence that traditional assumptions of independence and competition as fundamental to organization survival are giving way to the idea that collaboration and cooperation are viable alternatives. For instance, responses from state governments since the 1981 Wilson study show wider effort among states actively to foster collaboration among business, education, and government to revitalize or upgrade state economies.

The ecological perspective in organization theory is offered as a particularly appropriate conceptual tool for helping to direct new insights into the nature and extent of functional interdependence among the sectors.

The Research Questions

The problems in moving education, private industry and government toward more collaborative efforts at the state level were addressed (1) in the context of the literature in organization theory and (2) through the perceptions of those in management and policy positions in the three sectors in North Carolina and Ohio. The questions explored are the following:

(1) What types of cooperative intra and intersectoral linkages for purposes of economic development have been formulated?

(2) How have the mechanisms and forms of cooperation
evolved in response to structural changes in the economy?

(3) What factors do those in policy and management positions in the three sectors perceive as barriers and/or facilitators to the formation and maintenance of improved collaborative linkages?

To provide a contextual background for viewing collaborative efforts in the two states, a preliminary survey of the forty-eight contiguous states was conducted to determine regional patterns of state cooperative efforts.

This dissertation does not seek to provide a "how-to" guide or detailed formula for developing intra- or intersectoral collaborative structures. Rather it explores how the concepts and perceptions about the nature of their interdependence affect the quality of relationships between members of different, but functionally interdependent, sectors.

The Organization of the Dissertation by Chapters

The dissertation is comprised of seven chapters. In this chapter, four points related to the problem to be addressed in the chapters were introduced: (1) The history of independent and competitive approaches to goal attainment among organizations in three functionally interdependent sectors--private industry, education and government--neither provided them with the collective perspective
nor the experience at collaboration to cope with the rapid structural changes with which they have been faced over the past decade. (2) The tendency of organization theorists to model concepts on current practices in organizations has precluded their practical application as tools to alert managers and policy makers to the changes taking place, or as guides for changing relationships. (3) Vulnerability to foreign competition in private industry and inability of any of the three sectors to singularly control problems with which it is faced suggests fertile ground for change in old assumptions and values governing relations within and among them. (4) New organizational concepts drawn from Darwinian bioecological theories are proposed as alternative conceptualizations for understanding the nature and extent of functional interdependence among the sectors, and to serve as a tool for guidance to new collaborative relations.

The second chapter reviews organization and interorganizational concepts in five parts. The first part looks at the historical background of mechanistic and organic concepts and their application to social phenomena in Western society. The second part reviews the development of mechanistic and organic concepts in organization, their combination in contingency theories of organization, and their implications for evolving relations (1) at the organizational level between internal components of the
organization—e.g., management, workers and technology, and (2) at the interorganizational level, between groups of organizations.

The ecological concepts reviewed in the third part cover the interactive processes of organization adaptation and environmental selection, their influence in shaping organizational structures, and their implications for constraints on later adaptive processes. The concepts are employed to examine the interactive processes between industry and education and their structural implications. The fourth part presents an ecological perspective of societal transformation. It reviews ecological concepts of organized learning and social change, and provides a perspective of transformation in industrial forms over time. It also looks at the transformation in underlying values accompanying the industrial transformation and collaborative forms in which they are manifested in interorganizational relations. Finally, the chapter is summarized with a capsule of traditional and emergent organizational forms, a summary of the population ecology approach, and review of criticisms of population ecology's natural selection approach.

Chapter III covers four areas related to the research methodology employed in this dissertation: (1) It looks at mechanistic and organic concepts in sociology and organization theory and their methodological implications. (2) It
examines the appropriateness of qualitative vs. programmed methods for understanding social phenomena characterized by highly complex and interdependent relations. (3) Four patterns of interaction derived from a survey of regional patterns of interaction of the forty-eight contiguous states are provided as contextual backgrounds for analysis of interactive patterns at the state level in Ohio and North Carolina between state departments of economic development, and the private industry and education sectors. (4) Grounded theory, the method for research and analysis utilized in the dissertation, is described.

Chapters IV, V, and VI report the results of the research from North Carolina and Ohio, each around one of the three research questions. Chapter IV reports on collaborative arrangements and processes between and among government, education and private industry. The chapter shows the differences and similarities in demographic and economic factors and their influences on fundamental differences and similarities in strategic plans and collaborative forms and processes.

Chapter V presents findings on the transition from traditional to collaborative forms and values in each state. It shows the relationships between resource levels and perceptions of structural economic problems, and their impacts on differences in patterns of adjustment to economic changes. It also traces environmental influences on
forms and processes of interaction; and strategic choices which affected the comparable quality of collaboration in the two states.

Chapter VI presents findings, perceptions of factors which act as barriers and facilitators to collaboration gathered from taped interviews in the two states. The chapter looks at perceptions of barriers and facilitators which transcend state boundaries as well as those which stand out as differences in the two states.

Finally, Chapter VII presents the summary, conclusions and implications for the research.
Two enduring sets of conceptual lens used by theorists to help focus notions about the nature of organizations are (1) those which view the organization as a mechanistic system, closed to the environment, thus emphasizing the managerial role in directing its operations, and (2) those which view the organization as a living organism interdependent with its internal components and its environment. Ecological concepts drawn from Darwinian theories of biological evolution expand the organic imagery to populations of organizations. This chapter reviews the literature on ecological concepts as tools for clarifying the nature of functional interdependence between private industry, education, and government in complex industrial societies. The following topics are covered: (1) the influence of mechanistic and organic concepts in Western social thought, (2) mechanistic and organic concepts in organization theory, (3) ecological concepts for developing cooperative relations among functionally interdependent organizations in highly industrialized and post-industrial societies, and (4) ecological perspectives of societal transformation, and (5) presents a summary of the population
There has long been a tendency for societies to attempt a reconciliation of institutional patterns with universal principles found in the physical or biological realm. Our awareness of such attempts dates back at least 6000 years to the Egyptians and Babylonians for whom a knowledge of the configuration of the stars and sun was not only vital for determination of seasonal patterns upon which their survival as agricultural societies depended, but it also served as a foundation for the functioning of their religious and social institutions.

Schroeer (1972) and Greenfield and Strickon (1981) trace the organic and mechanistic influences in Western society. From Greek civilization until the Age of Enlightenment around the end of the 17th century, organic imagery was dominant in Western thought. The Greeks, who saw society and institutions as organisms, applied the concept Physis, translated "a way of growth," metaphorically to Greek social phenomena. The concept formed the basis of an essentialist philosophy which viewed "reality" as comprised of a fixed number of ideas of which observed phenomena were mere reflections.

The concept was modified first by the Romans who accepted the Greek view of reality, but mistook the growth
metaphor as a literal translation of nature. It was modified again by the early Christian church under the influence of the writings of Augustine, who, departing from the Greek and Roman assumption of a plurality of peoples and institutions each with its own growth cycle, applied the concept to humanity as a whole governed by a single growth cycle. Under the combined influences, social phenomena were seen as reflecting teleological purpose. Social change was viewed as a process in which society and its institutions, conceived of as an organism-like whole, and its component parts, passed through one or another of a series of like and essential stages through which humanity developed.

The organic imagery became overshadowed by a mechanical one with the publication of Sir Isaac Newton's *Mathematical Principles of Natural Philosophy* in 1687, regarded as the beginning of the Age of Enlightenment. The work established the three laws of motion and the universal law of gravitation. With knowledge of a starting point and initial speed, the three laws allowed, through quantifiable formulation, the prediction of all future movements of an object. The universal law of gravitation established a clear and non-mysterious relationship between the forces which govern falling objects on earth and the forces which govern the operation of the solar system.
Newton's discoveries, offered as proof of God's existence, were quick to be embraced by the church reconciling a long-standing split between science and theology. In the process they prompted a theological modification which removed God from a conceptual notion of actively running the universe to one of the Creator setting the universe on a mechanically predetermined course.

The organic and mechanistic threads combined to knit and to reinforce certain concepts in the fabric of Western thought. Essentialist concepts were carried over from the organic and reinforced in the new mechanistic imagery. From the organic imagery, Western societies and institutions were regarded as being at the leading edge of a growth pattern along which less developed societies would have to follow to reach a similar stage of development. It is reflected in works dating from the 18th through the present century of such economists as Adam Smith, Joseph Schumpeter, and W. W. Rostow.

Out of the mechanical imagery came concepts of natural religion, natural government, and natural philosophy. Attempts were made to place philosophy, politics, and other disciplines on a similar basis of quantitative law, thus giving them scientific form and universal agreement. The social impact of Newton's physics is reflected in such concepts as Jeremy Bentham's utility or "greatest happiness" principle as the social law of gravity in
legislation; again, in Adam Smith's supply and demand principles of the market where actual prices are perceived as gravitating toward the natural price; and in natural law which came to be considered a superior basis of authority to traditional cosmological notions granting unlimited powers to the crown.

Those mechanistic and natural law concepts came to constitute the dominant underlying assumptions about how organizations do and should work.

**Mechanistic and Organic Concepts in Organization Theory**

A major movement in our changing perception of organizations over the course of this century has been from "closed" system to "open" system models (Thompson, 1967; Kast and Rosenzweig, 1973). The three schools—scientific management, administrative management, and bureaucracy—which comprised the "three pillars" of the closed system model shared a central concern with achieving maximum efficiency through highly mechanized, standardized, optimally functioning organizational components. Focusing primarily on manufacturing or similar production, personnel relationships, and organizational structure, respectively, the three schools sought to reduce uncertainty and achieve determinateness in the organization through a system of logic which conceptually closed the organization to outside influences and subordinated operations to a master plan.
The concepts which rose to counter the closed-system model were influenced by the development of behavioral sciences which emphasized informal organization and other psycho-social and human aspects of administration beyond the direct control of managers. Moreover, the autonomy of organizations was challenged by research (e.g., Barnard, 1938; Selznick, 1949) showing the influence of other social entities which constituted variables external to the organization and hence not accounted for in the closed-system logic. The open-system perspective was one of organizations in interaction with environmental influences.

Contingency Concepts: The Organization Focus

The movement in organization theory has been unsettling in that it has raised a number of questions which still await resolution. For example, Kast and Rosenzweig (1973) have suggested that the behavioral sciences erred in a fashion similar to the traditional theories which they challenged by advocating a universal view assumed to apply equally to all organizations. Burns and Stalker (1961), who dubbed the two systems of logic applied to organizational form mechanistic (closed) and organic (open), state the case:

[T]he two management systems . . . represent for us the two polar extremities of the forms which such systems can take when they are adapted to a specific rate of technical and commercial change. . . . [T]he different forms assumed by a working organization do exist objectively and are not merely interpretations offered by observers of different schools.
Major contrasts between the two organizational forms are summarized as follows by Zaltman, Duncan, and Holbeck (1973):

**TABLE 1. MECHANISTIC AND ORGANIC ORGANIZATIONAL FORMS**

<table>
<thead>
<tr>
<th>Mechanistic</th>
<th>Organic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tasks are broken into very specialized abstract units</td>
<td>1. Tasks are broken down into subunits, but relation to total task of organization is much more clear</td>
</tr>
<tr>
<td>2. Tasks remain rigidly defined</td>
<td>2. There is adjustment and continued redefinition of tasks through interaction of organizational members</td>
</tr>
<tr>
<td>3. Specific definition of responsibility that is attached to individual's functional role only</td>
<td>3. Broader acceptance of responsibility and commitment to organization that goes beyond individual's functional role</td>
</tr>
<tr>
<td>4. Strict hierarchy of control and authority</td>
<td>4. Less hierarchy of control and authority sanctions derive more from presumed community of interest</td>
</tr>
<tr>
<td>5. Formal leader assumed to be omniscient in knowledge concerning all matters</td>
<td>5. Formal leader not assumed to be omniscient in knowledge concerning all matters</td>
</tr>
<tr>
<td>6. Communication is mainly vertical between superiors and subordinates</td>
<td>6. Communication is lateral, between people of different ranks and resembles consultation rather than command</td>
</tr>
<tr>
<td>7. Content of communication is instructions and decisions issued by superiors</td>
<td>7. Content of communication is information and advice</td>
</tr>
</tbody>
</table>
The fundamental assumptions of Burns and Stalker regarding organization design have become prevalent in organization theory. The underlying viewpoint is that such variables as task, technology, environmental constraints, and members constitute contingencies for structuring the organization (Lawrence and Lorsch, 1970). There is no single best way to organize, rather, contingency theory sanctions a virtually unlimited number of organizational forms available under certain conditions while assigning the manager the task of positioning the organization at an appropriate point on the closed-open continuum (Kast and Rosenzweig, 1973). Technological imperatives and environmental constraints are generally regarded as independent variables around which others are organized (Newman, 1971; Hunt, 1979; Perrow, 1967).

Organizations deemed appropriate for mechanistic structure are those with productivity as a major objective, and with uniform technology operating in stable environ-
ments. Organizations more concerned with creativity, non-routine activities, and facing uncertain environments are identified as more appropriately organic (Kast and Rosenzweig, 1973). Where more specific examples have been offered, mass production operations such as those turning out vehicle components (Pugh, Hickson and Hinings, 1969) or standard household appliances (Morse, 1979) or with simple technologies such as grocery chains (Kast and Rosenzweig, 1973) have been pointed to as likely candidates for mechanistic modeling.

Contingency theory also assumes wide latitude in managerial prerogatives to structure organizations. It suggests, for example, that an autocratic style may be appropriate in crisis situations (Kast and Rosenzweig, 1973). Morse (1970) cautions against attempting to link organizational characteristics to the motivation of the individuals who do the work in them. He offers that getting the tasks done may be incompatible, at times, to satisfying the needs of people. Lorsch (1979) criticizes psychologists such as Maslow, McGregor and Argyris, who speak to the centrality of the individual's needs in the organization, for "the implicit assumption that all individuals are motivated by similar needs." Under some circumstances, participative decisions are dismissed as impractical given the predisposition of the manager.
Practically speaking, however, adapting the organization to technological and environmental contingencies is no simple task. The problem is intimated by Kast and Rosenzweig:

Sales departments tend to be more open and adaptive than production departments. Practically, however, we have great difficulty in presenting these characteristics as dimensions. We can describe the polar positions, but it is much more difficult, if not impossible, to typify each of the possible intermediate positions (theoretically infinite) of certain characteristics—for example, between closed and open systems. Further refinement in contingency views are necessary in order to develop these characteristics into definable dimensions and to allow us to describe and analyze points along the continuum (1973).

If organization theory is to advance and make contributions to managerial practice, it must define more explicitly certain patterns of relationships between organizational variables. This is the major challenge facing our field (1972).

More recent attention has been called to the problems in moving from theory to application in organizational research. Hull and Hage (1982), in particular, concern themselves with the problems of generalizability in the application of Burns and Stalker's organizational forms. They opt for an expansion of the model, suggesting that Burns and Stalker offer an insufficient range of structural choices to cover the contingencies created by organization size and complexity and the various combinations possible. They suggest that there is a need for multiple continua rather than a single continuum.
Evolving Relations Between Organization Components: The Mechanistic Model and Internal Inflexibility

While the practical problem of identifying the variety of possible organization forms is acknowledged, other observations suggest that a more fundamental problem is that systems based on the mechanistic model tend to have built in biases against the flexibility required to make a move on cue to an alternative form.

Victor Thompson (1965) pinpoints a number of factors in bureaucratic systems which work to mitigate against innovation. He describes the bureaucratic model as a primarily monocratic system—i.e., it recognizes one source of legitimacy—with direction emanating from a leader assumed to be omniscient. The organization is a hierarchy of superior-subordinate relationships with each descending layer more narrowly specifying commands. Predictability and accountability are built in by narrowly specified, non-overlapping jurisdictions. Problems falling outside those narrow confines are referred upward in the organization until they reach the person with sufficient decision-making authority. Each person receives orders from and is responsible to only one superior. Operational consequences are inherent in the form and in the normative order upon which it is based.

First, there is a reliance on extrinsic rewards—money, status, power—in the absence of satisfaction intrinsic to the job, which trades high resource expendi-
tures for low worker commitment. Blue collar and a large segment of white collar workers are excluded from consideration for the few high-status jobs available on the basis of educational deficiencies while more highly educated workers have increasingly excluded themselves in deference to external sources of need satisfaction found in community and family activities. The situation requires increased monetary expenditures by the organization to buy satisfaction. Narrowly trained specialists originally hired to keep pace with the requirements for the enormous expansion of knowledge have had to abandon their specializations for avenues to promotion or success in more general management positions.

Second, the hierarchical system of competition tends to promote a highly individualistic and malevolent, rather than a cooperative and group oriented, system. The condition creates an automatic bias toward conservatism. The higher one moves up the organization, the more subjective are the standards for rewards and sanctions, hence the greater the conformity as a matter of self-protection.

There also tends to be a bias toward the veto of new proposals, given the absence of avenues for appeal (appeal would imply adjudicable rights). Proposals receiving early acceptance are subject to the veto higher up. Unskilled or semi-skilled workers, dependent upon hierarchically distributed, extrinsic rewards, approach proposed innovations
on how they will be affected personally. Workers generally regard innovations that result in increased productivity as a threat to job security (See Thurow, 1981).

Third, the practice of factoring activities into narrow, single-purpose, exclusive categories for assignment to hierarchical units fosters parochial rather than holistic identifications and interests. Work completed in one unit is handed over to another and further identification with or interest in it is dropped by the preceding unit. Ultimately, managers tend to be interested in preventing blame for error attaching to their unit. Since both praise and blame attach to jurisdictional units which become the responsibility of the unit head, there is a bias toward protecting one's unit and ultimately oneself against failure.

There is a great deal of evidence to suggest a significant differential in adaptive capacities inherent in mechanistic and organic forms. The suggestion is that the organic form, recognizing its essential internal interdependencies, shows superior ability to tap the creativity and productivity of its members.

Dynes and Aguirre (1979) look at the differential ability of bureaucratic and flexible systems to respond to what has been labeled traditionally as emergent conditions—for instance, those in crises situations. The authors identify two methods of coordination—by plan and
by feedback (terms originally proposed by March and Simon, 1958)—and show that it is possible to classify organiza-
tions according to the predominant type of coordination
which they utilize in internal operations.

Under coordination by plan, pre-established and stan-
dardized plans, and programs and schedules are used to
govern organizational functions. The behavior of members
is regulated chiefly by a clearcut external system of
rewards and sanctions backed by explicit rules and proce-
dures. Coordination by feedback, in contrast, centers "on
the transmission of new information so as to facilitate the
mutual adjustment of parts," and as a corrective for errors
or disturbance. Internalized standards of professional
excellence provided by peer groups are the major source of
social control.

In crisis conditions, extreme environmental uncer-
tainty prevails, new tastes and new structures are called
for to meet novel situations. There is generally a level-
ing effect on status differentials in organizations and an
increase in communication. Such conditions require coor-
dination by feedback. It has been found that organizations
which are accustomed to coordination by plan—e.g., police
and fire departments—in normal operations are often ill-
equipped to handle non-traditional tasks in crisis situa-
tions such as disasters.
Such organizations often "refuse" nontraditional tasks in disaster situations and usually have difficulty in utilizing volunteers. In effect their pre-disaster model of coordination would not "allow" such changes. Rather than increase their capabilities to meet the increased demands, such organizations tend to accept only those demands which are within their present capabilities. . . . Rejected demands by some organizations have to be absorbed by others within the community, and they are more likely to be effectively handled by emergent groups or by those organizations which coordinate by feedback.

Ouchi (1980), using a transactions cost concept, compares organizational forms—markets, bureaucracies, and clans—to determine differences in efficiency for mediating transactions between individuals. The problem of cooperation under interdependent work arrangements is used as a focus for comparison. This interdependence calls for transactions or exchanges between individuals in which each gives something of value in return for something of value—say, labor for money. The necessity to ensure equitability of contributions payments to the satisfaction of each party to the transaction is the factor which drives up costs.

Three types of contracts governing market exchanges tend to have built in weaknesses: (1) Spot contracts, or over-the-counter transactions are inadequate for dealing with long-term obligations. (2) Contingent claims contracts, specifying more completely long-term obligations, are inadequate where uncertain futures or complex situations are incomprehensible due to uncertainty or bounded rationality, thus inviting opportunism. (3) Sequential spot
contracting, or a series of short-term contracts, where specialized knowledge of goods and services are required by the supplier, tend to eliminate competitive bidding and thus competitive market prices, inviting opportunism. Audits of true expenses, again, drive up transactions costs.

Bureaucratic organizations have been viewed as overcoming market inefficiencies through the employment contract which (1) provides direction within a zone of indifference and ease of monitoring, and (2) allows the development of commonality of purpose leading to trust, thereby reducing the need to monitor performance.

Ouchi proposes that the assumption of commonality of purpose in bureaucratic organizations may not be accurate. He argues from Simon (1957) that instead, the employee's contract contains a risk premium, over the "spot" price that would normally be paid, to cover the eventuality of employers requesting performance significantly outside the zone of indifference. In an employment relation, high ambiguity or untrustworthiness on the part of the employee toward the goals of the employer will result in the demand for contractual protections, such as union representation, driving up transactions costs.

The clan, he contends, is superior in that it succeeds in minimizing goal incongruence while tolerating high levels of ambiguity over performance. A clan can be
thought of as any group which has organic solidarity. Organic solidarity grows out of an interdependence which brings about a union of objectives. The organization is described as one where the determination of individual performance is difficult. Discipline and solidarity are maintained through self surveillance rather than contractualism, commitment rather than coercion; "what the people want to do is the same as what they have to do; the interests of the individual are congruent with the interest of the group."

Ouchi points to the psychological consequences of close monitoring of worker performance associated with bureaucratic organizations at the individual, organizational and societal levels. At the individual level the effect is to create jobs which are psychologically unsatisfying, growth stunting, energy sapping, and emotionally debilitating. At the organization level worker dissatisfaction is chronic, worker management relations adversarial, creativity is absent, productivity is low, and opportunism becomes characteristic of most employees. The organization's powers of coordination become diminished as a result. And while it is possible for organizations to remain in business, in spite of rising transactions costs through close monitoring of performance, the costs of emotional and psychological disabilities created in their wake become passed on to society in the form of externalities.
Herbst (1974) shows, in tracing man's relationship to his work over the course of industrialization to modern productive processes, that flexible systems are no longer an option, but a requirement for viability. He explains that the mechanistic model of organization, consistent with a mechanistic, scientific view of the world, was based on the concept that organizations could be built to function as machines with uniform replaceable parts. The guild monopoly, in contrast, preserved the individual's self direction—his ability to determine quality and techniques of production as well as his relationship with customers and other environmental forces and ultimately his community status.

The industrial revolution broke the monopoly power of the guilds by a "scientific analysis of tasks," transforming the arts into predictable, determinate operations, performable interchangeably by man or machine, but substituting the former with the power of the latter where possible. Primary relations were also transformed from one of self control to control by the mechanical requirements of the new system. Coercion was introduced to resist the normal range of human behavior and variability, and extrinsic rewards replaced intrinsic ones as a primary means of motivation for carrying out prescribed operations.

The changing balance between the application of coercion and manipulation is traced through four stages: The
first, one of foreman control prior to the development of trade unions, revealed a syndrome of autocratic control and immediate sanctions by foremen, worker resentment and apathy, and further coercion.

The second stage, one of work-method control, saw some increase in worker influence stimulated by the formation of trade unions and the accumulation of industrial capital resulting in higher wages. Introductions of some government-backed safety measures, a reduction of the foreman's power and of coercive measures, and increased reliance on extrinsic rewards, organization loyalty, and training followed. Worker autonomy, however, became more restricted and operations more mechanized with the development of time and motion studies. Under such conditions, the use of worker intelligence and skills are lost to the system. Their introduction would conflict either intentionally or unintentionally with the requirements of the production process. Variances are now introduced in a system designed to eliminate variances. The production system becomes more costly because of the necessity for additional supervisory overhead.

The third stage, the machine control of workers, effectively completes the reduction of workers to machines. The introduction of continuous press techniques, such as the production lines in car factories, reduces the task to a simple repetitive operation where the machine sets the
workspace and the worker conforms. It is a kind of solitary confinement where there is no foreman to complain to and no relationship can be established with fellow workers. It is a function devoid of variance aside from the possibility of sabotage, walkout, or strike.

Process automation, the fourth stage, represents the logical end of the industrial revolution. From the reduction of the task of the worker to a single simple repetitive operation, a short, but fundamental, jump is required to a fully automated process line. According to Herbst, the process control worker is called on to employ a wide range of skills: information requirements render the fractionated hierarchical systems of communication inefficient, and automation principles do not apply: ... the product has to be tailor-made; the material ... or material work situation is idiosyncratic; the market is turbulent, requiring a high degree of internal flexibility; or the task itself is a creative problem solving one. [It is] not ... that computers or automatic equipment cannot be employed, but rather that the total task cannot be programmed in detail, or that the creation of a program is the actual task ... [T]raditional principles of work organization are not adequate.

Resource Dependence: From Intra- to Inter-Organizational Focus

The movement over the course of this century from closed to open system perspectives has led logically from an intra- to an increasingly inter-organizational focus. As shown above, mechanistic and organic models rest on fundamentally different organizational concepts. Moreover,
the built-in rigidities in mechanistic systems render impractical the swings between the two styles envisioned possible by contingency theorists. The open system perspective of the contingency model shifts attention to the manager's role in exercising an almost unlimited number of alternative strategies in its relations with other organizations for the purpose of survival. To ensure itself of strategic advantage in the interorganizational setting, control of resources becomes crucial.

The resource dependence model (Aldrich and Pfeffer, 1976) in organization theory sees the organization as unable to internally generate all of the resources required for its maintenance. Hence, it enters into transactions or exchanges (Levine and White, 1961) with environmental elements based on the inherent control or power implications in the move.

The resource dependence model portrays the strategic manager as having a wide latitude within which to maneuver in the formation of advantageous relationships and in the choice of feasible structures consistent with survival under given environmental constraints. Indeed, just as important as managing the organization is managing the environment. The acquisition and use of power then becomes the central ingredient in survival.

One consequence of the preoccupation with power as the central ingredient in organization survival is that
conflict becomes the norm implicit in all interorganizational relations. Seashore and Yuchtman (1967) submit that "conventional concepts of goals and goal attainments are not applicable to organizations; that performance can be assessed and described, instead, in terms of generalized resource-getting capabilities under conditions of competition for scarce and valued resources." Organizations, therefore, exist in uneasy interaction with strains toward autonomy and interdependence (Guetzkow, 1966). Interorganizational analysis starts with the assumption that there is a situation of partial conflict and investigates forms designed for social interaction under such conditions (Litwak and Hylton, 1962).

**The Macro Perspective: Interorganizational Struggle for Control**

Scott (1961) observes that most sciences alternate between micro and macro perspectives. Terreberry (1968), however, posits that though intrasystem analysis might necessarily precede the intersystem focus, "increasing attention to interorganizational relations may reflect a real change in the phenomenon being studied." Several heuristic devices---e.g. exchange (Levine and White, 1961), political economy (Wamsley and Zald, 1973; Benson, 1975), dialectics (Zeitz, 1980), policy networks (Milward and Wamsley, 1982)---have been offered to help provide some understanding of the connectedness of events and societal
implications of interorganizational actions. As the models become more expansive they reflect both an independence and an increasing sense of loss of control of the effects of interorganizational actions.

Benson (1975) points to the interorganizational network as the fundamental unit of analysis in the study of advanced industrial societies. He sees societal problems as increasingly framed in organizational and interorganizational terms while interorganizational research and theory are insufficiently concerned with issues of the macro structure. He characterizes the interorganizational network as a political economy concerned with the distribution of two scarce resources—money and authority.

Zeitz (1980) views interorganizational phenomena in modern industrial societies in general, but particularly in the United States as fraught with tremendous variety, pervasive change and conflict, the presence of a great number of confounding variables, and especially the propensity of some organizations to socially construct their own environments. . . . [The term, dialectics, implies] social processes [involving] conflict, paradox, mutual interaction and unintended consequences. . . . [Social action faces the dilemma of being] both active and self-determining, and yet passive and constrained. . . . Both tendencies exist and represent stages in a continuing interactive process; the creative actions of intentional subjects become constrained by structures that are the residues of previous actions.

Milward and Wamsley (1982) identify, as a unit of analysis, policy networks comprised of systemically interrelated variables and functionally interdependent members
linked vertically and horizontally through a variety of organizations and agencies at all levels of political jurisdiction. The networks are marked by a micro rationality at the individual level in which self-perpetuation is the only shared goal. They act on narrow interests rather than broad public mandates and are insulated from accountability to either the electorate or to nominal beneficiaries of their programs.

Summary

The mechanistic model viewed the organization as a machine, closed to and operating independent of its environment, controlled by a singular authority. The organic model which challenged the mechanistic assumptions did not replace them in modern organization theory. Rather, the contingency model, maintaining assumptions of managerial prerogatives, views the two models as potentially viable managerial alternatives. A problem in the contingency approach was shown to be the difficulty in relating organizational variables to dimensions along a continuum of theoretically infinite managerial alternatives. In addition, the relative weakness identified at the mechanistic end of the continuum was the inability to tap the creativity, commitment, and efficiency workers exhibit when they identify the interests of the company as their own. As a result, the mechanistic system is viewed as an inadequate
structural form for the requirements of postindustrial work systems.

At the inter-organizational level, the manager is regarded as exercising an almost unlimited number of alternative strategies for survival or advantage in relations with other organizations. This control of resources and the power necessary to ensure it become major organizational pursuits. As interorganizational concepts become more expansive and holistic, they provide a view of society characterized by both organizational independence and conflict, and loss of control of the effects of organizational action.

The Ecological Perspective

The last section reviewed the literature on mechanistic and organic concepts and the practical problems from their incorporation in contingency theories at the organization and inter-organizational level. This section reviews literature on the applicability of population ecology concepts in inter-organizational relations as tools for understanding (1) adaptability to environment, (2) mutual environment-organization influence, (3) inter-organizational activity on environmental unpredictability, (4) influences on conformity in structure, and (5) industrial and social influences on educational structure.
Ecological Concepts in Interorganizational Relations

Thomas Kuhn (1970) points to the critical role of new paradigms in directing researchers to revolutionary insights in all scientific fields. He emphasizes that with new paradigms, not only are new places searched with new instruments, but new perceptions are gained even when "familiar instruments" are used in familiar places. Indeed, Emery and Trist (1965) instruct that a "comprehensive understanding of organizational behavior requires" a knowledge of relationships at three levels: (1) processes within the organization, (2) processes between the organization and the environment in either direction, and (3) processes between components of the environment itself. They propose thinking in terms of "living systems" to be the most appropriate conceptual response for seeking to understand the interdependence between those levels.

Among the devices for viewing interorganizational relations, ecological concepts drawn from theories of Darwinian biological evolution have been gaining attention for their closely analogous relations at various levels of analysis to organizational interactions. McKelvey and Aldrich (1983) point to three nested (i.e., one is implicit in the other) deficiencies of organization studies which hinder their practical utilization: first, there is a deficiency in organization description and classification which hinders users from matching research findings to
organizations with which they are concerned; second, deficiencies in the description of the organization population and in the number sampled allow little faith in the generalizability of results to the organization of concern to the prospective user; and third, typically, studies do not explain a sufficient level of variance to allow predictability from one situation to another.

To overcome utilization barriers, the authors propose abandonment of the traditional essentialist classification of organizations and adoption of a population ecology approach for studying the process of organizational change. They argue that a theoretically grounded empirical taxonomy could be developed to provide a conceptual framework for describing and understanding the diversity of organizational populations. They also see the population perspective as relating micro and macro organizational behavior and as relating generalizations and theories about organizations to specific organization forms.

Hannan and Freeman (1977) see a correspondence between the choice of units of analysis facing the organizational analyst and those facing the bioecologist. While ecological analysis is conducted at the individual, population and community levels, organizational analysis is conducted at five levels: those of (1) members, (2) subunits, (3) individual organizations, (4) populations of organizations, and (5) of communities of organizations. While
events at one level display connectedness to (i.e., have consequences for) those of other levels, there can be no simple reduction from one level to another since individuals do not reflect the full genetic variability of the population, nor the population of the community.

There is almost a one to one correspondence between the three units of concern to the bioecologist and the last three levels facing the organization analyst. Members and subunits have no direct biological parallel in that "organizations are more nearly decomposable into their constituent parts than are organisms at the level of the individual." Though environmental effects are found at all five levels, the "focus . . . on the organization and its environment is . . . so widespread that there appears to be tacit understanding that individual organizations are the appropriate units for the study of organization environment relations."

The authors "argue for a parallel development of theory and research at the population (and, ultimately, the community) level." Using the term population to refer to aggregates of organizations rather than to aggregates of members attached to or served by the organization, they search for some unifying character by which they can be identified. Recognizing that the uniqueness and individuality of each organization precludes any two from being affected identically by environmental variations, the
ecological approach does suggest a relative homogeneity among classes of organizations with respect to vulnerability to environmental disturbances. The characteristics may vary with the concerns of the analyst since the groups are theoretical abstractions rather than immutable objects.

With the application of imagery of Darwinian concepts of biological evolution to organizations at the population level, a framework for focusing on interactive processes between organizations and environments is provided. It offers a dynamic rather than static perspective of society.

The Darwinian Concepts of Adaptation and Selection

The impact of physics on social thought was to crystallize the view of society as a fixed set of relationships between objects governed by a set of universal laws which are unchanging over time. Until the eighteenth century, science was pretty much limited to these inanimate subjects--math, astronomy, physics. Prior to Darwin, it was the universal belief that all species had been perpetuated from their creation over the millenia without change (Wallace, 1978). Darwin's contribution was to provide a theory of continual, dynamic adjusive processes in life.

Darwin's focus was on the variation within species exhibited by specific organisms. An important unit of analysis was a breeding population--i.e., "a group of individual organisms in sufficient contact and interaction with each other that the probabilities are greater that they
will mate with each other than that they will mate with other organisms of the same type" (Greenfield and Strickon, 1981). Natural selection occurs as those members of any breeding population better able to use environmental resources than other population members are likely to display an advantage in ability to reproduce and hence in the perpetuation or retention of their characteristics. The process has the effect of shifting the average characteristics of a population if it persists over a sufficiently long period of time causing an evolution in the species characteristics. The modification of characteristics particularly suited for extracting resources would, over time, result in an improved fit between the population and the environment (Greenfield and Strickon, 1981).

Though statistical averages are used to define a population at any given point in time, variation is the key concept or feature by which organisms achieve a better fit with the environment. Berrien (1968) is instructive on the adaptive process, particularly on the interaction between environment and structure. He points out that the common thread which distinguishes adaptation as a life-extending process is that the concept implies

an appropriate response to some input that would jeopardize the symbiotic relationship of the system [and other elements within its environmental context]... Adaptive systems are those which maintain their essential variables within those limits necessary for survival within the environments in which they exist.
Any disturbance or error originating from the environment to which the system cannot adjust or adequately respond threatens the balance of relationships between systems. Adaptive systems are those which develop feedback mechanisms or processes which allow them to automatically cope with—e.g., neutralize or dissipate—disturbances that would otherwise upset the homeostatic balance.

Certain of these feedback mechanisms or protective devices may be thought of as having developed organically within the species through an evolutionary process. A species analogue is developed by searching for those properties which serve to pass on critical characteristics of the organization. A species is defined by genetic content which can be conceptualized as a blueprint (Hannan and Freeman, 1977) or template (Berrian, 1968) for transforming energy into structure. The blueprint or template contains a summary of the organization's adaptive capacity. A species analogue in organizations then "will consist of rules or procedures for obtaining and acting upon inputs in order to produce an organizational product or response." A great many adaptations are also consequences of learning processes that have allowed the system to alter its behavior and thus adjust within a single generation to environmental disturbances or changes—e.g., the process of adjusting to new resource constraints.
Qualitative differences among organizations are most likely to be found in the formal structure of the organization embodied in the written rules, organization charts and the like; and in the "normative order," or the ways of organizing accorded legitimacy by both organization members and relevant environmental groups.

Using a systems definition, a population of organizations can be designated as all of those within a particular boundary—geographic, political, market, etc.—that have some common form.

The concept of a genetic blueprint, however, offers a dimension often inadequately dealt with in other theoretical considerations—that is, of constraints imposed on strategic choices and adaptive behavior inherent in the structure of organizations. The genetic blueprint provides the capacity to adapt. Berrien points out that what a surviving species acquires is not a set of adaptations, but the capacity to adapt.

Genetic changes, however, may either raise or lower the survival chances of a species in a given environment. Not all of the structural behaviors elicited by an environment are adaptive.

At the same time, mutations may provide inherited structures so arranged that their possible ranges of functions are more or less adaptive than their progenitors'. If the mutation's range of possible functions is more adaptive, a beginning may be made on a new species; if the reverse is true the new species will survive with a lower probability. It is well to bear in mind that what is inherited is the template for
structure. The play of nurturement and inhibitory circumstances of the environment not alone influences the degree to which the template is fully developed as a structure, but also requires of the system that it function within certain limits in order to survive (Berrien, 1968).

A better perspective of relative adaptive capacities of populations of organizations with identifiable forms (i.e., species in biological terms) can be gained when performance is viewed over time.

**Organization-Environment Interaction**

Most organization research, having been oriented exclusively to the concerns of the single organization, has opted to focus on adaptive responses of strategic managers to organization environments while ignoring environmental selection processes (Hannan and Freeman, 1977).

It has been argued on behalf of the resource dependence model, for example, that a variety of structural mechanisms may be strategically employed to counter environmental selection of organizational forms. Examples of strategic options include market segmentation to meet specialized consumer demands in disaggregated markets, formation of oligopolistic relations to alter market parameters, governmental and political interventions to manage environments, vertical integration to deny a competitor the use of raw materials, and horizontal mergers to restrict competition. The acquisition and use of power, then, becomes paramount in providing organizations the
ability to make a strategic move upon demand (Aldrich and Pfeffer, 1970).

In Zeitz's (1980) theory of interorganizational dialectics, he points out that it is not a matter of organizations either controlling environments or being controlled by them, but both are parts of a continuous interactive process. Rather than trying to prove one side or the other, he advises, research can be directed more fruitfully toward "examining the historical construction and unfolding of environments as they result from the strategic choice of organizational elites. These environments may, under certain conditions, react back and constrain their constituent organizations."

An ecological perspective does not portray natural selection as a one-way process of environmental selection. Rather it can best be understood as a process of mutual adjustment between organism or organization and environment (Berrian, 1968). In bioecological processes, behavioral changes of one species in a finely balanced, homeostatic environment are enough to set off a chain of events which affects the entire system (Hulse, 1971). Included in the picture then is a process of organisms altering or creating an environment which, in turn, reacts selectively on the organisms of which the environment is partially comprised.

Astley (1984) points out that while populations display individual adjustments to environment such as genetic
adaptations, they also adjust collectively. Two forms of collective adaptations are (1) commensalism, which refers to both cooperative and competitive interactions within a given species, and (2) symbiosis, which refers to direct or indirect interdependencies in interspecies relationships. Organizations confronting environments independently do so from micro-rational perspectives, and are thus subject to indirect and uncontrollable environmental effects. Those facing the environment collectively can, through agreed upon values, manage it.

Creating Turbulent Environments

Emery and Trist (1965) in an ecological perspective show how organizations act in large part to create the environments which later act as organizational constraints. They show that it is, in fact, precisely the kinds of strategic maneuvering in large industrial organizations indentified in the resource dependence model which create the environmental unpredictability and uncertainty which the authors label "turbulence." It is turbulent environments which are now strongly reflected in models that examine organizational interaction and their societal effects.

The authors assert that an understanding of organizational behaviors requires a knowledge of their systemic nature flowing from interdependencies with (1) processes involving components internal to the organization, (2)
exchanges between organization and environment, and (3) processes involving components within the environment where parts of the environment itself become interrelated and interdependent. Four environmental types are determined and can be identified by the degree of "causal texturing"—i.e., processes within the environment which help condition and shape organization-environment exchanges. The four ideal types exist simultaneously in the real world. While the environmental types are frequently referenced in other works, the existential nature of their development receives little attention.

As the typology moves through the four steps, the causal texture calls for an organization which requires progressively greater resources, and engages in more continuous and long-range planning and strategizing as a condition of survival. Environmental types move from step one, where classical market conditions prevail and relatively small organizations can adapt by trial and error and survive by hard work, to a peak of concentration and specialization in the second step. Greater complexity and a premium on quality and speed of decision influences the move toward decentralization in the third step. The environment is characterized by the dominance of a number of similar organizations whose strategic objective is to gain the power or capacity to move unencumbered by other forces.
Step four, the emergent environmental type, is turbulence, where dynamic and increasingly uncertain conditions arise not merely from the interaction of competitive organizations, but from a chain of autochthonous interactions, which originate in the environment itself. They are not independent, however, but are generated by the process of environmental adaptation to organizational activity.

Factors creating the "dynamic field forces" under turbulent environments are (1) a set of reactions set off by the continuous activity of large organizations attempting to meet type three conditions, (2) continuous and increasing interdependence and the attendant legal and regulatory involvement between economic organizations and other societal facets, and (3) continuous processes of research and development required to meet competitive challenges resulting in sustained and accelerating change.

**Intersectoral Structural Influences: The Principle of Isomorphism**

To this point, this review has looked at adaptive and selective processes between organizations and environments using, primarily, organizations in industry as the referent sector. It is also possible to view, within the context of ecological concepts, organizational and environmental influences on intersectoral conformity in structure.

In the interactive process of adaptation and selection between organism and environment, surviving
organizations will be those relatively better adapted to the demands of the environment and those for whom the environment has become relatively better tailored to accommodate. Applying the concept to organizational phenomena, the principle of isomorphism posits that viable organizations in a given environment will tend toward a conformity in structure forced by similar experiences and constraints. Thus there will be "a one-to-one correspondence between structural elements of social organization and those units that mediate flows of essential resources into the system" (Hannan and Freeman, 1977). In Western societies, we can expect other organizational forms to bear similarity in structure to industrial organizations since all sectors are, to a greater or lesser degree, subordinated to the maintenance of industrial development (Herbst, 1976).

Stinchcombe (1965) argues that the bureaucratic form of organization became prevalent when conditions of time and place were suitable. Originally, its development in Europe was regarded as a liberalizing trend in that it broke the bonds of arbitrary authoritarianism and nepotism which dominated organizational affairs (Ouchi, 1981; Herbst, 1974). Chayes (1960) traces the development of the corporate device as an instrument of royal favor and privilege, through its expansion to private enterprise in the relative egalitarianism of the Age of Enlightenment, to its post Civil War role in the growth of large-scale businesses
and concentration of capital which works in mutual complement with the bureaucratic form. The next sections trace social and industrial influences on the structure of education.

**Education and Industrialization: Ambivalent Responses to Environmental Demands**

Reinhold Niebuhr (1932) observed that while the rise of democratic institutions and mechanisms might have been instrumental in peacefully resolving conflicting social interests and changing political institutions, "the creeds and institutions of democracy have never become fully divorced from the special interests of the commercial classes who conceived and developed them." Recognizing that it was in their power to destroy political restraint upon economic activity, they weakened the state and made it more pliant to their needs, replacing political and military with economic power.

Niebuhr held that once new privileges were won, their equitable expansion to new groups was unlikely without a struggle. From Niebuhr's perspective, as individuals, men might espouse principles of love and service, but, as racial, economic and national groups, those who organize society always "arrogate" to themselves inordinate social privileges for their labor. Thus, "reason is always, to some degree, the servant of interest in a social situation."
Though the ecological perspective is not congruent with an absolutist one that ascribes to human groups unalterable patterns of behavior, the historical verity of Neibuhr's observations can be acknowledged. While we may be able to expect groups to behave in ways that they regard as protective of their positions in society, though, differences in protective behavior are likely to reflect differences in perception of how one's interests are best served.

Knowledge has been regarded historically as a source of power to be guarded jealously by those seeking to preserve privilege. The retardation for several centuries of advances in scientific knowledge and technique in the West, for instance, has been attributed to the fact that the Pythagorean school, which gained a knowledge of mathematics from Egypt and Persia in the 6th century B.C., was sworn to secrecy (Schroeer, 1972). A dilemma is posed, however, when retaining privilege depends upon the service of wider segments of the population with whom greater knowledge must be shared. Thus a historical reading suggests grudging reforms in education in industrialized nations pegged very closely to the requirements of advancing technology.

The dual concern can be illustrated clearly in the development of slavery. Neibuhr (1932) explains that within undifferentiated tribal societies, rights which are essentially equal within the group give way to inequality
as differentiation increases. In the undifferentiated society, war captives would simply be killed; but as agriculture develops, such captives become useful and are enslaved. The introduction of "rightless" individuals within the group destroys the principle of equality of rights, and the concept of inequality expands. In the United States, the abundance of land and the scarcity of labor which combined to promote the development of slavery in the South also attached a criminal penalty to the education of slaves (Kaufman, 1982; Kaestle, 1976).

A look at the relative degree of ambivalence with which industrializing societies have historically approached the spread of education to all segments of their populations suggests real differences in their perception of the interdependence between components of the productive process—differences which have been associated with their relative rates of technological advancement.

Crouzet (1982), for example, strongly links the demise of British productivity and their loss of industrial leadership in the last quarter of the 19th century to America and Germany, to their inability to generate or adapt to innovation both of which depend upon an educated population. A relative industrial stagnation grew out of a closed social system which placed value on classical education primarily as a tool for imparting proper social skills to the aristocracy. To manufacturers, classical
education was an avenue for status elevation from the class of commoner to that of gentleman.

Innovation at the beginning of the industrial revolution had been the work of those with little education, clever craftsmen and amateur tinkerers. The origins served to engender a mistrust of theoretical knowledge and a belief in the mystique of practical experience as well as a hostility to technical or scientific training for subordinates. By the last quarter of the 19th century, however, industrial advancement depended more and more on deliberate and systematic application of scientific knowledge of industrial technology.

The German educational system, in contrast to England's, was built on a Prussian base of compulsory education which had been in place since 1763. By 1860, 97.5 percent of all German children between the ages of fourteen and sixteen received a relatively high quality education enabling a minority to advance to secondary institutions. The Germans recognized the indispensibility of a system of strong scientific and technical education as a requirement for catching up to Britain economically.

Bowman (1962) attributes part of the economic vitality of the United States in the last quarter of the 19th century to the explosive growth of the land grant institutions in that period. The land grant colleges successfully tied the demands of the schools to the economy, which
necessitated their drawing on the children of farmers and manual laborers for enrollment. It also required experimentation to create a curriculum for solving the practical problems faced by the economy.

The Japanese response to Western industrialization began the drive toward modernization with the advent of the Meiji era in 1868. In matters of education, it marked a distinct departure from the Tokugawa era which confined learning as a "matter of concern to the warrior class and above," to be pursued "only for the sake of the state." The Meiji established the spread of education as a priority with a proclamation of the national Chancellor in 1872: "Efforts should be made so that there will be no uneducated homes in the village and no uneducated persons in the home."

From a base early in the Meiji era of nearly one-half of Japanese children receiving some education, a system of free compulsory education of six years with 40 percent of the total school age population enrolled was in place by 1908. The regular system of education was complemented with the hiring of large numbers of Western experts with pertinent technical knowledge while large groups of government officials and students were sent to be educated abroad (Emi, 1968). "The British trained their prime ministers on the playing fields of Eton. [Japan] learned early that education is too important to leave to the aristocracy"
The Japanese program for industrialization and modernization involved a conscious policy of importation, improvement, and adaptation of new technologies from a variety of fields. Over a one-hundred year period Japan has succeeded in moving from "imitative to creative" technology. The two factors regarded most prominently in that move are the education of the general population and the cooperation of government and industry (Shishido, 1983).

The mere process of industrialization, then, required some expansion of education, a point noted by Anderson and Bowman (1976) in their study of the relationship between literacy and early industrialization in the West. They explain that while in early stages of economic growth even small amounts of literacy can be important, "the stimuli to innovation and capability operate in due course at successively higher levels of schooling. Reorganization of production, transportation and trade both foster and presuppose literacy." Among industrializing nations, however, required increases in education were instituted with varying degrees of enthusiasm.

Kaestle (1976) in examining 19th century education reform movements in England and America contradicts popular contrasts of the two countries. Earlier comparisons characterized England's approach to education, on the one hand as pragmatic, limited and privileged and America's, on the
other, as principled, democratic and complete. Instead, he identifies what may be regarded as more of a mainstream transatlantic sentiment among reformers. It regarded mass schooling primarily as an instrument to prevent social disorder, attach the poor to the social structure, and increase productivity in the new industrial order—to steer "between the Scylla of brutal ignorance and the Charybdis of a literary education," rather than to increase the intellectual growth and personal advancement of the mass population. Such sentiments countered more conservative views, particularly among Tories in England, who were explicit in their arguments for the necessity of an ignorant labor force and the desire to preserve the class structure.

While the curriculum in schools in the United States was still in the literary tradition by 1898, Troen (1976) observes that ninety-five percent of the population did not advance past elementary school, only four percent were in high school and one percent in postsecondary institutions. Around the turn of the century, educators began calling for the introduction of vocational courses and compulsory rather than voluntary attendance—a combination of measures which had the effect of doubling the average duration of schooling between 1900 and 1920.

Troen points out, however, that the new attention to youth on the part of educators was not due to "new
psychological insights," but that advancing industrialization made unschooled teenagers "a liability to society and themselves." Changing skill requirements were brought about by such new inventions as the cash register, the pneumatic tube, the paper folding machine, and the telephone. The explosive growth of offices from 1880 to 1900 was also a period of attempts to cut costs by the addition of new office machinery and the application of Taylorist methods. Hence, more schooling was necessary to adjust to the new technological requirements.

Structuring Controls in Education

Educational systems have developed with a set of specializations characterized on the one hand by vertical fragmentation into academic and vocational divisions reflecting assumptions about the kinds of education that will be required for those who occupy various levels in hierarchically structured industries. On the other hand, there has developed a horizontal fragmentation by subject matter in keeping with the various specializations characteristic of bureaucratic structures.

Mare (1981) explains the role of schooling in perpetuating socio-economic stratification:

[S]chools are "people processing institutions," in which the population passes through a sequence of well-ordered, age-graded levels. During elementary, secondary, college, and graduate levels, individuals drop out at varying rates and, by the time birth cohorts have reached adulthood, their members are stratified by the amount of formal schooling they have received. Differences among
individuals in quantity of schooling reflect in part, variations in the socioeconomic levels of their parents and predict, in turn, differences in their earnings, occupational achievements, life styles, and political and social values. Thus the educational system is an agent in the demographic process by which socio-economic inequalities are perpetuated from generation to generation.

Herbst (1974) labels as socio-didactic analysis the "study of the relationship between the structure of educational tasks and characteristics of educational organizations." He says that the content and process of a given system will be a reflection of the way the task is structured. The production-process model, for example, will mirror in essential ways the structure, and, for teachers and students, social psychological consequences of the traditional factory. The subjects to be learned are fragmented, incoherent and unrelated; following instructions rather than creativity is emphasized—answers are either "right or wrong"; the teacher is the sole authority, an autonomous expert; originality is frowned upon, regarded as non compliance—"an attack on the teacher's expertise." Teachers, not having been required to establish interrelationships with other subjects, teachers or students, become interchangeable components.

With new technological processes, though, tasks are becoming increasingly more indeterminate where neither the facts of the existing situation nor the steps required for implementation are given. Rather, defining the existing situation, discovering potential approaches toward the
objective become the process. New alternatives only become visible through earlier exploratory implementations. Thus, changes sought become more definable and characteristics of the initial situation more clearly defined.

The research model of education which mirrors the process, then, emphasizes student autonomy, investigation, discussion, discovery; the teacher becomes a problem-oriented resource person; drills, where they are necessary, are explained; and performance is judged on increased ability, competence, independence, rather than on their being right or wrong.

The production-process model, the prevalent model in schools today, Herbst notes, has very successfully produced the kind of person needed by society after the industrial revolution. But the current liability to both the individual and society is that our specialized knowledge has become subject to increasingly rapid obsolescence. Moreover, industry tasks and professional problems increasingly cannot be confined to any one specialized field of knowledge.

Summary

The independent outlook among organizations, for strategies of competitive advantage emphasizes the organization's adaptation to the environment. The absence of a more holistic perspective among them fails to allow
sensitivity to the environmental reactions to independent strategies taken collectively. The ecological approach provides a perspective of environmental reaction to competition among increasingly interdependent organizations to produce conditions of unpredictability and uncertainty labeled as "turbulence."

Another perspective of the environmental selection process—the principles of isomorphism—operates to conform organizational structures across sectors to similar or complementary forms. In industrial societies, the principle of isomorphism operates on structures across sectors to complement industrialization. Education's dual implications for creating social change by more widely dispersing privileges among the population, on the one hand, but constituting a requirement for advancing industrialization, on the other, fostered an ambivalent approach to education among Western industrialized nations. The structural consequences are systems characterized by vertical and horizontal fragmentation to allow tracking of students as closely as possible to requirements for industrial advancement.

**Ecological Perspectives of Societal Transformation**

The last section showed the interaction of selective and adaptive processes between environment and organization. As the preceding section shows, one of the significant features of the ecological perspective of
organizational-environmental interaction is that it recognizes the presence of continual dynamics. There are no closed ecological systems, no static environments. Change is continuous; the potential for more rapid change is always present. This section (1) reviews the ecological concept of social change through organizational learning, (2) provides a perspective of transformation in industrial form occurring over time, (3) reviews the transformation in values accompanying the changes in form, and (5) shows measures and mechanisms for the implementation of cooperative values. The overall perspective is one of a movement from competitive to collaborative relations through organizational learning as adaptive behavior. This section examines ecological concepts for moving from competitive to collaborative relations through organizational learning as an adaptive behavior.

Social Change Through Organizational Learning

Greenfield and Strickon (1981) point to the ability to use symbols as a uniquely human feature allowing the attachment of "symbolic meaning, and hence value, to events, objects and activities that seem to go beyond the ability of these things to satisfy biological imperatives." It also allows the use of powers of contemplation, fantasy, invention and abstractions in conceptualizing alternatives for the attainment of goals and rewards which individuals
Learning takes place as actions which are unsuccessful in the attainment of goals or rewards are deleted from the range of alternatives considered and/or others are tried until the goal is attained. Successful alternatives will be learned by others; unsuccessful ones will not be copied or will be likewise discarded from the range of alternatives. In some instances, even successful alternatives bring, in addition to rewards, undesired consequences which necessitate weighing the reward against the negative consequence before again using the alternative. Decisions by others in a given population to copy, reject or abandon the alternative will be determined by the relative assignment of weights.

In a given population, large numbers of individuals seeking similar goals might emulate, "without reflection" patterns previously proven successful, driving up the frequency of a pattern's employment. However, there will always be variations—individuals who conceptualize and employ different alternatives to goal attainment. The authors point out that it is the variations always present in any environment which constitute the interesting features.

A statistical summary of relative frequencies of behavior at any point in time will provide a snapshot of population behaviors. While those with the greatest
frequency distributions can be regarded as "patterned regularities," the continuing presence of variation provides the constant potential for change. Thus, what might be perceived by some as a static society is, in ecological terms and in reality, a relatively constant frequency in behavioral variants over time. The persistence of a behavior reflects continuing reinforcement; a change in relative frequency of behaviors is social change.

An Ecological Perspective of Industry Transformation

Some recent attention among organization theorists (Kimberly and Miles, 1980; Durham and Smith, 1982) has been given to organization life cycles—birth, life, and death—stemming from increasing reports of organizational contraction and demise as well as more familiar ones of birth and growth. Hannan and Freeman (1977), for example, show a considerable volatility over a twenty-year period both in presence and position of companies on the Fortune 500 list. Over a longer perspective (200 years), they show that only 12 autonomous firms and seven recognizable divisions of firms survived the thousands present and in business in the United States during the American Revolution.

But a closer look also reveals patterns in the demographic changes among populations of organizations. A study by Birch (1982), based on data from 5.6 million businesses, 80 percent of all those in the United States, examined turnover among firms—i.e., those dying,
contracting, laying off or moving out; and those starting, expanding, or moving in—from 1969 to 1980. He finds that a major structural transformation has, in fact, already taken place in the country's economy. The study also reveals a substantial dynamism—a turnover of 8 to 10 percent per year (or approximately 50 percent every five years).

A look at the characteristics of the turnover shows that larger and older firms were being replaced with smaller and younger ones. Of those being lost, 80 percent were replaced by firms of fewer than 100 employees, and 80 percent of replacement jobs were being provided by establishments less than four years old. A massive shift from manufacturing to service is shown as well with the former accounting for less than 5 percent of the 19 million jobs created over the period.

The shift is viewed as one consistent with patterns throughout Europe, the United States and North America. Though it is nominally a shift from manufacturing to service, it is seen as, in reality, a transformation from emphasis on physical to human capital, from processes which require muscle and dexterity to processes which require thinking, from larger to smaller scale, from independence to interdependence. Consistent with the changes in business form are changes in theoretical concepts.
Transforming Values and Environments

Underlying the transformation in form is a beginning transformation in values from those upon which the old forms rest. Though the resource dependence model with its emphasis on competition is the norm in interorganizational relations, cooperation has been emphasized by some as a more effective means of resource acquisition. Michael (1977) suggests that resources, frequently perceived to be less than needed, are often expandable by sharing, better utilization, and invention. Gillespie and Perry (1975) view cooperation as a mechanism for relieving shortages. They define organizational cooperation as an exchange (e.g., of persons, information, funds) between two or more organizations which has consequences, actual or anticipated, for reaching their respective goals or objectives. Schermerhorn (1975) stresses the involvement of deliberate relations between otherwise autonomous organizations for the joint accomplishment of individual operating goals. Cooperation, here, is suggested as a corrective for "coordination gaps"—i.e., duplication, overlap and fragmentation.

Maruyama (1978) notes that different values are embedded in different cultural and epistemological foundations. He refers to them as "mindscapes" of which he identifies four types found in all cultures to varying degrees of percentage distribution:
**Type H** views homogeneity as desirable while it sees heterogeneity as representing error and/or potential conflict. The world is subdivided into categories, subcategories and supercategories. Heterogeneous relations are perceived to be zero-sum.

**Type I** sees the world as heterogeneous, but expects that many differences will be cancelled out through statistical averages. Moreover, it sees no utility in individual differences but assumes that higher productivity will result from individual separation.

**Types S and G** both regard heterogeneity as desirable and indispensible, while viewing homogeneity as a source of competition and conflict. S differs from G in that the former seeks to achieve a mutually maintained stability while G looks for new patterns generated by heterogeneous interaction. S sees long patterns of equilibrium, G sees cyclic patterns.

The scale and complexity of new ventures in the post industrial age will require new relationships among businesses (often multi-business ventures on an international scale), and between business and government, industry and ecology and labor and management. He cautions that often different mindscapes upon which apparently similar forms of management are built are ignored. Also, conversion to seemingly new methods may be trapped in traditional mindscapes, making assumptions as to the effectiveness of
cross-cultural applications problematic.

Such nominally altered approaches as participatory management, employed to overcome the high overhead costs of adversarial management-labor relations, for example, may still be based on "homogenistic" majority rule or consensus concepts (i.e., domination by quantity or coerced unanimity). They may be undergirded as well by traditional perspectives which view labor as something to be purchased, management as a control mechanism, and management-labor relations as a contract to be negotiated.

Stressing the need to plumb the creative potential in heterogeneity, Maruyama applies the concept of causal-loops to amplify differentiation and generate new patterns of relationships among businesses and between business and government, industry and ecology and labor and management. This is in contrast to feedback loops designed to maintain the system in equilibrium—a condition which, he points out, is artificial (See Hulse, 1971).

He introduces the concept of "morphogenetic" forms to the evolution of new multi-business ventures among heterogeneous firms and to the development of novel incentives to business by government as positive sum replacements of present zero-sum forms. He also introduces the concept of "heterogenistic participatory management" to encourage the identification and creative use of beneficial differences in habits and preferences rather than seeking to force
majority rule or consensus.

Emergent values of network relations are reflected in a number of works stressing the need for ideas, arguments, perceptions and information from those in the environment who presumably will gain or lose from activities guided by long range planning (Michael, 1973); tapping existing and opening new information channels (Mintzberg, Raisinghani and Théorêt, 1976) to ensure that the problem is correctly defined (Mason and Mitroff, 1981); and fostering minimal consensus in organizations, in order to gain, comprehend and apply extended perceptions (Hedberg, Nystrom and Starbuck 1976).

Terreberry (1968) sees the formal organization evolving in relation to its environment (1) from the status of systems within environments not formally organized; (2) through intermediate phases (of which Weberian bureaucracy is dubbed an example); and (3) to states of subsystems of larger social systems. She observes that there is an evolution from mechanical solidarity to organic solidarity where the values of organizations in oligopolistic relations are being replaced by specialized functionally interdependent organizations. With a single organization's inability to predict the future under turbulence, a feature of the new systems is increased survivability as a result of information gains from a diversity of informational input. Clark (1965) sees functionally interdependent
organizations in education, also, as analogous to organic forms within single organizations.

Herbst (1974) sees drawing on the leading position of industry, given the highly systemic nature of society, as the most promising point for the successful introduction of new collaborative norms. He points to industry as part of an ecology of social organizations in which industrial organization, rising education standards, formation of new social classes and changes in family organization are all linked sequentially by causation, and affect, again, further industrial development.

Moreover, all these changes are cross-linked. Changes in social classes and in family organization determine the educational interests and career choices of the younger generation, which then determine the educational and professional skills available to industry.

At the same time, the steady expansion of university and post-graduate education has led to a steady growth of research organizations which play a central role in further societal and industrial development. . . . [A]s in the ecology of nature . . . each part is intimately dependent on other parts; changes introduced within any one organizational sector or lack of adjutive change can have an almost immediate influence . . . on other sections of the ecology . . . . [C]hanges introduced to optimize any one sector . . . have at present unknown consequences. Their effects on other sectors may be direct or indirect, supportive or reactive; they may become damped or be intensified to an explosive degree.

Herbst suggests that isomorphic changes are likely to flow from new workplace norms. "To the extent that basic changes are introduced in the form of new types of work role setting, these can be expected to spread out into society either directly or in the form of a model."
Emery and Trist (1965), upon whose work Terreberry elaborates, focus not only on descriptive aspects of organizational relations but prescribe a process for transforming environments from turbulence to stability. They first establish that turbulent fields require some overall form of organization essentially different from the hierarchically structured forms to which we are accustomed.

In disturbed-reactive environments, which are precursors to turbulence, accommodative forms are required between like, but competitive, organizations with zero-sum relationships. Turbulent environments, on the other hand, require some relationship between organizations whose ends are complementary, where concerns about organizational dominance among them are absent. Such relationships, referred to as organizational matrices, are reinforced by the institutionalization of values which would require little in the way of formal hierarchy among organizations. Institutionalization implies the embodiment of values which are related to the wider society. Strategic planning, then, would become geared, not only to the realization of individual goals, but would now be biased toward "goal-paths that offer maximum convergence as regards the interests of other parties."

Emery (1967) stresses that values are not reducible to strategies or tactics, rather, they act as guides to behavior. As Ouchi (1980) indicated the function of values
in clan organizations, Emery indicates that "[f]or larger classes of events, their relevance no longer has to be sought in an intricate mesh of diverging causal strands, but is given directly and in almost binary form by references to the ethical code." They allow predictability to substitute for unpredictability, stability for turbulence.

He identifies two societal alternatives for attempting to increase the survival chances of a population: by (1) strengthening and elaborating social mechanisms of control, or (2), increasing the adaptiveness of individual members. Controls may be placed in mechanisms at considerable overhead costs, or they may be placed in self-regulating devices of shared values in people allowing the distribution of responsibility for decisions that shape the future over a larger portion of the population. He sees socio-technical organizations as the most efficient vehicle for the spread of more collective values.

Metcalfe (1978) looks at the problems of public policy processes in turbulent environments of advanced industrial societies and explores requirements for their transformation. He sees turbulence as a product of a situation in which organizations pursuing micro-objectives in a complex, and culturally and functionally differentiated setting are blinded to the extent of their interdependence. Initial misconceptions, failures of communication and suspicion become perpetrated in self-fulfilling prophesies of
panic and further defensive actions.

Organizational performance in complex pluralistic societies is dependent upon the cooperation and support of other organizations. Intensified efforts of individual organizations to protect their own interests triggers competitive responses which not only reduce short term prospects for cooperation, but also reduce long run possibilities for dealing with structural problems. In an environment where low trust is prevalent, belief in the integrity of mutual commitment to "interlocking role obligations" becomes damaged. A vicious circle arises where past unfulfilled expectations become references for future behavior. The situation is referred to as a "productivity trap"—i.e., "a situation in which the deterioration of interorganizational relations has an adverse effect on current performance and obstructs changes that would improve long-term performance."

Interorganizational learning at the macro level is required to transform public processes so that the rules of the game, diagnosis of structural problems, and proposals for concerted action are arrived at through collective rather than individual actions. Interaction between organizations would be direct. Information about changes would be shared for evaluation in light of their individual and systemic implications. Ad hoc bargaining as a means of decision making would be replaced by collective
formulations of general rules prior to action allowing equal application to all interests concerned.

The new approaches to policy formulation are labeled as revolutionary in two dimensions: (1) quantitatively, in terms of the increased information processing and problem solving capacities the processes would generate in the system; and (2) qualitatively, in creating conditions for subsystems to focus on common interests rather than "beginning with a series of separate definitions of private interests which are then pursued competitively regardless of system consequences. . . ."

Metcalfe advises that the transformation cannot be brought about by government alone. Rather government is a participant—a component in the system with special responsibilities. Emergent values of network organizations serving as interpersonal models for larger networks of interorganizational relations provide the cultural context for the design of new organizational roles and relationships. The network model establishes an integrated planning process which provides an effective system for exploring interconnections between individual perceptions of problems and arriving at mutually acceptable solutions without presupposing consensus. The experience gained through wider participation contributes to greater societal flexibility.
Cooperative Forms and Mechanisms

Forms and mechanisms have been pointed to as suggestive of the degree of cooperation. Warren (1967) delineates four contexts in which interdependencies occur with varying degrees of cooperation:

Social choice—organizations act autonomously, interdependencies are inadvertent or competitive, and there is little regard for goals that transcend individual values.

Coalitional—deliberate and cooperative, but issue specific relations in which participating organizations maintain complete control.

Federative—interdependent activities are controlled and monitored through supra organizational authority structures, though participation is discretionary.

Unitary—interdependencies are determined and governed through supra organizational authority structures.

Marrett (1971) measures the strength of interorganizational relations by four dimensions, which can be arrayed along a continuum from low to high:

degree of formalization—measured by the extent to which (a) exchange is given official recognition, and (b) an intermediary coordinates the relations;

degree of intensity—measured by the (a) size of resource investment and (b) frequency of interaction;

degree of reciprocity—measured by the extent to which (a) elements are mutually exchanged, and (b) terms of
the interactions are mutually reached; and

\textbf{degree of standardization}---a measure of the fixedness of (a) units of exchange, and (b) procedures for exchange.

Clark (1965) viewed the development of public-private confederations to bring about curriculum reform in education as "a way of concerting action without bureaucracy. . . . to coordinate autonomous agencies, to unite effort "without" the authority of formal hierarchy and employee status." Confederation was perceived as part of a larger trend in education toward such forms as interagency compacts, limited alliances, consortia, grants committees and federations--all serving to mirror emergent forms within single organizations.

Aiken and Hage (1968), looking at relationships between organizational structure and organization-environment interactions, suggest that the degree of organizational interdependence can be measured by the number of "joint programs" a focal organization has with other organizations in its environment. Joint programs function through mechanisms of exchange or transactions to increase such resources as clients, funds, staff and information. They submit that joint programs will be most prevalent among organizations characterized by high degrees of complexity, decentralized decision making, professionalization, innovation and active internal communications. Evolutionary implications may be gathered from their
projection that cooperation may start with organizations with different goals and move to those with similar goals ultimately creating a net increase in the amount of coordination in communities.

Joint ventures, it is noted by Pfeffer and Nowak (1976), are creations of new organizational entities between two or more partner organizations, and in that respect, differ from joint programs. The creating organizations are referred to as parent organizations; the joint ventures as the progeny. They are jointly owned and controlled by parent organizations to garner and utilize resources more efficiently, and to establish stable and predictable patterns across environments.

Summary

The unique ability to contemplate and attach values to events allows humans to choose among alternative models for goal attainment. The ecological perspective centers attention on the ever-present variation in society from the "patterned regularities" in behavior by which societies become defined. Static societal concepts are replaced by those which view society as comprised of constantly learning and constantly changing groups. The patterned changes, though often imperceptible in the short range, constitute dramatic transformations in society as those in industrial form reveal.
Though the resource dependence model with emphasis on competition over resources has provided the imagery undergirding organizational norms, more attention recently has been centered on cooperation as a more effective means for resource acquisition. Attention is also beginning to be turned to the necessity to put in motion processes for consciously transforming societal values. The new cooperative models depart from traditional concepts of consensus and majority rule to an emphasis on participation, heterogeneity, diversification and amplification of differentiation to provide a holistic rather than a partial view of issues. Transformation of societal values is seen as flowing from emergent work place norms and are embodied in new models of interorganizational collaboration at the macro level.

**Chapter Summary: The Population Ecology Approach**

This chapter reviewed literature on mechanistic and organic concepts in Western social thought and organization theory, ecological concepts for developing cooperative relations among functionally interdependent organizations in postindustrial societies, and ecological perspectives of societal transformation. This section capsulizes traditional and emergent normative orientations in organization theory, summarizes the population ecology approach, and reviews criticisms of the approach.
Traditional and Emergent Orientations

The various theoretical approaches to the study of organizations can be separated around two polar normative orientations—one traditional, the other emergent—which follow logical and consistent paths through work unit, organizational, and interorganizational levels of analysis.

The traditional normative order is characterized at the work unit level by external and concentrated control, subordination of work relations to the technological imperative, and the decomposition and reduction of functions and activities into minute parts; at the organization level by a hierarchical structure of superior-subordinate relationships; and at the interorganization level by independent or competitive relationships. The orientation covers closed/mechanistic, open, and contingency models.

The emergent orientation, by contrast is characterized at the work unit level by participative management, reliance on internal controls, the complement of worker and technology, and enlargement of functions; by flat structures with matrix or other lateral relationships at the organization level; and with networking and symbiotic relations at the level of the interorganization.

The resource dependence model of interorganizational relations (Pfeffer and Salancik, 1978) is rooted in the traditional normative orientation. The model views interorganizational relations from the perspective of a focal
organization operating in exchange with organizations and elements in its environment for the resources required for its survival. While the environment is seen as a source of potential opportunities and pitfalls, it has no constraining effect on the possible organizational forms which are adopted for survival. In fact, the manager is perceived as having an almost unlimited array of strategies at his/her disposal for advantage with other organizations. The power and autonomy of operation to ensure control of resources and hence advantage in interorganizational relations become primary pursuits.

The population ecology approach lends itself to an explication of interorganizational relations rooted in emergent norms. Drawing on Darwinian biology for analogous structures and processes in organizational relations, it is contrasted with the resource dependence perspective in several respects: (1) it relates micro and macro organizational processes, (2) it provides a system for classifying types or groups of organizations, and (3) focuses on processes within or between them, and (4) provides a framework for viewing organizational changes over time.

**A Summary of Essential Features of Population Ecology**

Population ecology centers on the Darwinian concept of natural selection. Under the concept, certain classes (or species) of organizations, typified by form or other
designated characteristics, have similar advantages in a given environment or vulnerability to its disturbances, and thus are selected differentially for survival. The relative compatibility of form and environment enables the reproduction of certain types and the retention of their characteristics over time and space.

Variation is the key by which species adapt or achieve a better fit with the environment. Survival is limited by (1) internal adaptive capacity, and (2) collective adaptive capacity. Internal adaptive capacities are limited by genetic characteristics thought of as a blueprint (Hannan and Freeman, 1977) or template (Berrien, 1968) for transforming environmental inputs into outputs, or stimuli into responses. Organization structure, rules, organization charts, normative orders are genetic analogues which can be categorized into types or species. Genetics does not provide specific responses, but determines the capacity to respond.

Collective adaptations are of two types: (1) commensalistic, which refers to interactions within the same species and may be competitive or cooperative; and (2) symbiotic, which refers to interdependent and complementary relationships between two or more species, and may be either direct or indirect (Astley, 1984).

Adaptations also occur through learning, which may be an individual or group process. Learning occurs initially
by trial and error, and successful actions are retained through diffusion processes (Greenfield and Stricken, 1981).

Natural selection is not a one-way process determined by the environment, but is an interactive one in which the actions of organizations affect environmental conditions which in turn react to further tighten or broaden the constraints within which organizations can act successfully. The principle of isomorphism posits that viable organizations in a given environment will tend toward conformity in structure forced by similar experiences and constraints. Thus in industrialized nations, private industry, education, and government sectors are all characterized by similar and complementary structures.

Acting independently, organizations are limited to micro-rational processes and are subject to the indirect and unintended effects of their own and others' actions. Environments become unpredictable and unmanageable, or "turbulent." Collective strategies, however, allow progress toward agreement on values and collective management of environmental forces.

Theoretical and Practical Problems

Criticisms of the population ecology approach offered by Jeffrey Pfeffer (1982) center around two related factors which have a bearing on its explanatory power. First, the population perspective has been criticized on the grounds
that the environmental focus offers "little room . . . for
elements of rational choice, and for the operation of
goals, preferences, wants, or ambitions"; second a question
has been raised with respect to operationalizing the con­
cept of selection. In relation to the second, it has been
suggested that (a) large segments of the organizational
population escape selection pressure (public bureaucracies
rarely disappear, and large firms have special options,
e.g., government bailouts and mergers); (b) disappearance
or failure is difficult to measure (firms may disappear
through acquisition or merger without actual failure); and
(c) some firms change forms and escape failure.

The level of analysis has a bearing on both of the
criticisms raised. As Emery and Trist (1965) point out, an
understanding of organization behavior requires analysis of
processes within the organization, between the organization
and environment in both directions (a focal organization
perspective), and within the environment. While a
researcher for whatever purpose may concentrate on struc­
tural or process problems at any level, analysis at no
single level will provide a holistic perspective. Thus,
analysis at the various levels should be thought of as
complementary and not self-contained.

Also related to both criticisms is the question of
the appropriateness of the unit of analysis for the
research interest. With the population ecology
perspective, firms may be classified according to any num-
ber of structural or process characteristics where the
interest is common vulnerability, fate or behavior in a
given environmental setting. Related to concerns with
behavior, the disappearance of a particular organization
need not be of ultimate concern, though the disappearance
of a particular form of organization does provide informa-
tion on social change which eludes analysis at a more micro
level. Survival or failure of form is applicable to all
organizations--both public and private, large and small.
CHAPTER III

RESEARCH AND METHODOLOGY

The preceding chapter reviewed the distinctions between mechanistic and organic concepts in organization theory and their practical implications for intra/interorganizational interactions. Attention was focused particularly on functional interdependence between private industry, education, and state government in meeting both their independent organizational goals as well as collective or societal goals of economic well-being of the population.

This chapter (1) reviews the mechanistic-organic distinctions in orientation to social phenomena and their implications for organizational research; (2) examines the appropriateness of qualitative vs. programmed research for understanding problems in complex, functionally interdependent systems; (3) outlines a contextual background for analyzing intersectoral relations in Ohio and North Carolina; and (4) describes grounded theory, the method of research and analysis to be utilized in this dissertation.
Mechanistic and Organic Concepts: Implications for Research Methodology

The research literature shows that the mechanistic-organic distinction in orientations to social phenomena also has profound methodological implications for research. Schatzman and Strauss (1973) distinguish between mechanistic and humanistic orientations. Just as the mechanistic orientation sees the individual as an independent, interchangeable part in an organizational context, so it tends to lead one to search for explanation of social forms and behaviors in processes independent of human definition and choice. The authors' concept of humanism, on the other hand, is to be distinguished from sentiments which merely express a profound concern for man as a value. Rather, as an orientation, it tends to look directly to human definitional processes. Man and the "symbolically shaped cognitive processes" he uses to mediate between himself and his environment become the central point of reference in attempts to understand or explain individual and organizational actions.

The mechanistic-organic division in orientation is reflected in a major dichotomy of theoretical perspectives in sociology—positivism and phenomenology (Bogdan and Taylor, 1975). The positivistic perspective regards the facts or causes of social phenomena as "things" external to human individuals or groups which exercise a coercive influence on behavior. Phenomenology, by contrast, focuses
on the subjective states of people; it is concerned with an understanding of human behavior from the actor's own frame of reference. Phenomenology assumes that the important reality is that which is determined by one's imagination, therefore, it examines how the world is experienced by people.

Methodology, then, derives somewhat logically from the orientation which the researcher brings to the project. The mechanistic/positivistic orientation tends to seek facts and causes of social problems through quantitative instruments designed to statistically prove relationships between operationally defined variables. In such approaches, the subjective nature of human behavior is often overlooked as individual behavior is reduced to a statistical aggregate.

The organic/humanistic/phenomenological orientation, however, seeks to gain an understanding of individual and group processes through more intimate contact with its subjects. The subject is not reduced to an isolated variable or hypothesis, but instead is viewed holistically within settings. Qualitative methods, such as participant observation, open-ended interviewing and examination of documents, constitute the tools through which understanding is sought, more so than quantitative methods.

A number of conventions are observed in quantitative research which lend legitimacy to the results. For
instance, the method is extant prior to the research. Instruments and strategies are developed prior to the start of the research and ideally are not refashioned in later processes. Variables in the problem are thereby regarded as controlled through the design. Analytic processes are performed after the data are in (Schatzman and Strauss, 1973).

There has been increasing concern, however, that there is a growing discrepancy between the promise of quantitative methods in social research and the product which they have been able to deliver. Indeed, Van Maanen (1979) suggests the operation of a kind of Gresham's Law in research on individual and group processes "wherein programmed research is driving out the unprogrammed." He points out four problems of inquiry in programmed research --problems of growing divergence: (1) between postulates of behavior offered by observers, and understandings and explanations for behavior offered by those observed; (2) between theoretical constructs, and data supplied to test them; (3) between the complexity, sophistication, and rigor of mathematical techniques and narrowness of assumptions on the one hand, and the looseness, open endedness and fluidity of interpretive frameworks to provide meaning on the other; and (4) between the claims for analytical tools, and their ability to produce data that do not "do violence" to the phenomena they purport to reveal.
QUALITATIVE VS. PROGRAMMED RESEARCH

Several factors about the nature of the research problem become important considerations in the applicability of research methods. Three factors with important implications considered here are (1) the degree to which a problem's complexity is organized or disorganized, (2) the unit of analysis appropriate for studying the problem, and (3) contextual factors that affect the problem.

Disorganized and Organized Complexity

The differential applicability of programmed research to problems of unorganized and organized complexity is discussed by Mason and Mitroff (1981). They point out that statistical tools have proven effective in solving problems where the phenomena are relatively disconnected—that is, their variables exhibit "independent probabilistic behavior." In such problems, they meet conditions of random sampling and are amenable to statistical solution. For example, they have been dramatically successful in handling such problems as predictions of voting behavior of large populations of voters, or of buying patterns of large populations of consumers, even though the prediction of behavior of any single individual in such a population would be beyond the reach of quantification.

But even in predicting behavioral patterns of large populations, a realistic appraisal of the capabilities of
programmed research is necessary. Its limitations as well as its potential harmful effects when those limitations are not well understood can be illustrated. The problems are outlined in Pomper's (1978) analysis of The American Voter (Campbell et al., 1960), the seminal work in the development of programmed research on electoral behavior in the United States.

As a product of the post World War II behavioral revolution in political science and the first work of Michigan University's Survey Research Center, the book, aside from being a highly detailed and scholarly execution, was ground-breaking in several respects: it employed new capabilities such as computers to manipulate large sets of quantitative data, and sampling techniques whereby the entire nation rather than only small groups or communities could be represented by as few as 2000 carefully chosen respondents. Hypotheses, representative data, and behavioral regularities replaced speculation, personal examples and moral exhortations as normative questions gave way to value-free analysis in the consensus-producing cold war atmosphere of the 1950s. Social psychology and mathematics became new recruitment areas for political science.

The influence of The American Voter was demonstrated in its attraction of grants for expanded findings and in its attraction, education, and placement of the most outstanding graduates in the area of voting behavior. As a
result, its methods and findings became the models upon which subsequent research in and notions of voting behavior were shaped. The work had a particular appeal for educated elites both because of the esoteric nature of its research methods and the findings which cast the more highly educated as relatively better equipped to function in a democratic system. The image portrayed of the American electorate at large was one of a population largely uninformed, blindly guided by traditional loyalties. Blacks were conditioned for low political involvement by low psychological motivation.

Counter findings in recent years have pointed up fundamental weaknesses in the study which have served to dull its relevance: (1) concepts were poorly defined. Claims of having tapped, through quantitative tools, basic psychological, and ordinally measurable, attachments to political parties have defied replication and are unsubstantiated. (2) The conclusions, claims of long term truths notwithstanding, were reflections of the uncharacteristically quiet 1950s in American politics. Following static assumptions, based on a continuation of the observable present, the programmed research methods provided no basis for speculation about important unobservable behaviors, hence no speculation about change. The book would not have led to predictions of black political resistance in the South, of general resistance to Viet Nam, or voter
responses to initiatives of political leaders but to opposite reactions in all cases. (3) The book substituted method for theory. Rather than operating with a set of causal propositions the authors proceeded to operate with a few empirical regularities and proceeded to report a high number of correlations among them.

The problems in relating quantitative method to voting behavior outlined in Pomper's analysis signal an increasing problem in applying programmed research to social and organizational phenomena in general. In long periods of relative stability or in very short periods where time tends not to permit great changes, prediction may occur as long as one can perceive patterned regularities without one's necessarily understanding causal relationships. Terreberry (1967) suggests that many of the failures in long range planning may be attributable to forecasting the future by extrapolation of a noncomparable past.

As society increases in complexity, however, a great number of seemingly unattached and isolated events may collectively act to produce changes that were unpredictable based on observed relationships. The events or variables, in effect, become organized. In the words of Mason and Mitroff (1981), "The great difficulty with systems of organized complexity is that deviations in one element can be transmitted to other elements. In turn, these
deviations can be magnified, modified and reverberated so that the system takes on a kind of unpredictable life of its own." In such systems, quantitative tools become relatively ineffective in solving problems.

The once seemingly "placid randomized" systems of organizational interactions in large industrial societies have evolved to conditions described as turbulent by Emery and Trist (1965) and as dialectical by Zietz (1980). They are characterized by high functional interdependence where actions taken to further independent interests have unpredictable and unintended consequences for other elements in the system. Because actions produce unforeseen and uncontrollable consequences in the system, the initiator cannot be certain of the eventual impact on his own organization. They have become systems of organized complexity. A deemphasis on programmed research and emphasis on methods to probe behaviors and relationships not readily observed become appropriate.

The Unit of Analysis

The growing awareness of the necessity for organizations to consider their actions in light of the potential for consequences for or reactions of other organizations—though not necessarily well understood nor calculable in advance—is indicative of the growing functional interdependence among organizations in highly industrialized societies. For organizational theorists, it has also
signaled the increasing recognition that in highly industrialized societies, the interorganizational network is a fundamental unit of analysis (Benson, 1975; White, 1974; Clark, 1965).

Concentration on the interorganizational unit represents a qualitative shift in the analysis of interorganizational relations. It is a departure, for instance, from Evan's (1966) concept of organization-set where the focus in the study is on a focal organization and its relationships with a specifically defined set of organizations in its environment, mediated through boundary-spanning functions. The primary concern is with the individual organization. The focus on the interorganization, by contrast, places emphasis on the collective organizational purposes and processes and gives attention to societal implications as well as the impact on the organization or class of organizations involved. The focus is more on systemic processes and is more holistic in scope.

From a holistic perspective, a state's human resource approach with its implications for economic development capability is a product of the interaction of the units charged with economic development functions, those charged with education responsibilities at all levels and the private business(industry) sector among others, and not merely the sum of their individual actions (Metcalf, 1978). This functional interdependence operates regardless of whether
the individual units acknowledge it and develop cooperative forms for interacting, act competitively, or act with presumed independence. Problems that arise within the system will exhibit conditions of organized complexity. Thus, the development of system control and predictability will require some arrangements for coordination. Recognizing the influence of the three areas in state human resource development approaches, the research design elicits multiple rather than single-sector perspectives on the problem addressed. The interdependent nature of the problems makes qualitative rather than quantitative methods appropriate.

The degree to which economic development, education, and private industry sectors recognize their interdependence and the forms or arrangements which they develop for interaction will vary from state to state. Those arrangements or processes of interaction, then, become the important units of analysis. The differences in arrangements from state to state lead to contextual considerations.

**Contextual Considerations**

In state to state comparisons of interorganizational arrangements through which economic development objectives are carried out, mechanistic and organic orientations become important points of departure in shaping research assumptions. A mechanistic orientation is primarily
essentialist in nature. It assumes that based on a knowledge both of empirically observable, quantifiable characteristics of given states, and past developmental patterns, future developmental patterns are predictable for other states with similar characteristics.

An organic orientation, on the other hand, leads logically to an ecological perspective for phenomena at the population level. From this perspective, an ecology of relationships is assumed in which development approaches are considered and either ignored, or tried, and adopted or discarded from the range of alternatives. Other states may serve as models, but, then, there is always the possibility of chance or invention for producing novel approaches. Though there might be patterned regularities of behavior in a given region, the possibility of breaking from the pattern is always present. Walker (1969) in his study of diffusion of innovations in state policy notes that while states have a tendency to follow regional influences in adopting innovations, regional pioneers are difficult to predict given the enormous number of ideosyncratic influences constantly at work. Thus, there is an existential nature to social behavior and social change in which man creates his own environments, albeit, which, in turn, impose new adaptive requirements for survival within them.

Another factor to be considered by the researcher is that because of the unique population mix of individuals
and influences in any given setting, even nominally similar organizational forms are likely to function sufficiently different to render confidence in programmed research methods unwarranted. Thus, Yin (1982) suggests that a potential problem in comparing organizational forms across sites lies in the difficulty of separating the phenomenon from the context. A one to one correspondence across program settings, therefore, cannot be assumed. He identifies limitations in existing techniques for dealing with this problem. For example, even in laboratory experiments, context and unit may become entwined, although controls are assumed. In survey research, the number of direct questions about context are constrained by the interviewing time. Anthropological methods face time constraints of a different sort, as historical events might be important but unobservable.

He suggests that these problems can be overcome by (1) interviewing several informants within each site about organizational or collective processes, and (2) by examining documents. Yin, Gwaltney, and Molitor (1981) employ similar methods in a study of factors accounting for success in collaborative arrangements among state departments of education, regional education agencies, and local school districts. They are also well suited to the research problem addressed by this dissertation.
The Research Context: Variations within Regional Patterns of Interaction

A preliminary survey of the forty-eight contiguous states was conducted in February and March 1983 to determine regional patterns and state programs involving (1) intersectoral linkages between private industry and state departments of education and economic development; and (2) intersectoral linkages between primary, secondary and postsecondary education at the state level.

Requests for information were addressed to state superintendents of public instruction, and to directors of higher education and of economic development on collaborative efforts between their departments and with private industry aimed at developing human resources to attract, retain, expand and or create business/industry. Replies were received from all states except Mississippi.

The survey was conducted to determine whether or not it was possible to discern cooperative patterns by region in general; and particularly between the more industrialized Northeast and Midwest on the one hand and the South and West on the other. Some clarifications and qualifications for the findings are in order. (1) The inquiries were directed at state policies and do not reflect cooperative efforts at the local level or interorganizational cooperative efforts at less-than-state levels. (2) The number of reports calling for education reform are likely to spur new state policy initiatives (See Time
Magazine, October 10, 1983). (3) While states reported on interrelationships, there was no way to evaluate the quality of cooperative efforts. Yet, regional consistency in quality of responses, and the time required to plan and implement changes provide reason to believe that the general regional patterns portrayed offer a fair reflection.

For comparison, states were divided into five regions: Midwest, New England, Mid Atlantic, South, and West (Flint, 1981). Results derived from information and state documents returned reveals the following general pattern: (1) There is a greater frequency of movement toward formalized intra/intersectoral relationships and more fundamental reforms underway or proposed in response to technological and economic changes in the Midwest, New England and Mid Atlantic states than in the South and West. (2) The great majority of states surveyed (approximately 69 percent) offered some form of "customized training" in which vocational/technical education divisions and/or economic development departments offer free recruitment and training of personnel according to company specifications for specific jobs as an incentive to attract or retain industry. Among Southern and Western states "customized training" constituted the most frequent ongoing form of intersectoral cooperation. (3) Over half of the states surveyed (52 percent) reported the development of plans and proposals for cooperative efforts specifically geared to
the attraction of industries in the "high technology" category. (4) Few states (six) reported cooperative efforts at the state level specifically geared to the development of entrepreneurship.

The states which fit the regional categories or models constitute the patterned regularities in intersectoral relations. But, the categories merely provide a snapshot in time, not fixed or static models of behavior. The most reliable prediction that can be made about them is that they will undergo change. Using the models for a background, though, it is also possible to identify cases of variation which provide the focus of the dissertation.

The two states selected for study were North Carolina and Ohio, both of which are attempting to chart, through strategic planning, economic courses markedly different from those which have characterized the regions in which they are located. Both plans involve the development of advanced technologies, revitalization of traditional industries, and generation of continued growth and innovation through entrepreneurial development.

The two states provide the setting in which to explore (1) the identification of types of inter/intra-sectoral linkages formed for human resource and economic development, (2) the transformation of forms and mechanisms of interaction in response to structural changes in the economy, and (3) strategic managers' perceptions of
barriers and facilitators to linkage formation and maintenance.

North Carolina

North Carolina has drawn a great deal of attention recently and is of particular interest in this study because of its wide variation from the southern regional pattern in approaches to education and economic development. Billings (1979) characterizes it as a state of great anomalies. It emerged from a position as the poorest southern state on several economic indicators in 1860 to industrial leadership in the South by 1900, yet in 1981 it ranked thirty-ninth among the states in per capita personal income. It is extremely rural even by southern standards, yet it ranked eighth among the states in 1981 in numbers employed in manufacturing. It has produced highly conservative political representatives, yet it is known as progressive in political, social, and economic outlook.

In this seemingly enigmatic and paradoxical environment, North Carolina has stood out as a state strategically shaping its economic and social transformation. It has been credited with several "firsts" (see Rawls, 1983; Lyons, 1983). It was the first state in the Southeast to recognize a need for the United States to shift its emphasis to research and newer technologies. Research Triangle Park was built 25 years ago as a joint effort of state
government, education, and private industry to combine the resources of the Universities of North Carolina at Chapel Hill, Duke, and North Carolina State to transform the economy from dependence on the low wage textile, furniture, and tobacco industries. Careful planning has allowed it to avoid many of the problems of the spontaneous commercially developed high technology parks, such as Boston's Route 128 or Palo Alto's Silicon Valley.

Over 70 percent of its general fund is spent on education. It is the first state to establish a tuition-free boarding school at the high school level specializing in math and science. The school mirrors the state demographically. A tuition-free boarding school for training professionals in the performing arts has enrollments from seventh grade through college. The educational system is considered to have high vertical and horizontal articulation. Minimum competencies apply to both students and teachers and has reduced the failure rate among students from 11 percent to less than 2 percent in five years.

Ohio

Ohio, as a leading industrial state in a leading industrial nation, has enjoyed a long history of prosperity. Until relatively recently, the state's development approach has been grounded in a policy of aggressive pursuit of more of the traditional manufacturing industries that accounted for its past economic success. It has the
fourth lowest tax level among the fifty states. With a vast statewide network of educational resources, 40 percent of Ohio's high school students are enrolled in vocational training and a two-year technical campus is located within 50 miles of every community in the state. Yet Ohio ranks 34th among the states in per capita expenditure for education.

Until Ohio's economic fortunes began to slump in the latter half of the 1970's, it could remain comfortable with independent approaches to management in the three sectors. In 1979, in response to industry flight and demise, the Division of Vocational Education of the Ohio Department of Education organized a network of Vocational Technical Resource Consortia (later changed to the Ohio Industrial Training Program) to offer customized training, primarily in manufacturing, to attract and retain industry. A 1982 proposal by the Ohio Board of Regents to establish a Business, Education and Government Alliance to coordinate development did not gain legislative approval. With a change in state administrations in January 1983, a comprehensive development effort based on collaboration among the sectors has been launched to transform the state's economy.

Research Methods: Arriving at Grounded Theory

Several factors related to the nature of the research problem and discussed above—the functional interdependence
and problems of organized complexity inherent in state-level education, economic development, and private industry interrelationships and the necessity to account for contextual influences—render qualitative rather than quantitative methods more suitable for use.

From an organic/phenomenological orientation, human perceptions and experiences become the most important factors in the shape and direction of interorganizational relations. The inability of actors in connected systems of organized complexity to independently predict or control the consequences of their actions for others or themselves suggests that diagnosis of structural problems reflect the collective viewpoints of those involved. The approach, therefore, is to view key factors in the interactive processes directly through the eyes of actors in the three sectors who comprise the system.

Because explanations and complex descriptions of events and processes were sought, unstructured, open-ended interviews were utilized. Yin (1982) points out that structured interviews are inappropriate for unstructured descriptions. Interviews were recorded with an average length of one to one and one-quarter hours.

The instrument utilized was an interview guide which served as an outline for the general categories of information sought by the interviewer rather than a questionnaire with narrowly defined questions designed to elicit
preconceived responses. Experience with guided interview techniques was gained by the author in a 1981 study of CETA-education-private industry collaboration in the Columbus, Ohio area.

The interviews were scheduled to be conducted over a one-week period in each state. Interviews in North Carolina were scheduled with the assistance of a representative in the North Carolina Department of Commerce, a respondent, in the preliminary survey conducted earlier. Ohio interviews were scheduled through individual contacts on the recommendations of representatives of or persons associated with the Ohio Department of Development and the Ohio Board of Regents.

Documents and reports relevant to intersectoral relations were utilized as sources of factual and interpretive information against which interview transcripts were analyzed. With the use of interviews and documents, the expectation was that both facts and opinions would be derived. "Truth then emerges not as one objective view but rather as the composite picture of how people think about the institution[s] and each other" (Bogdan and Taylor, 1975).

Analysis

As pointed out in the introductory chapter, there is not a great deal which is known about interorganizational
relations. Thus, the method of analysis was designed to emphasize the exploratory nature of research rather than the verification of theory. It utilized comparative analysis as a means of systematically arriving at grounded theory—i.e., the discovery of theory from the data. Comparative analysis or the constant comparative method, outlined by Glaser and Strauss (1967) involves a combination of (1) coding and analyzing data that can be brought to bear on a point, and (2) constantly redesigning and reintegrating theoretical notions as one reviews material.

Data are coded enough to generate or suggest theory about the research problem, but the concern is not with the universality or proof of suggested causes or other properties of the theory. A "saturation" of data rather than a consideration of all available data is required. Data are not restricted to one kind of clearly defined case. The process may be applied to a number of different kinds of qualitative information in the same study including observations, interviews, documents, books, articles and the like.

Aspects of the constant comparative method are carried simultaneously and successively through four steps: Step one, comparing incidents applicable to each category, consists of (a) coding or noting categories and comparing them with previous incidents in the same or in different groups in the same category, and (b) beginning the
generation of theoretical properties of the categories. Step two, integrating categories and their properties, moves from an incident by incident comparison to a comparison of incidents with properties of the category that resulted from initial comparisons. The third step, delineating the theory, involves clarifying logic, integrating and reducing categories, and extending the theoretical scope with a smaller set of higher level concepts.

The final step, writing the theory, is facilitated by processing the coded data, the series of memos recorded on field notes and collated, and theory. The coded data serve as a source to validate points, pinpoint back up data or gaps in theory, and to provide illustrations. Analysis occurs within each site and across sites.
CHAPTER IV

RESULTS OF THE STUDY, PART I:
STATE-LEVEL COLLABORATIVE RELATIONSHIPS AND
PROCESSES IN NORTH CAROLINA AND OHIO

The third chapter focused on methodological issues and the research methodology used in this dissertation. Chapters IV, V, and VI report the research findings on each of the three research questions gathered from taped interviews in North Carolina and Ohio, as follows: Chapter IV, on current collaborative arrangements and linkages between and among the government, education, and private industry sectors showing similarities and differences in the two systems; Chapter V, on the transition from traditional to collaborative forms and values in each state, showing factors which account for the differences in the two systems; and Chapter VI, on perceptions, from the vantage points of the actors in the three sectors in the two states, of factors which act as barriers and facilitators to collaboration. Anonymity of the sources of direct quotations is maintained throughout the three chapters of results.

This Chapter (1) points out demographic and economic differences and similarities in North Carolina and Ohio,
(2) compares and contrasts the strategic plans adopted to address the structural economic changes taking place, (3) develops a matrix for comparing collaborative forms, and (4) identifies apparent similarities, and (5) fundamental differences in collaborative forms and processes designed for implementation of the two plans. Finally, the findings from Chapter IV are summarized.

Demographic and Economic Differences and Similarities in North Carolina and Ohio

In the redistribution of industry and people in the United States accompanying technological and economic changes, North Carolina and Ohio have been affected much differently. North Carolina, consistent with other states in the South—the Sunbelt states—has made dramatic gains in population during the 1970s, while Ohio's population, like those of other states in the industrial Midwest, stagnated. Over the decade, North Carolina's population grew by 15.7 percent, significantly above the national average of 11.4 percent. During the same period, Ohio's growth rate trailed at 1.3 percent.

Current growth trends are helping to reverse some of the most apparent differences in the two states, but the differences remain very wide. First there are obvious differences in population size. North Carolina, with a total land area larger than Ohio's—48,843 square miles to 41,004 square miles respectively—has a population
approximately one-half the size of Ohio's—5.8 million to 10.8 million respectively. Even projecting current trends to the year 2000, North Carolina will have 4 million fewer people—7.7 million to Ohio's 11.2 million—and will stand at Ohio's 1950 population level.

Spatially, North Carolina's population is dispersed into nine urban regions made up of small to medium sized cities surrounded by areas of high rural density. The largest city in North Carolina is Charlotte, with a 1980 population of 314,447. Four other cities trail Charlotte with populations in a 100,000 to 155,000. From there, populations drop sharply. Ohio, by contrast, has fourteen Standard Metropolitan Statistical Areas (SMSAs) wholly within the state and five more which are shared with neighboring states. Of the top eight SMSAs, one stands at 1.8 million, three exceed 1 million, and the smallest stands above 400,000. Of its cities exceeding 100,000 in population, two have over one-half million, with four others ranging from 200,000 to over 385,000. The smallest has a population of over 350,000.

The two states also contrast sharply in industrial background. Ohio's economy has long been based in heavy industry, while in North Carolina, agriculture was supplanted by manufacturing as the leading source of jobs only in 1958. Ohio is highly unionized—31.5 percent of its non-agricultural workforce in 1980; North Carolina had the
TABLE 2. NORTH CAROLINA AND OHIO CITIES WITH POPULATIONS OVER 100,000, 1980.

<table>
<thead>
<tr>
<th>NC CITIES</th>
<th>POPULATION</th>
<th>OH CITIES</th>
<th>POPULATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charlotte</td>
<td>314,447</td>
<td>Cleveland</td>
<td>573,822</td>
</tr>
<tr>
<td>Greensboro</td>
<td>155,642</td>
<td>Columbus</td>
<td>564,871</td>
</tr>
<tr>
<td>Raleigh</td>
<td>150,255</td>
<td>Cincinnati</td>
<td>385,457</td>
</tr>
<tr>
<td>Winston-Salem</td>
<td>139,885</td>
<td>Toledo</td>
<td>354,635</td>
</tr>
<tr>
<td>Durham</td>
<td>100,831</td>
<td>Akron</td>
<td>237,177</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dayton</td>
<td>203,371</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Youngstown</td>
<td>115,436</td>
</tr>
</tbody>
</table>

Source: U.S. Bureau of the Census

second lowest percentage of unionized workers of any state in the Union at 9.6 percent for the same year. Average weekly earnings for production workers in manufacturing in North Carolina in 1981 were $232, and annual per capita income was $8,679. The figures in those categories for Ohio were $390 and $10,371, respectively.

It is easy for the highly apparent differences, however, to obscure fundamental similarities. Though North Carolina's arrival at a manufacturing economy was late relative to Ohio's, both states' economies have been chiefly influenced by manufacturing. North Carolina is even more heavily dependent on manufacturing than Ohio with 32.8 percent of its civilian labor force in manufacturing; Ohio has 30.1 percent of its workforce so employed.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Metrolina</td>
<td>1,264,891</td>
<td>Cleveland</td>
<td>1,898,895</td>
<td>Loraine-Elyria</td>
<td>274,908</td>
</tr>
<tr>
<td>Piedmont Triad</td>
<td>1,114,750</td>
<td>Cincinnati</td>
<td>1,401,491</td>
<td>Hamilton-Middletown</td>
<td>258,787</td>
</tr>
<tr>
<td>Research Triangle</td>
<td>861,479</td>
<td>Columbus</td>
<td>1,093,361</td>
<td>Lima</td>
<td>218,244</td>
</tr>
<tr>
<td>Gold Leaf</td>
<td>504,694</td>
<td>Dayton</td>
<td>830,070</td>
<td>Wheeling</td>
<td>185,566</td>
</tr>
<tr>
<td>Highland Plains</td>
<td>481,604</td>
<td>Toledo</td>
<td>791,599</td>
<td>Springfield</td>
<td>183,885</td>
</tr>
<tr>
<td>Land of Sky</td>
<td>334,171</td>
<td>Akron</td>
<td>660,328</td>
<td>Steubenville-Wiarton</td>
<td>163,099</td>
</tr>
<tr>
<td>Unifour</td>
<td>270,457</td>
<td>Youngstown</td>
<td>531,350</td>
<td>Parkersburg-Marietta</td>
<td>162,836</td>
</tr>
<tr>
<td>Coastal</td>
<td>224,919</td>
<td>Canton</td>
<td>404,421</td>
<td>Mansfield</td>
<td>131,205</td>
</tr>
<tr>
<td>Wilmington-Cape Fear</td>
<td>212,547</td>
<td>Huntington-Ashland</td>
<td>311,350</td>
<td>Newark</td>
<td>120,981</td>
</tr>
</tbody>
</table>

Economic vulnerability in both states springs from a history of dependence on a few dominant industries—tobacco, textiles, and furniture in North Carolina; steel, automobiles, and rubber in Ohio. Though the two states have followed divergent paths on the issue of unionization, changing technologies and foreign competition have left both with large numbers of displaced workers, having been trained to narrow industry specifications. In North Carolina, 300,000 people are unemployed, and another 400,000 are underemployed in low paying jobs with little future. In 1983 in Ohio, 670,000 were unemployed and another 200,000 were underemployed.

**TABLE 4. COMPARATIVE DEMOGRAPHIC AND ECONOMIC INDICATORS, NORTH CAROLINA AND OHIO.**

<table>
<thead>
<tr>
<th>Indicators</th>
<th>NC</th>
<th>Rank</th>
<th>OH</th>
<th>Rank</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Square Miles 1980</td>
<td>48,843</td>
<td>28</td>
<td>41,004</td>
<td>35</td>
<td>-----</td>
</tr>
<tr>
<td>Population 1980</td>
<td>5,883,000</td>
<td>10</td>
<td>10,128,000</td>
<td>6</td>
<td>326,546,000</td>
</tr>
<tr>
<td>Population per Square Mile 1980</td>
<td>720.4</td>
<td>17</td>
<td>263.3</td>
<td>9</td>
<td>64.9</td>
</tr>
<tr>
<td>% Population Change 1970-1980</td>
<td>15.7</td>
<td>21</td>
<td>1.3</td>
<td>46</td>
<td>11.4</td>
</tr>
<tr>
<td>Civilian Labor Force 1980</td>
<td>2,940,000</td>
<td>--</td>
<td>5,122,000</td>
<td>--</td>
<td>110,204,000</td>
</tr>
<tr>
<td>Indicators</td>
<td>NC Rank</td>
<td>OH Rank</td>
<td>U.S.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>---------</td>
<td>---------</td>
<td>-------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Employed in Manufacturing in 1980</td>
<td>32.8</td>
<td>30.1</td>
<td>22.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td># Employed in Manufacturing in 1981</td>
<td>817,000</td>
<td>1,233,000</td>
<td>20,173,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td># Employees in Service Industry 1981</td>
<td>358,000</td>
<td>856,000</td>
<td>8,592,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td># Unemployed 1982</td>
<td>266,000</td>
<td>640,000</td>
<td>10,678,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Unemployed 1982</td>
<td>9%</td>
<td>12.5</td>
<td>9.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Union Workers, Non-agricultural</td>
<td>9.6</td>
<td>31.5</td>
<td>25.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workers 1980</td>
<td>49</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per Capita Personal Income 1981</td>
<td>$8.679</td>
<td>10371</td>
<td>10,517</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Hrly Earnings Prod'n Workers in Mfg 1981</td>
<td>5.94</td>
<td>9.53</td>
<td>5.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Wkly Earnings Prod'n Workers in Mfg 1981</td>
<td>232</td>
<td>390</td>
<td>318</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Another similarity is that both states are in the process of developing strategic plans and designing processes to address proactively the structural economic changes with which they are faced. The major components of their development plans are compared next.

**Strategic Plans for Development: Addressing State Similarities and Differences**

The common structural economic changes which are affecting North Carolina and Ohio are reflected in the broad similarities in comprehensive economic development strategies outlined to carry the states through the next couple of decades. The strategies, however, also point to differences based on the unique economic and demographic factors in each state. Though both states' strategies are designed to employ a full range of measures to bring about economic development and renewal—(a) attraction of industry from outside, (b) revitalization and retention of
existing industries, and (c) generation of new industries and businesses—variations in emphasis and timing reflect some of the differences in state conditions.

Much of North Carolina's development strategy has been shaped by the realization that the traditional industries--textiles, tobacco, and furniture--which replaced agriculture as the leading source of employment in the decade of the 1950s are relatively low-wage industries. In 1980, wages in North Carolina were 74.1 percent of the national average. In the drive to diversify its economic base, a major thrust has been to attract into the state primarily research and development (R&D) and advanced technology industries that can continue to generate growth through expansion and "spin-off" businesses and industries.

There has been growing realization, however, that recruitment of outside industries, in spite of dramatic successes, offers only partial solutions to the state's economic renewal efforts. First, depressed economic conditions and intensified competition from other states over corporate expansions or relocations has seen a diminishing payoff. New investments in the state in 1982 were 44 percent of the level of new investments in 1981, and only about one-third of those in 1980. Moreover, new investments have not been able to keep pace in the provision of jobs with those being lost through plant closings and layoffs. Therefore, another component of the overall
strategy has been to revitalize traditional industries by the introduction of innovations, making them competitive on an international scale.

In contrast to North Carolina, historically, Ohio's traditional industries have paid wages above the national average. Therefore, state strategy has been to build around its existing economic strengths. Like North Carolina, until recently, the cornerstone of Ohio's economic development efforts was the attraction of industry from outside the state. From 1950 through 1970, Ohio's per capita income was sliding as a percentage of the United States figure but was still above the national average. In the decade from 1970 to 1980 it dropped from 101 percent of the national average to 99.5 percent. The state's history of prosperity as a leader in manufacturing led it to redouble its recruitment efforts as a means of economic revitalization.

With a change in state administrations in January 1983, recruitment still occupies a place in development strategy; however, the emphasis has shifted to building around Ohio's strengths from within. Strategy now focuses on fostering the development of innovative technologies around regionally identified areas of industrial and academic strength. One of the aims is the restoration of traditional industries to positions of international prominence through technological innovation. Technological
innovation is seen as both a potential magnet for attracting as well as a source for generating new businesses.

Though North Carolina's strategy places greater initial emphasis on attracting firms from outside the state, both states see their long term interests in broadening their small business bases. They are, therefore, placing major resources in building financial, research, and managerial infrastructures to promote and support entrepreneurship. A major departure from the traditional logic of concentration is the recognition that small businesses tend to be the greatest sources of innovation, and constitute the most resilient economic base for a community or state.

The next section looks at collaborative mechanisms and processes designed to implement state development strategies.

**Comparing Mechanisms and Processes for Collaboration in State Economic Development**

Some obvious differences and fundamental similarities in economic and demographic factors in North Carolina and Ohio resulting in similarities and differences in development strategies have been shown. This section looks at similarities and points out fundamental differences in the mechanisms and processes designed to implement development strategies.

The literature reviewed in Chapter II (see pages 75 to 86) points to an emergent form and logic of
organization. A summary of the characteristics can be identified as a transition from hierarchical to flat organization (Herbst, 1974); from independent to collaborative interorganizational relations (Clark, 1965); from authoritative to consultative, participatory system management (Metcalf, 1978); from narrow to diverse policy input—a premium on information (Mintzburg, Raisinghani and Theoret, 1976; Maruyama, 1978); and from reliance on elaborate rules to reliance on the inculcation of values as a means of control (Emery and Trist, 1965; Ouchi, 1980). Consistent with the new organizational patterns outlined, both North Carolina and Ohio are in periods of significant transition from traditional independent, competitive forms of interaction to collaborative systems of government—education—industry relationships. The matrices developed below show the organizational forms adopted for economic development programming as a part of that transition in the two states.

To this point in the dissertation, the terms cooperation and collaboration have been used interchangeably in contrast with independent and competitive forms of interaction. Drawing on Schermerhorn's (1975) and David Whetten's (1982) distinction between cooperation and coordination, cooperation can be regarded as relations between otherwise independent units to further individual interests. Collaboration differs in that it connotes interactions of two or more organizations or groups of
organizations for the purpose of accomplishing collective goals. Four modes of collaboration—ad hoc groups, periodic forums, joint programs, and joint ventures—can be identified through which government, education, and private industry sectors join forces to develop and implement economic development programs at the state level.

Four dimensions for measuring the strength of interorganizational relations proposed by Marrett (1971) are (1) formalization—the degree to which requirements and characteristics are made explicit, (2) intensity—a measure of organizations' commitment, (3) reciprocity—a measure of agreement on the terms of interaction, and (4) standardization—the degree to which units of exchange are clearly delineated. Marrett's measures were designed to apply to interactions between social service agencies among whom relations are customarily competitive.

Table 5 compares the relative strength of the modes of collaboration on a continuum from low to high as measured by four dimensions adapted from Marrett. The measures employed here are designed to show the relative strength of the mode generally and not to evaluate actual or specific interactions between organizations. Therefore, only a form of the first two dimensions—(1) formalization, and (2) intensity—are relevant. The last three dimensions—resource requirements, frequency of interaction, and duration of interaction—are forms of intensity.
<table>
<thead>
<tr>
<th>DIMENSIONS OF STRENGTH</th>
<th>AD HOC GROUPS</th>
<th>PERIODIC FORUMS</th>
<th>JOINT PROGRAMS</th>
<th>JOINT VENTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formalization</td>
<td>Informal to Formal</td>
<td>Informal to Formal</td>
<td>Informal to Formal</td>
<td>Formal</td>
</tr>
<tr>
<td>Resource Requirements</td>
<td>Low to Moderate</td>
<td>Low to High</td>
<td>Moderate to High</td>
<td>High</td>
</tr>
<tr>
<td>Frequency of Interaction</td>
<td>Infrequent to Frequent</td>
<td>Infrequent to Frequent</td>
<td>Frequent to Continuous</td>
<td>Continuous</td>
</tr>
<tr>
<td>Duration of Interaction</td>
<td>Limited</td>
<td>Long Term</td>
<td>Permanent</td>
<td>Permanent</td>
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</table>
Formalization is the degree to which such devices as legislative statutes or inter-agency agreements are used to delineate terms of the agreement. A note of caution with formalization is required in that some collaborative efforts are strong on the other dimensions and thus operate without much formal agreement. Such collaborative efforts exhibit features analogous to organic solidarity at the level of the firm. Resource requirements are measures of money, staff and other resources required to maintain or operate the collaborative effort. Frequency of interaction measures the amount of time per unit of time which is required of parties to the collaborative effort. Duration of interaction is a measure of the degree to which some continuity of interaction (say through staff appointments) between collaborating groups is maintained. A description of the modes of collaboration based on the dimensions follows.

Ad hoc groups, at the low end of collaboration, may or may not be formalized by statute or agreement; resources required for its operation tend to be low to moderate given the limited duration of the interaction; interactions may be infrequent, but tend more toward high frequency during the group's existence. Ad hoc groups are characterized by such forms as interagency task forces, working groups, commissions, and steering committees.
Periodic forums may also be formal to informal, but are more likely to be mandated; resources required of the collaborative parties for their maintenance may lie below to high depending on whether staff support is required, and depending upon the mission; and they generally meet periodically over a long period of time. Examples of periodic forums include standing committees and advisory committees.

Joint programs (Aiken and Hage, 1968) may be formalized by agreement between collaborative parties or they may operate informally out of a shared sense of need to provide a service or share information; required resource commitments are generally moderate to high; interactions are frequent or continuous and are generally designed to be permanent or ongoing. Examples of joint programs include such operations as data banks or field offices.

Joint ventures involve two or more collaborating "parent" organizations in the creation of a jointly owned separate entity referred to as the "progeny" designed to more efficiently utilize resources across organization boundaries (Pfeffer and Nowak, 1976), and thus require formalized legal agreements; resource requirements for the parties involved are generally high; and interactions are continuous and permanent.

In Tables 6 and 7 major collaborative forms either in operation or in a well developed proposal stage as of
### TABLE 6. COLLABORATIVE FORMS FOR ECONOMIC DEVELOPMENT IN NORTH CAROLINA

<table>
<thead>
<tr>
<th>FUNCTIONAL AREA</th>
<th>LINK-AGE INITIATED</th>
<th>COLLABORATIVE FORMS AND PROCESSES</th>
<th>LINKAGES</th>
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<tr>
<td></td>
<td>GOVERNMENT</td>
<td>EDUCATION</td>
<td>UNC</td>
</tr>
<tr>
<td></td>
<td>GOVNR</td>
<td>DOC</td>
<td>DPI</td>
</tr>
<tr>
<td>POLICY AND PROGRAM DEVELOPMENT</td>
<td>AH 1981</td>
<td>NC Commission on Year 2000</td>
<td>C</td>
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<tr>
<td></td>
<td>AH 1982</td>
<td>Gov. Task Force on Sci. and Tech.</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>PF 1963</td>
<td>NC Bd. of Sci. and Tech.</td>
<td>C</td>
</tr>
<tr>
<td>HUMAN RESOURCE DEVELOPMENT</td>
<td>AH 1980</td>
<td>N.C. Commission on Sci/Math Educ.</td>
<td>o</td>
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<tr>
<td></td>
<td>PF 1983</td>
<td>Committee on Sci. and Math</td>
<td>o</td>
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<tr>
<td></td>
<td>PF 1983</td>
<td>Committee on Educ. for Econ. Growth</td>
<td>C</td>
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<tr>
<td></td>
<td>JP 1958</td>
<td>New and Expanded Industries Prog.</td>
<td>o</td>
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<td></td>
<td>JP 1982</td>
<td>Quality Assurance Program</td>
<td>o</td>
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<tr>
<td>FUNCTIONAL AREA</td>
<td>LINK-AGE MODE</td>
<td>YEAR INITIATED</td>
<td>COLLABORATIVE FORMS AND PROCESSES</td>
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<td>HUMAN RESOURCE DEVELOPMENT</td>
<td>JP</td>
<td>1983</td>
<td>Centers of Sci. and Math</td>
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<td>(cont.)</td>
<td>JV</td>
<td>1978</td>
<td>N.C. School of Sci. and Math</td>
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<tr>
<td></td>
<td>JP</td>
<td>1955</td>
<td>UNC Engineering Extension CTR</td>
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<tr>
<td>BUSINESS/TECHNOLOGY DEVELOPMENT</td>
<td>JP</td>
<td>1983</td>
<td>Innov. Rsrch Fund</td>
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<td></td>
<td>JP</td>
<td>1983</td>
<td>Venture Cap. Fund</td>
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<td>JP</td>
<td>1983</td>
<td>Innov. Rsrch. Loan Fund</td>
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<td></td>
<td>JP</td>
<td>1983</td>
<td>Sm Bus. Directory</td>
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### TABLE 6 (Continued)

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<th>FUNCTIONAL AREA</th>
<th>LINK- YEAR</th>
<th>COLLABORATIVE FORMS AND PROCESSES</th>
<th>GOVERNMENT</th>
<th>EDUCATION</th>
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<tr>
<td>BUSINESS/TECH-</td>
<td>JV 1980</td>
<td>N.C. Microelectr. Ctr.</td>
<td>GOVNR</td>
<td>DPI</td>
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<td>(cont.)</td>
<td></td>
<td></td>
<td>DPI</td>
<td>BUS/INDUS-</td>
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</table>

AH = Ad Hoc, PF = Periodic Forum, JP = Joint Program, JV = Joint Venture; C indicates the Program Coordinator; GOVNR = Governor; DOC = Department of Commerce, DPI = Department of Public Instruction, DCC = Department of Community Colleges, UNC = University of North Carolina. *The N.C. School of Sci. and Math is party to the Centers of Sci. and Math Joint Program.
<table>
<thead>
<tr>
<th>FUNCTIONAL AREA</th>
<th>LINKAGE MODE</th>
<th>YEAR INITIATED</th>
<th>COLLABORATIVE FORMS AND PROCESSES</th>
<th>GOVERNMENT</th>
<th>EDUCATION</th>
<th>BUS/INDUSTRY</th>
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<tr>
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<td>1983</td>
<td>Cabinet Cluster</td>
<td>C</td>
<td>o</td>
<td>o</td>
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<tr>
<td>AH</td>
<td>1980</td>
<td>Advisory Commission on Articulation</td>
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<tr>
<td>AH</td>
<td>1982</td>
<td>Joint Commission on Vocational Technical Education</td>
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<td>HUMAN RESOURCE DEVELOPMENT</td>
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<td>1982</td>
<td>Commission on Educ. Excellence</td>
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<td>AH</td>
<td>1983</td>
<td>Blue Ribbon Commission on Voc. Educ.</td>
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### Table 7 (Continued)

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<th>Collaborative Forms and Processes</th>
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<th>Education</th>
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<th>Industry</th>
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<td>Govnr</td>
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<tr>
<td>HUMAN RESOURCE DEVELOPMENT (cont.)</td>
<td>1984</td>
<td>Oh. Bus.-Ind.-Educ. Council</td>
<td>C</td>
<td>o</td>
<td>o</td>
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<td>1979</td>
<td>Oh. Industrial Training Prog.</td>
<td>o</td>
<td>o</td>
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<td></td>
<td>1978</td>
<td>Oh. Technol. Transfer Org. (OTTO)</td>
<td>C</td>
<td>o</td>
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<td>BUSINESS/TECHNOLOGY DEVELOPMENT</td>
<td>1983</td>
<td>Small Business Enterprise Ctrs.</td>
<td>o</td>
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<td>Innov. Research Financing (TAEPP)</td>
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<td>Search for Innov. Technology (TAEPP) Technol. Info.</td>
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### TABLE 7 (Continued)

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<th>FUNCTIONAL AREA</th>
<th>LINK-AGE MODE</th>
<th>YEAR INITIATED</th>
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<th>EDUCATION</th>
<th>BUS/INDUSTRY</th>
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<tr>
<td>BUSINESS/TECHNOLOGY DEVELOPMENT (cont.)</td>
<td>JV</td>
<td>1983</td>
<td>Exch. and Innov. Network</td>
<td>o</td>
<td>o</td>
<td>o</td>
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<td></td>
<td>JV</td>
<td>1983</td>
<td>Advanced Technol. Attraction Ctrs. (TAEPP)</td>
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<td>o</td>
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</table>

AH = Ad Hoc, PF = Periodic Forum, JP = Joint Program, JV = Joint Venture; C indicates the Program Coordinator; GOVNR = Governor; DOD = Department of Development, OBOR = Ohio Board of Regents (2 year and 4 year schools).
January 1984 in North Carolina and Ohio are displayed with the sectors normally linked by them, with the coordinating agency or operation designated.

The matrices organize collaborative arrangements in the two states into three broad functional categories for comparison: (1) policy and program development involves policy development and system design; (2) human resource development is broadly defined to include both academic and vocational/technical education, from primary through post-secondary levels (community based organizations and federally sponsored training programs are not included in the study); and (3) business and technology development covers the process of building financial, managerial and informational infrastructure for business and technological development.

Mechanisms and processes in each functional area are displayed according to the linkage mode, from ad hoc arrangements at the low end of the collaborative continuum to joint programs at the high end. Based on the concepts used to form the matrices, the number of collaborative arrangements at the joint program and joint venture end of the continuum will serve as a good indicator of the relative degree and strength of collaboration in a system. The collaborative arrangements in both systems are described below and similarities are detailed.
**Policy and Program Development**

Policy development and system design processes in both North Carolina and Ohio depart significantly from the centralized and concentrated planning processes assumed to be models of efficiency and control under bureaucratic systems. Processes in both states are marked by the following characteristics: (1) broad interaction among government, education, private industry sectors; (2) highly flexible arrangements to bring an appropriate array of talent, skills, and input from other interests to bear on problems being addressed; and (3) a collaborative staffing process for professional staff support for working groups, drawing from a variety of departments and institutions.

In Ohio, Cabinet Clusters, established by Governor Celeste after taking office in 1983, constitute the core of the strategic planning process. They are comprised of cabinet-level department heads appointed by the governor on an ad hoc basis to address a specific problem, and may function over an extended period of time or only for the time required to deal with a given issue. They are designed to transcend traditional jurisdictional boundaries of departments, and reduce the tendency for problems of turf which are common under bureaucratic organization. There is also a premium placed on participation of diverse groups including business, labor, education, and local officials. Clusters report to the governor and cabinet to propose actions
or recommendations. Of four issue areas identified for attention at the beginning of the current administrative term--human resources, environment and infrastructure, state government, and economic development--the economy and jobs held first priority for assignment to a Cabinet Cluster.

A key component around which strategic planning in development matters revolves in North Carolina is the North Carolina Board of Science and Technology, a fifteen-member board chaired by the governor with membership drawn from higher education, state and local government, and private industry. The Board serves as a "nerve center" linking government departments and agencies, the scientific and engineering community, and private industry to foster the application of science and technology to state development problems. Like the Cabinet Clusters, the Board also works through a highly flexible task force approach, combining appropriate outside research resources with board membership. Research initiatives, however, may originate with the Board itself, from state agencies or local governments, or from private institutions or industries, and may be made either formally or informally. The Board functions more in a planning and coordinating than in an operating capacity. In the formulation of North Carolina's development strategies, two other collaborative processes were highly visible. First, a Commission of the Future of North Carolina
was appointed by Governor James Hunt in June 1981 to give state strategies a broad local as well as a state orientation. Through such devices as a network of committees from each of the state's 100 counties and a mass (113,000 returns) public opinion survey, local views were coordinated with state perspectives in a comprehensive set of goals and recommendations covering (1) people, (2) the economy, (3) natural resources, and (4) community.

Second, a Governor's Task Force on Science and Technology, for which the North Carolina Board of Science and Technology served as the core, was appointed to undertake an eighteen month evaluation of technological and scientific resources, policies, procedures, organization structures, and financial requirements necessary for implementing the Commission's goals and recommendations. The Task Force drew heavily on non-Task Force members, and regional forums for broader input. The final product was a four-volume report covering (a) an overview of the issues, (b) technological innovation, (c) research and higher education, and (d) elementary and secondary education.

**Human Resource Development**

The term human resource development can be used to cover the entire spectrum of education and training from primary through postsecondary; academic as well as vocational/technical; public, private (non-profit), or proprietary (for-profit). This study, however, is confined to the
states' primary/secondary (k-12), and postsecondary education systems in collaboration with state government and private industry. It does not extend to community based or federally sponsored job training programs.

Collaborative efforts in human resource development show three different sectoral focuses: (1) efforts between education at the vocational/technical level and state development agencies, primarily the customized training programs; (2) intrasectoral efforts focused on coordination among various levels and facets of the educational system; and (3) efforts focused at linkages between private industry and education at all levels.

Under the first category, the customized training programs are collaborative arrangements between vocational/technical divisions and development agencies aimed at the attraction of new industries or the revitalization and retention of existing industries. The programs are designed to provide recruitment and training of prospective employees to exact company specifications at no charge to the firm. Training may take place at a school or at the company site on actual equipment to be used on the job. Completion of training is designed to coincide with the projected move of the firm or start of a given operation.

In North Carolina, the customized training program, referred to as the New and Expanding Industries Program, is operated by the Industry Services Division of the North
Carolina Department of Community Colleges in collaboration with the North Carolina Department of Commerce. In Ohio, the comparable program is the Ohio Industrial Training Program, jointly funded and coordinated by the Division of Vocational Education of the Ohio Department of Education and the Ohio Department of Development.

In the second category of collaborative arrangements are those among secondary and postsecondary educational components. Such efforts focus on the clarification of responsibilities where problems transcend component boundaries and impact on an institution's ability to deliver services and ultimately on educational standards and economic performance.

In North Carolina, the coordination process began with the establishment of minimum competency tests. In addition, in both states, articulation measures have been established to raise and standardize entrance requirements to four-year academic institutions, and to increase standards of teacher certification. In North Carolina, entrance requirements to the four-year academic institutions were raised when other schools followed the lead of the University of North Carolina at Chapel Hill in raising its standards.

In North Carolina, the goal of increasing standards for teacher certification is addressed through the Quality Assurance Program, a joint effort of the University of
North Carolina Board of Governors and the Board of Education. The program includes measures to screen entrance to teacher education programs, clarification of competencies expected, pre-certification testing, and evaluation prior to final certification. The measures are recommendations of the Committee on Science and Mathematics Education, created jointly by the North Carolina Board of Science and Technology and the Department of Public Instruction in 1980 to "increase the interest and proficiency of high school graduates in North Carolina in science and mathematics."

The Report of the Commission on the Future of North Carolina provided a broad-based recommendation for the expansion of the Quality Assurance Program statewide and the Governors Task Force on Science and Technology provided a more in-depth analysis of the policy and organizational requirements for implementation.

Both the establishment of uniform minimum standards in college preparatory curricula for public and private four-year institutions and the establishment of minimum requirements for preservice and inservice teacher education were developed in Ohio by the Advisory Commission on Articulation between Secondary and Ohio Colleges. The Commission was a joint appointment by the Ohio Board of Regents and the Ohio Department of Education in 1980. The Advisory Council for College Preparatory Education was created to conduct progress reports on the implementation, follow-up
studies on the students, and other reports which the Board might need or request.

Following the academic trend, a Blue Ribbon Committee on Vocational Education has been established by the Regents and the State Board of Education to add a stronger academic component to the vocational education program, including additional mathematics, science, and English.

Another problem area affecting the delivery of services was addressed by the two Boards in 1982 with the establishment of the Joint Commission on Vocational and Technical Education to resolve problems of duplication between the two levels in serving the adult population.

The North Carolina School for Science and Mathematics (NCSSM) provides another collaborative model for upgrading teacher and student performance. The school is a state-financed, tuition and fee paid, residential, coeducational high school for juniors and seniors with exceptional ability and with a special interest and potential in the sciences and mathematics. Located in Durham, it draws students from the entire state with its enrollment mirroring closely the state's sex and ethnic composition. Through a number of linkages, such as the provision of industry-sponsored teaching experiences and summer workshops offered by the school to teachers throughout the state, the methods developed are widely disseminated.
A third category of collaborative arrangements in human resource development focuses on the involvement of the business/industry sector in the development of comprehensive strategies and as integral parts in the operation of the educational system to increase the quality of its output. In North Carolina, a network of business support is provided for the state's drive to increase mathematics and science resources and skills through the North Carolina Business Committee on Math/Science Education; and, in Ohio business leaders became involved in strategic planning for the state elementary and secondary system when the state Board of Education appointed the Ohio Commission on Educational Excellence in 1982.

A model provided by the National Commission on Education for Economic Growth, sponsored by the Education Commission of the States and chaired by North Carolina's Governor James Hunt in 1983 called for governors' leadership in pulling together government, education, industry and other interests for assessing state and local needs and developing comprehensive action plans for improvement. Both North Carolina and Ohio responded to the recommendations of the national commission. North Carolina established the North Carolina Commission on Education for Economic Growth; Ohio established the Ohio Business-Industry-Education Council, closely aligned to the model.
Business and Technology Development

For both North Carolina and Ohio, a major change in development policy has been the shift from a focus on exclusively external sources of economic growth to include also a major commitment of resources to internal sources. With new research findings on the role of small advanced-technology firms in the overall growth and resilience of state economies has come the recognition of their potential for introducing technological change into, and thus revitalizing, traditional industries, as well.

Collaborative arrangements between government, education and private industry are aimed at the provision of a complete infrastructure to support the generation and growth of small businesses and advanced technologies. Five categories of such supportive services are identified in North Carolina and Ohio: (1) mechanisms to unite universities and entrepreneurs to transform research ideas into marketable products or services; (2) the provision of financing at various stages of the business development process; (3) development of centers to facilitate the growth of advanced technologies; (4) services to transfer technical information from a variety of sources to industry users; and (5) the development of data bases for business information needs.

The North Carolina Technological Development Authority (NCTDA), a non-profit agency operating out of the
state's Department of Commerce, was authorized to establish a number of support services for the development of new enterprise. Under the first category, the NCTDA was authorized to establish Incubator Facilities through one-time locally matched grants to non-profit corporate affiliates of local higher education institutions. Through the facilities, and combination of support services may be offered from affordable space, to such other services as the use of computers, technical and managerial advice, and legal and accounting services, and the like.

In Ohio, the Thomas Alva Edison Partnership Program (TAEPP), operated by the Ohio Department of Development with an intersectoral advisory board, represents the major element in the strategy to generate innovative small businesses, and to transform the state's traditional industries to advanced technology operations. The Search for Innovative Technology operated under TAEPP is a low-cost pilot program to establish within participating universities and industries a mechanism to identify, evaluate and assess potential technologies for commercialization.

The federal Small Business Development Act of 1982, through the Small Business Innovation Research (SBIR) program, makes available three categories of funding appropriate to three stages of development which it identifies: (1) "start-up" or "seed" capital for developing prototype products or services, (2) "first stage" financing to begin
marketing operations, and (3) "second stage" or "venture capital" for financing business growth or expansion. With some slight variation in taxonomy of processes identified, the two states have adopted the SBIR model for targeting efforts at the generation of new businesses and industries.

An Innovative Research Fund authorized under NCTDA and the Innovation Research Financing Program under Ohio's TAEPP are designed to provide new enterprises last resort financing and to maintain revolving funds through equity positions in successful commercializations. In addition, in North Carolina, the Governors Task Force on Science and Technology has proposed the addition of an Innovation Loan Fund with a revolving fund maintained from interest payments to provide an alternative to equity financing; and the development of a venture capital fund for this third stage financing, or businesses expansions.

The third category of support services are centers for the development of advanced technologies, usually non profit joint ventures between higher education, private industry and state development agencies. Advanced technology centers are designed to bring about a marriage between university interests in basic and applied research and private industries in the application of research to commercial development in a given technological field. Aside from research and development, center activities might include such benefits as education of students and industry
personnel and patent rights to new developments.

North Carolina has developed two such centers. The Microelectronics Center of North Carolina (MCNC), established in 1980, functions as a resource hub integrating the research and educational capabilities of six universities to carry out complimentary applied research with the electronics industry. The North Carolina Biotechnology Center (NCBC), established in 1981, unites research strengths and training capabilities of medical, engineering and agriculture schools along with basic science departments of educational and research institutions with private industry to stimulate developments and application in biotechnology within the state. The comparable effort in Ohio is the Advanced Technology Application Centers (ATACs) Program under TAEPP to create a number of world class centers for the development of technologies around existing regional strengths in the state.

The fourth category of services are those designed to transfer information already developed in a variety of fields to a business or industry user who can put it into practical application. In North Carolina, this function is performed by the Industrial Extension Service, established in 1955 under the School of Engineering of the University of North Carolina. The program works cooperatively with the extension programs on the other campuses of the sixteen-member University of North Carolina system, and with
the state's Department of Commerce to deliver technical assistance and extension education services to business, industry and local governments.

In Ohio, the Ohio Technology Transfer Organization (OTTO), originally developed in 1978 under the Ohio Board of Regents, was reorganized in 1983 and is administered by the Ohio Department of Development with services delivered by the state's twenty-four two-year technical institutes and community colleges. The network of schools uses a common resource research office at The Ohio State University.

The final category of services are the information systems established to access and create data bases for such uses as the location of potential customers, suppliers, and funding sources. The systems are designed to be made available to business, industry and government through both electronic and printed form. In Ohio, the Technology Information Exchange and Innovation Network (TIE-IN), is an independent non-profit corporation developed in 1983 by representatives of business, industry, education, and government. In North Carolina, a Small Business Directory has been proposed by the Governor's Task Force on Science and Technology as a collaborative effort between the Triangle Universities, the Technological Development Authority, and private industry to establish a comprehensive directory of services to small businesses.
Differences in North Carolina and Ohio Collaborative Processes

The last three sections showed striking similarities in collaborative forms and processes adopted across functional areas—policy and programs, human resources, and business and technology—in economic development processes in North Carolina and Ohio. This section points out some of the differences in the forms and processes across functional areas, in the two states. Distinctions lie in five factors: (1) date of origin, (2) participation patterns, (3) articulation patterns, (4) reciprocity patterns, and (5) level of educational involvement.

First, both North Carolina and Ohio are in the process of transition from traditional to collaborative forms of interaction among government; education and industry at the state level in economic development. Collaborative processes, however, have a longer history, and thus a longer period for interorganizational learning, in North Carolina than in Ohio. Two of the forms in North Carolina began in the 1950s—technology transfer under the Industrial Extension Service in 1955, and customized training under the New and Expanding Industries Program in 1957. Ohio's first collaborative forms appeared in the late 1970s. The Ohio Technology Transfer Organization was established in 1978 and the Ohio Industrial Training Program in 1979. The North Carolina Board of Science and Technology was first established in 1963 and reorganized in
1979, while Ohio's Cabinet Clusters were just established in 1983.

The second through the fourth factors can be regarded as dimensions of strength of collaboration for specific processes or functions. The second, participation, measures the degree of access to, and diversity of opinion sought in, policy making processes. Both states have turned from hierarchical to flat, intersectoral decision structures in policy-making. Strategic planning processes in North Carolina, though, used both more layers and more highly visible layers for deliberation with areas of access for public participation. The Governors Task Force on Science and Technology and the North Carolina Board of Science and Technology all had distinct identities. The Commission ensured wide participation employing such devices as parallel state and local channels for deliberation, mass public opinion polls, and regional open forums. The work of the Cabinet Clusters and task forces in Ohio had lower visibility with comparatively lower opportunity for wide public participation.

In North Carolina the process covered a longer period of time. The formulation of goals and recommendations by the Commission and the follow-up study by the Governors Task Force required two and one-half years—from June 1981 to November 1983—before being returned to the Board for implementation. In Ohio, the process was accomplished in
one year—January to December 1983. A point to be considered, however, is that the period marked the beginning of a new administration. It is likely that a premium was placed on establishing what constituted an identifiable change in direction.

A third distinguishing factor is indicated on an articulation dimension—a form of Marrett's (1965) standardization dimension. Marrett defines standardization as the degree to which exchange elements, rules, or procedures for organizational interactions are fixed. Interaction at a more formal level of coordination is possible where exchange elements, rules, or procedures are "clearly delineated" rather than "ill-defined and shifting" (Marrett, 1965). Articulation moves beyond standardization by requiring not only delineation of factors, but that organizations take each other into consideration in their development for a collective purpose. It is a measure of the degree to which policy or program development is symbiotic rather than independent.

In North Carolina, the advanced technology focus is highly articulated across the range of functional areas related to economic development. The Board of Science and Technology, under the chairmanship of the Governor is described as a "nerve center" linking the various sectors and interests to foster the application of science and technology to state development problems. The focus is
reflected in the collaborative efforts devoted directly and visibly to technological transformation—e.g. the North Carolina Board of Science and Technology, the Governors Task Force on Science and Technology, the Committee on Science/Math Education, the North Carolina School of Science and Mathematics, the North Carolina Business Committee on Science and Mathematics, and the North Carolina Technological Development Authority.

In Ohio the articulation efforts between higher and secondary education and collaborative efforts between education and industry have a clear bearing on economic development, but, for the most part, have been independent of the Governor's Office. In North Carolina the Board of Science and Technology, the Governors Task Force and the Commission were all involved in the development of the Quality Assurance Program.

A fourth factor of distinction is determined by a reciprocity dimension. Reciprocity refers to the symmetry of interactions—the degree to which collaborating organizations have mutual influence in determining the conditions of interaction. A high degree of reciprocity implies conditions which allow otherwise autonomous units to enter into collaborative relations out of shared interests with no threat of control. Administrative patterns in North Carolina's collaborative arrangements show a high degree of departmental reciprocity; Ohio's collaborative arrangements
involve significantly more control. For example, in the area of customized training, the New and Expanding Industries Program in North Carolina is operated by the North Carolina Department of Community Colleges. The Department is one of three independent components in the state's educational system, equal with the Department of Public Instruction and the Board of Governors of the University of North Carolina System. It operates in collaboration with the Department of Commerce.

The Ohio Industrial Training Program is operated jointly by the Division of Vocational Education of the State Department of Education and the State Department of Development. There is a legislative requirement, however that funds appropriated to Education for the administration of the program be funneled to the Department of Development for operation.

The technology transfer function in North Carolina is performed by the Industrial Extension Service of the University of North Carolina College of Engineering. It works collaboratively with the Department of Commerce in sponsoring workshops and other programs for private industry. The Ohio Technology Transfer Organization, by contrast, is operated by the two-year technical institutes while it is funded through and coordinated by the State's Department of Development.
Finally, the states may be distinguished in terms of the degree to which higher levels of education are involved in practical development programs. At the beginning of the 1980s, nationally, there was little higher education linkage with state development departments (Wilson, 1981), a pattern which is changing with requirements in emergent technologies. For comparable functions in development programs, North Carolina's educational components tend to be involved at higher levels than Ohio's. North Carolina's customized training is operated at the post secondary level by the two-year technical institutes; in Ohio it is operated at the secondary level by the Division of Vocational Education. The Industrial Extension Service in North Carolina, operates at the university level with a staff of twenty-five, most with master's degrees in engineering; the Ohio Technology Transfer Organization at the technical institute level.

SUMMARY OF FINDINGS, PART I

Research Question #1

What are the current (as of January, 1984) state-level collaborative forms and processes in North Carolina and Ohio between state-level government, education, and private industry sectors?

(a) North Carolina and Ohio, in spite of highly apparent superficial demographic and economic
differences have fundamentally similar economic structures: (1) both have been heavily based in manufacturing, (2) both have been structured around dependency on a few dominant industries, and (3) both have been vulnerable to the same structural changes in the economy.

(b) Fundamental similarities in economic structure in the two states are reflected in their development of similar strategic plans, and in similar collaborative forms for interaction among the sectors in policy and program development, human resource development, and business and technological development functions to implement them.

(c) Though collaborative forms adopted are similar, there are differences in collaborative processes in the two states: (1) North Carolina's collaborative programs originated earlier than Ohio's, providing North Carolina with a longer period of interorganizational learning; (2) North Carolina's strategic planning processes are highly participative, Ohio's are moderately participative; (3) development related functions in North Carolina are highly articulated and are moderately articulated in Ohio; (4) collaborative processes tend to be
more reciprocal arrangements between autonomous units in North Carolina, whereas in Ohio collaborative arrangements involve some degree of control; and (5) collaborative arrangements involving educational components in North Carolina tend to operate at higher levels of the educational system.
Chapter V

RESULTS OF THE STUDY, PART II: TRANSITION FROM TRADITIONAL TO COLLABORATIVE FORMS AND VALUES

Chapter IV pointed out (1) superficial demographic and economic differences and basic economic similarities; and (2) similarities and underlying differences in collaborative forms and processes between government, education, and private industry at the state level in North Carolina and Ohio.

Chapter V presents findings on the second of the three research questions: How have the mechanisms and forms of cooperation evolved in North Carolina and Ohio in response to changing environmental conditions? The results of the research on the second question also shed light on an important question raised on ecological concepts of interorganizational relations regarding the degree to which environmental forces constrain strategic choice. The findings from the two states in this chapter are presented in six sections, as follows: (1) a brief overview of the relationship between the natural selection/strategic choice question and the findings, (2) the relationships between
perceptions of economic strength and awareness of structural problems, (3) differences in the patterns of adjustment to economic changes, (4) patterns of convergence over time in forms and processes of interaction, (5) choices that have affected the quality of collaboration, and (6) a summary of findings from Chapter V.

Natural Selection and Strategic Choice in Social Change

The literature review in Chapter II pointed out that conceptual devices developed in organization theory through the course of this century have steadily broadened in scope to provide a better grasp of complex relationships of organizational phenomena in society. Ecological concepts drawing on the imagery of Darwinian biology have been pointed to as highly useful (1) in reflecting how events in various parts of a system affect each other, and (2) for highlighting, in a prescriptive sense, principles of operation which work toward symbiotic relationships between system components. Within ecological concepts, however, a number of issues remain to be resolved or clarified if concepts are to provide a useful tool for policy analysis.

One conceptual issue for clarification involves the relationship between environmental constraint and policy choice in the guidance of systems. For example, it has been argued by Child (1972) and Aldrich and Pfeffer (1976) that natural selection is a relatively negligible factor
and that there is wide latitude in the choice of organizational forms for survival and advantage open to policymakers. A look at the transition from traditional to collaborative forms of interaction in government, education, and private industry sectors in North Carolina and Ohio provide an opportunity to bring into sharper focus the interplay between environmental constraints and strategic choice in the process of social change.

The results of the study suggest that the general similarities in collaborative forms adopted by the two states were in response to the constraining influence of the environment growing out of fundamental similarities in their economic structures. Both the differential in time of adoption and some of the fundamental differences in interorganizational arrangements and processes, however, are attributable to differences in the ability of the states to perceive their need to adjust to structural changes taking place in the economy in the post World War II period. The difference in perception was due, in turn, to the tendency for economic changes to be obscured by such superficial differences between the states as relative levels of industrialization and of wealth.

The trends of development in the two states, then, suggest that in Ohio (1) slack resource levels interfered with, obscured, or diverted attention away from signals of structural change, (2) slowed the time for initiation of
change processes, and (3) obscured the perception of the profundity of change required to meet the new economic conditions. In North Carolina the absence of slack resources contributed to the early perception.

**Structural Economic Changes and Perceptions of Economic Strength in North Carolina and Ohio**

Responses to the second research question suggest that in assessing conditions of basic economic health, impressions in North Carolina and Ohio were influenced most profoundly by those indicators which are most highly visible. Where outward conditions were a truer reflection of fundamental health, they allowed a more accurate reading. Therefore, though the underlying structural forces operating in North Carolina's and Ohio's economies are the same, North Carolinians have had the more accurate picture of the state of their state's economy.

In the last chapter, economic and demographic data were presented showing that historically North Carolina has been below national averages by most indicators of economic strength while Ohio has been ahead of them. In spite of Ohio's historically visible prosperity, however, there are, in retrospect, indicators that the downhill trend was in effect early in the post-World War II period. Manufacturing, which has been the source of Ohio's strength, peaked in number of jobs in 1969, but by 1982 had lost 400,000 jobs. Underlying the losses were both increased foreign
competition, and newer technologies which were independent of the state's fixed raw materials as a situational factor in location.

Looking at trends over the period 1950 through 1980, the labor force in Ohio grew faster than the national average until the mid 1960s when it began to dip below; unemployment outpaced national averages in each decade; gross product has been below national averages since the 1960s; per capita income was on a sliding trend since the 1950s and slipped below the national average by 1980; and average annual population growth declined steadily from 2 percent in the 1950s to .1 percent by the 1980s.

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**Figure 1. Unemployment Trends in Ohio and US, 1950-1980**

Ohio -----
US ------

Source: State of Ohio, Toward a Working Ohio: A Strategic Plan for the Eighties and Beyond, 1983
Figure 2. Gross national and State Product, 1960-1980.

Ohio -----
US ______

Source: Ohio Department of Development Data Users Center. Reported in State of Ohio, Toward a Working Ohio, A Strategic Plan for the Eighties and Beyond, 1983.

Figure 3. Ohio Per Capita Income Performance as a percent of U.S. Totals 1950-1980.

Source: U.S. Bureau of the Census
Figure 4. Average Annual Percentage Growth in Population, Ohio and U.S., 1950-1980

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Though the structural changes were operating all along, they were not readily apparent. And even by the late 1970s, when the underlying economic problems were clearly manifested in the indicators listed, revitalization efforts were centered around recruiting the large industries which had accounted for Ohio's prosperity with no attention to advanced technologies or to revitalization from within. The major shift of focus came in 1983 with the change in administration.

[T]he major effort should be on the existing facilities, or on the . . . entities that are here. . . . That was one thing that Governor Rhodes didn't even give lip-service to.
But though the changes which are regarded as necessary for redirecting growth trends in Ohio are regarded as significant breaks from the past, relatively speaking, the changes are not as radical as those required in North Carolina. In Ohio, the perception is that we are building on strengths, both of the region and of the state.

The fancy word today is computers and high-tech and all those buzz-words. There is still, and I'm sure always will be, a preponderance of major industry in the Great Lakes area. For one reason, we are blessed with the largest supply of fresh water in the United States... probably the finest transportation system of any state... probably the largest trained labor force in the United States; tool and die makers... , an awfully fine cross-section of skilled labor in the state... by virtue of the types of industries we have here.

North Carolina, which had attracted low-wage industries in its relatively late drive to industrialize, recognized its need to diversify to higher wage industries to be competitive after World War II. In contrast to Ohio, the state had an early objective view of its economic health and moved to undertake structural changes as a corrective measure.

North Carolina had traditionally been... heavily dependent upon agriculture--more than any other state. ... Mechanization on the farm was, in effect, an industrial revolution in North Carolina, and we suddenly had thousands of North Carolinians who needed job[s]... [O]ne thing we talk a lot about right now is "Hey, how are we going to provide job opportunities for the citizens of North Carolina in the 1990s with the changes that we see... Here we spent all this time getting textiles, apparell, furniture in North Carolina--very labor intensive. Now the job opportunities are not there as they once were. So we're almost back in that same cycle. But, there has been a concern of "How do we find job opportunities for
our people?" in North Carolina for a long period of time.

The time differential in the evolution of intersectoral relationships which developed in North Carolina and Ohio since the end of the Second World War illustrates that the level of prosperity was a significant factor in the ability of the states to read signals indicating structural changes in the environment to which they would have to adapt for survival. The research results show the impact of differences in levels of prosperity on the patterns of intersectoral relations adopted.

Assessing Economic Conditions; Adjusting to Environmental Constraints on Intersectoral Relations

The ecological perspective of social change reviewed in Chapter II outlines a three-part process of organizational learning in adjustment to environmental constraints: (1) alternative actions in the pursuit of goal attainment are tried, (2) successful ones are adopted and emulated by others, and (3) unsuccessful ones are ignored or discarded from the range of alternatives. Adaptive systems are those which, through automatic feedback processes, are able to make the automatic adjustments necessary to maintain their essential variables within limits required for survival. Over the three decades from 1950 through 1980, fundamentally different patterns of intersectoral relations developed in North Carolina and Ohio. The patterns of interaction between the sectors are reflections of the clarity
with which feedback processes were signaling changes in the environment to which the system would be required to respond for survival.

In North Carolina, the years immediately following World War II (1) signaled the need to diversify the economic base to become competitive with other industrialized states, and (2) showed the low level of ready resources to attract outside industries. The lack of resources required intersectoral cooperation as a condition of moving toward a more competitive condition. The environmental condition provided fertile ground for a concept. The origin of collaborative efforts which serve as a foundation for those characteristics in North Carolina today are attributed, by most observers to the administration of Governor Luther Hodges in the mid and late 1950s. Three initiatives designed to accommodate industry stand out as influences on later collaborative efforts: (1) the Industrial Extension Service, (2) the New and Expanding Industries Program, and (3) the Research Triangle Park.

In 1955, the North Carolina state legislature established the Engineering Experiment Station as an applied research extension of the faculty of the University of North Carolina School of Engineering to develop the state's natural resources and to extend that capability to business and industry as a means of promoting industrialization. The name was changed to the Industrial Extension Service in
the 1960s and engineers were made available to industry and to local governments to respond to inquiries to establish programs and to assimilate other expertise of the state for its use. The Service's emphasis has evolved over the years from serving primarily as an intermediary between regulatory agencies, such as the Federal Occupational Health and Safety Administration and private industry in the 1960s, to its emphasis in the 1980s on technological applications, such as computer assisted design and computer assisted manufacturing (cad/cam) to private industry.

The New and Expanding Industries Program--North Carolina's customized training program--was started in 1957 as a part of the economic package to accommodate the specific training needs of firms relocating to the state. The program is operated by the Industry Services Division of the North Carolina Department of Community Colleges. It was designed to determine the specific skills a company would need upon relocation, and to provide, through short-term training programs in the community colleges and technical institutes, a full complement of trained employees by a date targeted for the company to begin operation. The program operates in close cooperation with the State Department of Commerce in the identification and servicing of client firms. In a collaborative arrangement, called 'twinning,' with Commerce's Regional Development Staff, seven joint field offices covering the entire geographic
area of the state are operated, providing such client services as dispensing information and permits needed by new and expanding firms. The customized training concept was pioneered in North Carolina and has since been adopted by nearly all other states.

The development from the Hodges period which has exerted the greatest influence on later collaborative patterns between government, education, and industry in North Carolina is the Research Triangle Park. The Triangle Park is significant in that it is a planned development that incorporates and improves upon principles embodied in emergent forms of interaction that developed more spontaneously in California and Massachusetts. A study by the Joint Economic Committee of the U.S. Congress (1982) compares its development to that of other research parks.

The most outstanding models of advanced technological growth prior to the Research Triangle Park were those that occurred in the now widely-known Silicon Valley, as Santa Clara County, California has come to be called, and along Route 128 in Boston, Massachusetts. The developments in these areas have at least three factors in common: (1) they were both generated from technologies—particularly electronics—that were well-established in their respective states years prior to World War II; (2) both were generated from long, symbiotic relationships between entrepreneurs and established research universities in the areas—
Stanford in California, and Massachusetts Institute of Technology and Harvard in Massachusetts; and (3) growth was fueled by infusions of military spending for research and development—especially during World War II, but also followed by the Korean War. The release of pent up consumer demand allowed for rapid business growth in the postwar period.

North Carolina, by contrast, had no history of development in advanced technologies, no interplay between research university and indigenous entrepreneurial group, nor any magnet for government funding. Rather, the Research Triangle Park, from the beginning, was based on a concept—namely, that the combined efforts of three universities in the triangle formed by Raleigh, Durham, and Chapel Hill could pool resources to support scientific research as a way of attracting research-based industries and diversifying from the state's low wage traditional industries.

The concept, developed during the 1940s and 1950s, was acted upon by Governor Hodges, who, along with a state bank president and the state treasurer, incorporated the Research Triangle Committee in 1958. Land was then assembled for a research park, funds were raised from state sources to begin operations, and the original Committee became the Research Triangle Foundation. The Research Triangle Institute was formed as a separately operated
affiliate by the three universities as a research resource for government and private industry. The Park opened officially in 1959.

The Research Triangle Park, located on 5500 acres of wooded land in a campus-like setting, as of December 1983 was the largest planned research center in the world. Planned development has allowed the Park and Triangle area to avoid many of the problems of uncontrolled growth that occurred in Boston and Santa Clara County. In the Triangle area, growth and development has occurred within stringent guidelines controlling such factors as distance between buildings, lot sizes, landscaping, and noise. It is committed to research and has maintained a diversified industry mix by refusing to allow domination by a single industry.

In Ohio, typical of the other heavy industrialized states, there was a perception of unlimited economic expansion during and following the two world wars. Manufacturing was the dominant force, and "the boom economy never stopped despite the pressure of short-run recessions. What is more, it has been observed that it was almost impossible to fail in those post-war years so eager was society for new products..." (Hunker, 1972). Industry profits were sufficiently high to grant demands to unionized workers to avert strikes, though basically adversarial union-management relations continued (Easterbrooke, 1983). Among
education, industry, and government, there was no pressure for joining ranks; rather, the level of slack resources afforded each sector the freedom to operate independently. The level of prosperity acted as a source of interference in the reading of feedback information signaling the need to change.

In the late 1970s, when it was becoming clear to some that the economic downturn which the state was experiencing was more fundamental than one of the normal cyclical changes, the nature of intersectoral relations in Ohio began to change to address different aspects of the crisis. The perception of a need for a change in relations had not yet occurred in the governor's office; rather the first efforts at collaborative relations were in different facets of the educational sector. In 1976, the Ohio Department of Education assembled a group of twenty top industrialists in the state, the Committee of Twenty, to examine and recommend changes in the method of school funding.

In 1978, the Ohio Technology Transfer Organization was begun as an experimental collaborative program between Ohio's two-year post secondary technical institutes and community colleges, and The Ohio State University, with funding from the Ohio Board of Regents, to transfer information already developed in a variety of technical fields to business and industry users. The program's role in technology transfer is similar in concept to that of North
Carolina's Industrial Extension Service.

The Division of Vocational Education in Ohio's Department of Education, in collaboration with Ohio's Department of Economic and Community Development (now the Ohio Department of Development) initiated the state's customized training program in 1979. The program is based on the concept originated in North Carolina for attracting industry into the state, and represents the first collaborative involvement between the state's economic development arm and the education sector.

Beginning in 1980, several moves were made within the education sector to address the consequences of long standing independent operations at the secondary and post secondary levels. In September of that year, recognizing the need to address the slide in academic competence of entering college and university students, the Ohio Board of Education and the Ohio Board of Regents jointly appointed a fifteen-member Advisory Commission on Articulation Between Secondary Education and Ohio Colleges charged with developing uniform admissions criteria to the public and private four-year institutions. An Advisory Council for College Preparatory Education was also appointed to implement and provide the necessary follow-up on the Commission's recommendation.

The Regents and the Board of Education came together again in 1982 to establish a Joint Commission on Vocational
and Technical Education to address problems of duplication between the two levels in addressing the adult population. Since that time, a Blue Ribbon Committee on Vocational Education has been established to add a stronger academic component to the vocational education program.

Leadership in the promotion and formation of collaborative relationships among the sectors from the Governor's level in Ohio, however, took place only with the change in state administrations in 1983. Relations under the new administration contrasted sharply with those immediately preceding the change.

The relationship between my office and the governor's office was . . . a direct working relationship. . . . The Celeste administration . . . is more committed to the development of a strategic plan that would encompass all of the agencies of state government in delivering . . . services. . . . In that, we have more linkages beyond the Superintendent. In other words, people in our agencies work on a more direct basis than during the Rhodes administration because of that structure. . . . [T]he difference is in the development of a coordinated plan for the delivery of state services through the Cabinet Cluster concept.

Under the previous administration, the tone for a fractionalized and highly independent approach was established from the top. As effort intensified to recruit private industry in the face of declining economic conditions in the state, the highly personalized, and independent approach became more apparent.

Under the Rhodes Administration, particularly his last term, we in essence had three different state development groups. . . . Rhodes was very much development oriented, and he had his particular core group of
industries that he worked with individually. [T]he Director of the Development Department . . . had his own individual little core group that he worked with. Then what neither one of them wanted or knew about, the Development Department handled. . . . [The] last four years was a very splintered type of effort. Now, under Celeste, there seems to be a more concentrated, more definitive effort. . . .

North Carolina's and Ohio's differential perceptions of the fundamental nature of their economic problems allowed North Carolina at least a twenty-five year lead in experience in the development of collaborative relations at the state level. In Ohio, the changing frequency distribution in those who held the opinion that new forms of interaction were called for, first became manifested in collaborative forms in the educational sector and culminated in the selection of a new administration in 1983 that espoused development policies based on emergent organizational forms. The next section takes a closer look at the constraining influence of the environment on the process of change in the two states.

Social Change: The Impact of Environmental Constraints on Patterns of Interaction Among the Sectors

It was already suggested in the section on Natural Selection vs. Strategic Choice (pp. 162-164) that the similarities in form in collaborative relations provide some indication of the constraining influence of the environment on strategic choice. The suggestion is reinforced by a focus on the processes of change showing international and national influences acting to constrain choice within
environmentally established parameters. The different patterns of interaction which characterized the two states in the post-World War II decades began to converge in the late 1970s. The patterns in four areas—(1) customized training, (2) ties within the educational sector, (3) union management relations, and (4) small business development—suggest that the cost of independence among the sectors was becoming prohibitive.

First, the customized training concept was pioneered in North Carolina as a means of allowing greater competition with the more richly endowed industrial states for the attraction of private industry. The program combined education and development efforts to tailor training to the specific needs of the firm rather than to more general needs of industries as in more independent approaches. Moreover, the technical institutes in the area which offered the initial training became tied more closely to the incoming firms by offering to adjust curricula to accommodate their continuing training needs.

Over the two decades which elapsed between the initiation of the concept in North Carolina in 1957 and its adoption by Ohio in 1959, its success had been demonstrated and it had been widely adopted by other states. Ohio felt compelled to adopt it to remain competitive.

The perception of that need included the fact that other states were doing it, and many other states had been involved in similar efforts for some time, namely
North and South Carolina—kind of identified as the first—North Carolina even preceding South Carolina... .

A second illustration of the environment forcing convergence in patterns of interaction can be seen in the intrasectoral collaborative moves in education. There has been increasing attention focused on the relevance of the nation's public schools to the country's productivity and its economic performance in international markets. The increased recognition of the links are forcing a number of new ties among various facets and levels within the education sector. For example, the tradition of independent operation in education at the secondary and postsecondary levels had the rippling effect of poor academic performance in colleges and universities and poor work performance on the job. But, it also had the effect of increasing the costs to higher educational institutions for providing remedial coursework.

In response to the growing costs to all parties, both states have felt it necessary to establish ongoing mechanisms for secondary-postsecondary articulation.

Historically, the Ohio Board of Regents and the Ohio Department of Education have never done any work together, which is a comment, I think, on maybe why schools and colleges have not done much work together. But, we decided to put together a Commission on Articulation... . That was in 1981, and since that time, there have been significant changes in higher education and secondary education in Ohio... .

Moreover, the clarification of the implications for business and industry have prompted their direct involvement
throughout the educational process in both states. The Advisory Council for College Preparatory Education in Ohio and the Quality Assurance Program in North Carolina provide ongoing ties to coordinate secondary-postsecondary programming.

A second facet of this convergence is in the softening or blurring of the traditionally sharp lines of demarcation between academic and vocational education. Again, the pressure of international competition is forcing the trend. For example, the Governor's Task Force on Science and Technology (1983) in North Carolina makes the following observation:

[1]f the U.S. textile industry is to remain internationally competitive, . . . [it] must not only watch mistakes in production, but also eliminate the potential for mistakes. The U.S. textile industry produces about 20,000 defective parts per million compared to only 1000 ppm in Japan.

The Japanese have achieved this remarkable level of quality and productivity largely through the application of statistical quality control methods. In Japan, statistical methods and techniques are understood and used by a large number of foremen who are elementary and secondary school graduates. By contrast, in the United States we consider ourselves fortunate when managers that have graduated from universities with technical degrees show an understanding of the theory and principles of statistics, and use those principles in their industrial work.

In both states, two significant trends are evident: (1) large numbers of graduates from four-year colleges and universities are enrolling in two-year technical institutes to gain skills to become employable; and (2) the vocational/technical divisions are beginning to include more
academic content in their programs. Again, the Governor's
Task Force on Science and Technology (1983) states that

Perhaps of even more economic importance than scientists and engineers is the availability of manpower for
jobs as technicians and skilled labor. . . . An increasing percentage of high school graduates who have
mastered the basic concepts and skills in science and mathematics must be produced by our public schools if
the technical and community colleges are to effectively meet the labor demands of our technological growth.

And, from the business community, the following statement:

[W]e're going to be taking what used to be just a
technical hands-on type of training and looking now at
a very thorough understanding and training in the over-
all math and science area . . . as opposed to just
strictly working with a piece of equipment. Our com-
panies say that's a real problem. . . . [T]hey can
train many of the people once they do have a basic
understanding of math and science.

In Ohio, the Board of Regents' and the Board of
Education's joint appointment of a Blue Ribbon Committee to
add a stronger academic component to vocational education
is an indication of that need. In addition, eight model
programs were in operation as of April, 1984, with further
recommendations due in June, 1984.

A third indicator of environmental influences is that
the two states, starting from diametrically opposed orien-
tations--non-union in North Carolina and heavily unionized
in Ohio--are being moved to convergence at a more middle
ground of encouraging union-management cooperation with
greater worker participation as a means of increasing pro-
ductivity.
North Carolina . . . is a "right-to-work" state. But, we have, within . . . Small Business Programs, a mechanism that would allow a small company . . . [to keep] abreast of technological [and other related] changes, . . . for example, on quality circles . . . we have annual seminars. . . . [We have] an international authority on productivity, by the way, [who] is readily available to us on almost a moments' notice.

Ohio has addressed the problem by establishing an Office of Labor-Management Cooperation to encourage within firms around the state adoption of proven successful models. The program will work in close collaboration with the Center for Labor-Management Cooperation established at The Ohio State University to perform research on models of cooperation on a world-wide scope.

A fourth area of convergence in state programs is in the move from reliance on the recruitment of large firms into the state as the primary strategy for economic growth to strategies concentrating on growth from within through entrepreneurship as the focal effort. The structural economic changes that became manifested in the latter half of the 1970s demonstrated two weaknesses with respect to giant firms (1) the high mobility of branch operations of multinational corporations, and (2) the high vulnerability of the states' economies to domination by a few traditional industries.

The plant closings and job displacement in Ohio's traditional industries--automobiles, steel, and rubber--are already well documented. But, in 1982 in North Carolina, 10,000 textile workers were unemployed, and the state had
more plant closings than any other state in the nation.

Another factor in the shift is the increased information research on the role of small businesses in the resilience of a state's economy. Economic development documents in both states refer to the research of David Birch from the Massachusetts Institute of Technology. It has been found that small businesses tend to be (1) the major source of employment, (2) more firmly rooted in communities than larger firms, (3) more insulated from national and international economic fluctuations, and (4) major sources of innovation. Both states have, therefore, placed major resources in providing elaborate financial, informational, and managerial infrastructures for fostering entrepreneurial growth. And both states have based a large part of their designs on the Small Business Innovative Research model.

To this point, Chapter V has looked at environmental constraints that have acted to influence movement in interactions between state-level sectors toward collaboration. In each of the areas of convergence, the system will no longer allow a high degree of independence if the state is to function at a high level. In the next section, relationships between strategic choice and environmental constraints are explored.
Forms and Values: Shaping Patterns of Interaction

The movement in North Carolina and Ohio from divergent patterns of interaction among state government, education, and industry sectors in the 1950s, to convergence by the 1980s, suggests the imposition of environmental constraints on forms and processes. Yet differences in operation also show room for choice. This section focuses on the interaction between environment and strategic choice in the adoption of collaborative forms. Collaborative patterns in the two states are distinguished in ways that suggest that beyond similarities in form, there are differences in the degree to which principles underlying the forms are internalized.

Looking at patterns in the adoption of collaborative forms in North Carolina and Ohio, two forms can be distinguished that may account for differences in operation: (1) collaboration through diffusion and (2) collaboration from principles. Greenfield and Strickon (1981), using an ecological perspective, point out the tendency for large numbers of individuals seeking similar goals to emulate without reflection, patterns proven successful. The variations in patterns are those which seek different alternatives to goal attainment. The same principle is applied here to groups of organizations. While the two patterns of collaboration are not mutually exclusive, one may exist without the other.
The adoption of collaborative forms in North Carolina in the 1950s was based on innovative ideas for overcoming shortages in resources. The success of those collaborative forms over time spurred other collaborative developments in North Carolina, and established the customized training model and the planned research park as models to be widely emulated by other states. Those developments and particularly the Research Triangle Park are regarded by North Carolinians as embodying the principles upon which inter-sectoral relations in the state are based.

The university-government industry situation started here twenty-five years ago. It's very natural for us. We don't even second guess the concept of working with our state government, Department of Commerce or others when they're recruiting industries.

The Luther Hodges mentality of twenty-five years ago just simply says we ought to be four or five years ahead of . . . the mainstream. . . . [W]e recognize that we're a poor state and . . . that we don't have the resources that many other states have. There[for] you've got to work a little smarter and a little harder.

Working from the principles of collaboration, joint efforts in North Carolina distinguish themselves in several ways: (1) they tend to be highly innovative with many conceptual firsts—e.g. customized training, the Research Triangle Park, the North Carolina School for Science and Mathematics, the Microelectronics Center and Biotechnology Center, and the University Place development (designed to integrate residential space, research park, and university); (2) a number are based on informal
relationships between department heads—e.g., Industrial Extension Service Commerce, New and Expanding Industries Program and Commerce, and the North Carolina Council on Technical and Managerial Service; and (3) they tend to be highly reciprocal relationships—i.e., based on mutual control of the conditions of collaboration by otherwise autonomous organizations.

By the time Ohio established its collaborative programs, several models were already in existence which could be drawn on. While the effectiveness of collaborative forms had been demonstrated and could be recognized as an effective organizational mode, the same internalization of principles which impelled cooperation out of a need to increase resources was not required. The observations are reinforced by examples of traditionally bureaucratic responses to organizational problems. The Department of Development controls in customized training and technology transfer have already been mentioned. Another illustration was the Governor's proposal to centralize education under one department upon assuming office; this stands in sharp contrast to North Carolina's creating an independent Community Colleges Department.

The patterns in the two states show that though the environment may impose constraints upon organizational form, strategic choices may differ within those constraints. Strategic choices also may act to change the
environment which in turn reacts to further constrain choice. A case in point is the wide adoption of customized training by the states such that Ohio felt constrained to adopt it.

SUMMARY OF FINDINGS, PART II

Research Question #2

How have mechanisms and forms of interaction between state-level government, education, and industry sectors in North Carolina and Ohio varied with changing environmental conditions?

(a) Similarities in collaborative forms adopted by North Carolina and Ohio were in response to environmental constraints on similarities in economic structures.

(b) Differences in time of adoption of collaborative forms were the results of differences in ability to perceive fundamental economic changes taking place in the post World War II period: (1) slack resources in Ohio obscured signals of structural change; and (2) the lack of resources in North Carolina drew attention to structural changes taking place.

(c) Differences in degree of internalization of principles of collaboration resulted from differences in resource constraints influencing
sectors toward cooperation: (1) slack resources in Ohio afforded government, education, and industry the freedom to operate independently; and (2) lack of resources in North Carolina required cooperation to operate at a competitive level.

(d) The general convergence from traditional independent to collaborative forms of interaction among the sectors beginning in the 1950s in North Carolina, and in the late 1970s/early 1980s in Ohio—the time of their perceptions of structural changes—suggests the imposition of environmental constraints on strategic choice of forms of intersectoral relations.

(e) The process of diffusion of particular models of interaction developed by the states suggests that environments are products of strategic choices which constrain further choices as operational requirements necessary for viability become higher.
CHAPTER VI

RESULTS OF THE STUDY, PART III:
PERCEPTIONS OF BARRIERS AND FACILITATORS TO
COLLABORATION IN NORTH CAROLINA AND OHIO

The results of the research presented in Chapter V focused on factors affecting the transition from traditional to collaborative forms of government-education-industry interaction in North Carolina and Ohio. The results suggest that whereas environmental factors brought about a convergence in forms and processes of interaction among the sectors over time, the historical differences in resource levels influenced subtle but fundamental differences in strategies for implementation of new collaborative forms.

This chapter focuses on the third research question: What factors do government, education, and industry sectors perceive to be barriers and facilitators to collaborative efforts in the two states? All perceptions of barriers and facilitators from interviews in the two states are included in the results, and are grouped into four categories of factors: (1) bureaucratic, (2) participatory, (3) institutional, and (4) resource. They are presented as follows:
first, perceptions of barriers and facilitators in the four categories common to both states; second, a summary of the barriers and facilitators from the four categories; third, those factors which stand out as differences between the two states; and finally, a summary of the research findings from Chapter VI.

Perceptions of Bureaucratic Factors as Barriers and Facilitators to Collaboration

Table 8 shows categories of barriers and facilitators and the general sources of observations. Bureaucratic barriers to collaboration were pointed to as factors in (1) time and financial losses, and (2) constraints on effective program operation resulting from the series of steps or regulations required under standard operating procedures. Examples from both states point to bureaucratic processes as problems for internal operations as well as impediments to intersectoral activity. Paperwork and delays in government funding for industry training programs, for instance, have driven education, industry, and government further apart.

To get involved with any funds—even five dollars worth of funds to train twenty-five people out there—. . . takes three months to get that kind of money approved, with so many controls on them. . . . Each time we get involved with a government agency, we run into this kind of problem. . . . Until government gets off that Mickey Mouse paperwork, and all of that monitoring. . . . the institutions aren't going to want to be involved.

Some of these applications for a training program for a given industry have taken up to a hundred days to
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<td>Participatory Factors</td>
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<td>o Exclusion from planning</td>
<td>o Avenues for local/regional participation</td>
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**FACTOR CATEGORIES AND SUB CATEGORIES**

- **BARRIERS**
  - Conflict over domain
  - Conflict over resources
  - Status perspectives
  - Style and time perspectives
  - Lack of information
  - Lack of accommodative structures/devices
  - Provision of incentive for coordination
  - Neutral chair/honest broker
  - Gov. mandate (or dept. head)
  - Ground rules for openness in meetings
  - Demonstrated success

- **FACILITATORS**
  - Paid linkage positions
  - Commitment from top
  - Short agenda
  - Flexible site service provisions
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Categories and subcategories of perceived barriers and facilitators to collaboration in North Carolina and Ohio. GOVNR = Governor's Office, represented in North Carolina by the N.C. Board of Science and Technology; DEV = Ohio Department of Development N.C. Department of Commerce; K-12 = Oh. Department of Education, N.C. Department of Education; S-V = Secondary Vocational; 2-YR = N.C. Department of Community Colleges and Ohio Board of Regents; and 4 YR = Board of Governors, University of N.C. System, and Ohio Board of Regents.
be implemented. . . . It's difficult to explain to a
president of an industry out there, "Yes, we will set
up a training program for your employees, but you'll
have to understand that it might take us a hundred
days to get permission to do it." Your credibility
and everything goes right down the tubes. . . .

In some instances, the response time required for a
request for assistance precludes an operation's use of
system resources.

Just the weight of the bureaucracy [hinders
relationships]. . . . I'm talking about the univers-
sity system . . . or state government or the Depart-
ment of Public Instruction--and this is not to be
negative about the people who work there--but they
have a great body of law, great relations and poli-
cies that just move very ponderously, and sometimes
it's difficult to cut through in a way that they can
respond to an overture I might make, where we need
their help. [T]heir interaction just takes too much
time.

In other cases, regulations prevent sharing resources
between different units in the same sector, and reliance on
external sources is the only alternative.

There's been an extreme amount of cooperation; yet,
there is a policy hinderance here. They can't pay us
to do the job, and we have to collect the money or we
can't pay the people who do the job for us. There
has to be some change in policy that would allow a
local community college to pay us to put on a work-
shop in their . . . operation. . . . [I]n many
cases, they have to go out and find somebody to
develop a program . . . and we've got it right here
waiting for them. So there needs to be a way to
handle financial purchases from one department to
another. . . .

Bureaucratic operations were also perceived as stunting
personal growth.

Most state employees don't have [the] luxury [of
becoming professional]. They're too busy pushing
paper.
Measures identified as facilitating the removal of bureaucratic barriers can be grouped into three categories as follows: (1) intervention, (2) redesign, and (3) removal. The first of these, intervention, involves a person in authority using the power of office to circumvent or otherwise expedite the normal bureaucratic process. Another form is intervention to shield a party in an interorganizational relationship from the work associated with the process. In training programs, for example, service providers in the education sector have established mechanisms to protect the business community from the required reports.

Sometimes for big projects, we have . . . an onsite coordinator, a person we hire on our payroll, put them right at the plant site to do all the paperwork.

The second category involves redesign to simplify the process. The recent movement to collaborative forms in Ohio, for example, has called attention to the necessity of simplifying the approval and funding process by state government for training contracts between education and private industry.

The third category, removal, involves freeing an operation from normal departmental control through such mechanisms as outside consultants, independent commissions, or other special legislative arrangements to allow autonomy of operation. A characteristic of the joint programs which are products of collaborative systems is their removal from regular departmental operations. The North
Carolina School for Science and Mathematics, the Microelectronics Center of North Carolina, the North Carolina Biotechnology Center, and the proposed incubator facilities for nurturing start-up enterprises are examples in North Carolina; the proposed Advanced Technology Attraction Centers are examples in Ohio. Under the arrangements, regulations, pay scales, and staffing criteria allow operation independent of normal state processes.

Perceptions of Participatory Factors as Barriers and Facilitators to Collaboration

Participatory factors were identified as barriers to collaborative development at both the strategic planning level and at the level of program operation. At the strategic level, problems were seen as resulting from exclusion, and an unequal representation in the policy process. These problems were reflected in perceptions of lack of autonomy and inequality among the sectors at the level of operations.

Differential access to an influence in the legislature have been viewed as means of excluding sectors or components of sectors from the policy process and thus as barriers to collaboration. By moving policy proposals through the legislature rather than first through collaborative processes with the involvement of the affected parties, the practice fails to generate the discussion necessary to provide a holistic view of the potential
operational consequences. It has been perceived as resulting in a number of practical problems in the two states. One has been a proliferation of service providers with insufficient detail to coordination.

What tends to happen . . . is that if a new service is needed, and no one is doing it, then a new organization is created to deliver it as opposed to bringing together the delivery mechanisms. . . . What we have is various people running to try to develop with a legislator, or a committee in the legislature a service or a proposal that would develop a new service. . . . I'm not sure I understand how to prevent this because the politics are there.

A second consequence has been the complication of procedures causing delays in service delivery.

The money is funneled into [the] office and then . . . transfer[red] . . . for administration. We didn't intend for that to happen. [It] was a lobbyist . . . that got that to happen. [N]ow we're going through a very complex contract process.

A third problem has been a low level of congruence between sector and function in program delivery.

The legislature put [it] into our budget. . . . I have a sense that once it's evaluated, . . . then it should rightfully go to the Department. . . . In fact, there are some people questioning why it ended up [here] to begin with.

Another means of exclusion cited is the assumption of unilateral prerogatives in policy development by a sector in areas perceived to fall within its functional domain. In such instances, the impact on other sectors is ignored.

We have some very strong thoughts about . . . the processes and procedures. Typically, they have designed the program and then gotten it through whether anyone else is on board or not.
Another barrier to collaboration was seen to lie in the unevenness with which the interests of geographic regions of the state are reflected in development policies and projects. The perception of bias becomes a potential problem in that it can result in the inability to gain needed legislative support for collaborative projects.

Many individuals in the Legislature, especially from the eastern and western parts of the state, don't feel that we're really going to benefit their parts of the state. . . . Because we have received some opposition, we haven't received as much money as we really need.

Three general principles of organization were regarded as necessary for observation in developing processes to facilitate collaborative efforts among the sectors: (1) autonomy, or freedom from state control in the provision of services; (2) coordination at the state level with wide participation by the various sectors; and (3) the inclusion of wide geographic representation in the policy process.

There isn't anything wrong with having programs established under the state and having institutions participate in them; but for the state to become more heavily involved in control of . . . education will destroy education.

I'm being a bit proprietary, [but] I feel that the schools . . . should have most of those . . . type programs in its charge. The Department of Commerce seems a natural to coordinate a lot of these activities. [I]t's not really providing many services. . . . [I]t's more of a coordinator of those services.

We need more formality . . . a more structured kind of an organization so long as it didn't become so powerful . . . that it controlled all of the delivery
mechanisms.

[The] first thing I'd do is have a council of some kind, advisory to the Governor that's not in the hands of any one particular agency. . . . And several agencies should be represented . . . a whole variety of sectors, but not so large that it's unwieldy and unproductive. Second thing . . . is get the best data base possible, not only on what the State represents, but what the cities--Cincinnati . . . Cleveland . . . Cambridge--represent so that you know exactly what it is that should be on it.

The Governor has supported a balanced growth policy in North Carolina to decentralize growth throughout the state, and I think this effort needs to be taken a step further in the future . . . to make sure efforts similar to those made in the Triangle . . . take place in other parts of North Carolina as well.

Perceptions of Institutional Factors as Barriers and Facilitators to Collaboration

A number of institutionalized perceptions of differences among the sectors serve to create guls that require efforts beyond the removal of more formalized barriers. Institutional barriers were seen as resulting, first, from perceptions of conflicting interests—generally those involving concerns over (a) "turf" or domain of services, and (b) resources; and, second, status perceptions and time and style differences leading to (a) lack of information or (b) difficulty of adjusting individualized practices to ones of mutual accommodation.

Perceptions in North Carolina and Ohio suggest that turf and resource considerations are potentially problematic at other than initial stages in the development of collaborative systems. In Ohio's move from traditional to
collaborative relations, there is the perception that those at the director level in agencies feel constrained in fully discussing issues which confront them because of anxiety over possible program losses.

We worked very well together because we could discuss issues—we could put really absurd things on the table, talk about them and remove ourselves from that stake we have in our meetings. That's very difficult for the top person. . . [Y]ou get the top directors of all the agencies together and they've got a stake in the whole agency behind them. So, if there's a particular program that they're likely to lose a lot of money on, or for instance, if it's reshuffled—put under another agency. There are just a lot of things at stake when they sit down and negotiate.

In North Carolina with a longer history of collaboration, there is uneasiness over the proliferation of new programs without coming together to coordinate existing efforts.

I think in North Carolina we are evolving into a lot of providers, and in some cases it is not as effective as it would be to pull together some of the providers. There's this turf kind of a thing—once you get started you want to preserve your own organization—that we see building.

Another set of institutional barriers are not directly related to anxieties over turf and resources, but rather to differences in such factors as status perceptions and style and time perspectives. In education, perceptions of status differentials have been a significant factor in articulation problems between vocational/technical and four-year academic divisions; both status perception and time and style differences operate across public/private lines as barriers to linking government and education to
private industry.

Your institutions of higher learning sort of frown on vo-education.

[1]n some meetings, the superintendents, community college presidents weren't showing up. They were sending other representatives. [T]he business community . . . said, "You want us to come CEO (chief executive officer) level but you're too busy. . . ." I've sat with a group of decision [makers] in one meeting where it would take second and third party people ten meetings to make that decision.

Thus, little attention has been given to the development of information channels or access points required for collaboration.

In the educational institutions, it's very difficult to locate a person with the expertise. if a company needs something . . . its very difficult for them to break through this big maze to find out who it is who can help. Most of them aren't willing to make ten phone calls to find out. So colleges need to better advertise what they have.

Perceptions of facilitators for overcoming institutional barriers to collaboration can be categorized into (1) mechanical measures which include principles for organizing and meeting, and positions or devices to increase contact or accessibility; and (2) personal factors which include qualities skills and attitudes. Some facilitators were regarded as applicable to a given institutional problem while others were considered applicable to the whole range.

For barriers related to resource or turf conflicts, measures which served to engender trust or to neutralize meetings, for example, by choice of chairperson, or
establishment of ground rules prior to meeting. Facilitators applicable to status barriers mostly were seen as involving personal factors such as attitude adjustments for taking the initiative to cross invisible barriers. To overcome style and time differences, mechanical measures such as adjustments in meeting schedules and agendas were regarded as facilitators.

Applicable to barriers in all categories was the development of incentives for encouraging increased contact or accessibility between the sectors.

The most important factor in all cases for breaking down institutional barriers was seen as the commitment to collaboration in leadership positions; and the most influential person was regarded as the governor.

My own personal view is that it [movement toward collaboration] has to come from the person at the top. If that's what the Governor wants, he must step forward and say, "We're all going to work together." Otherwise things will go on as usual. If somebody wants to change the status quo, they've either got to shake from behind... or get out in front and say "This is where we're going to go, troops," and the Governor does both.

I don't think they're going to do it voluntarily. . . . It's going to take some political entity—the Governor—saying, "Get in and attend the meetings."

Governor Hodges certainly had the ability to bring together business . . ., education leaders, and of course state government, and to orchestrate . . . efforts for the benefit of the people of North Carolina. . . . Now it just sort of seems natural.
Perceptions of Resource Factors as Barriers and Facilitators to Collaboration

Resource factors that affect collaboration were cited mainly in the context of education-industry relations. Resource barriers can be categorized into human and financial factors which threaten education's capacity to fulfill the role which provides the basis for its relationship with private industry—the major supplier of appropriately educated skills for research and industrial productivity. The most prominent human resource problem is the shortage of qualified teachers and instructors. Teacher shortages are attributed to problems of (1) preparation, (2) currency, (3) environment, and (4) pay.

While preparation refers to problems of inadequate education, and is more of an individualized problem, currency is applied more generally to the inability of the system to provide opportunities for teachers to stay abreast of technological changes within industry.

But to do that it's going to take resources. Primarily the resource is money, because when you take an instructor out of the classroom for a week, you have to put one in there, and you've got to have funds to pay whoever goes in there while this one's gone. . . . I just wrote a proposal last week to send fifty instructors back to industry next year. . . . To send that one hundred instructors would cost an estimated $300,000. A hundred instructors is not even two instructors per institution in our system. So you see, we wouldn't even be touching the surface by sending two, because when you're talking about 227 different curricular programs offered in 1500-1600 different locations, that's a tremendous undertaking.
Environmental factors, such as teaching loads and committee pressures at the university level, and crowding, disciplinary and community differences at the elementary level were cited as factors in such preferences as academic freedom and love of learning having been deferred to higher pay outside of teaching, for many.

We had tremendous growth in engineering education in terms of student population for the last ten years. We're just bursting at the seams. . . . And yet there's been little growth in the staff to teach that population. There's been almost no . . . major investments in engineering education on some campuses, no buildings, no equipment, no staff. . . . [G]iven the faculty that we need, there is a shortage projected both for those we ought to have to help teach, and also for those positions we currently occupy, because graduate education is not attractive to most students today. . . . I am concerned . . . that when you look at the competition for people, that some of the very people you want are not attracted to stay on, and some of the people that you're having to make do with are the ones you build your whole system out of.

The problem in tool and die making is to hire qualified instructors. The problem is not the enrollment. A good tool and die maker can pay his own way, and he can name his own salary; . . . many of them are working full time in tool and die making in private industry, and are teaching maybe at night, or for two hours in the afternoon at a tech school.

Compounding the problems of teacher supply is the diminishing ability of the school to afford the equipment and facilities needed to keep pace.

I think it's going to be increasingly difficult for our schools with limited resources, very limited resources, to provide the kinds of labs and equipment in those labs that our students are going to need for real experiences that will prepare them for the job market.

We've already felt the unpleasant anger of industry who says we're not up to date. When an industry
walks into a drafting shop in one of our institutions and sees us still preparing drafting students with the old T-square without cad/cam . . . without even a demonstration unit in the building, then the leg between this occupation is clearly out of step with what the business community needs.

Proposed solutions for overcoming the shortages involve linking industry with education in three principle ways: (1) opening plant facilities and laboratories for training; (2) industry-education exchange programs between company personnel and faculty for teaching and training; and (3) industry's lobbying the legislature in support for education.

We had . . . from the university . . . a researcher who came in and taught a full course all year. Industry sometimes might be willing to let an engineer, instead of going to work at 8:00 in the morning, come to school . . . and teach physics, then go to his or her job. So we're doing a little bit of that kind of flexibility.

There's going to have to be some kind of commitment on the part of the company to share equipment, advisors, facilities, and the labs. There's going to have to be some kind of collaborative arrangements because much of the equipment now is so outrageously expensive that all of our colleges can't handle it.

Summary of Common Perceptions of Barriers and Facilitators

The four sections of Part III showed perceptions that transcend state boundaries of North Carolina and Ohio of barriers and facilitators to collaboration in four categories: (1) bureaucratic, (2) participatory, (3) institutional, and (4) resource factors. The categories of barriers and facilitators are not mutually exclusive; rather they overlap and are highly interrelated. Starting with
bureaucratic barriers, the others follow.

Bureaucratic barriers—those which establish formalized rules and procedures of operation—cannot accommodate the close interaction flexibility requires for survival in advanced technological systems. The inflexibility encountered in traditional structures was seen as requiring either intervention, redesign, or independent program operations under independent commissions or other special arrangements.

The highly structured and independent operations under bureaucratic form are perceived as fostering exclusive processes in planning, and controls in operation. Principles of organization shared across state boundaries called for coordination at the state-level under the governor with autonomy at the level of operation with care for wide participation by sectoral and geographic interests in policy processes. Independent operations have also resulted in institutional barriers—protectionism among department heads and undeveloped avenues of access and communication necessary for resource sharing and coordination. The perceptions show that environmental conditions are forcing the move toward collaboration.

Differences in Perceptions of Barriers to Collaboration in North Carolina and Ohio

Though similarities in perceptions of barriers and facilitators to collaboration in North Carolina and Ohio
are shown in the four categories, two areas of perceptions show differences in emphasis in the two states in participatory barriers. First, in North Carolina, geographic barriers to participation were perceived to be greater than in Ohio. The economic transformation sparked by the development of the Research Triangle Park in the Raleigh, Durham, Chapel Hill area has served to exacerbate the geographic disparities between it and other geographic areas of the state.

The Park has not only attracted a high concentration of advanced technology industries to the area, but it has also become the site of a number of other state-level collaborative efforts, including the Microelectronics Center (MCNC), the Biotechnology Center (NCBC) and the North Carolina School for Science and Mathematics. The Governor's Task Force on Science and Technology (1983) reported for 1983, unemployment rates ranging from 4.1 per cent in the Triangle area to 27.1 percent in Swain County (in the northwestern section of the state). It has been proposed that the state place similar efforts in other regions.

Second, in Ohio, participatory barriers were seen as problems also. A mark of the Celeste administration which came to office in 1983 was the move from traditional to collaborative forms of interaction. Though, on the one hand, the move to collaboration was regarded as positive by actors across the board, there was still a level of
dissatisfaction over a perceived concentration of decision-making in the Department of Development, and over the insufficient reciprocity or mutual control in collaborative program operation. Though North Carolina's initial collaborative programs were all innovations, for both states, many of the collaborative programs adopted in the 1980s have been diffusions of processes developed elsewhere. The concerns over reciprocity in Ohio suggest that collaborative forms may rest on some traditional as well as emerging principles of organization.

SUMMARY OF FINDINGS, PART III

Research Question III

What factors do government, education, and industry sectors perceive to be barriers and facilitators to collaboration in North Carolina and Ohio?

(a) Perceptions of barriers to collaboration common to actors in both states tend to be synonymous with traditional bureaucratic forms of interaction with their consequent participatory, institutional, and resource problems.

(b) Collaborative forms and processes are proposed for overcoming barriers in all four categories: (1) bureaucratic, (2) participatory, (3) institutional, and (4) resource.
Differences in emphasis in North Carolina and Ohio concerns are expressed in the area of participatory factors: (1) North Carolinians are concerned that the successes of collaborative efforts are being concentrated in the central geographic region of the state, particularly the Research Triangle Area, rather than being spread evenly through the state; and (2) Ohioans have emphasized greater concern over perceived concentration of decision making in the Department of Development and the lack of mutual influence in collaborative program operation.
CHAPTER VII

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

The final chapter is divided into three major sections. First is a summary of the dissertation including a brief statement of the problem, a review of research methods used in conducting the study, and the research questions. Second, the conclusions section focuses on each of the three research questions (1) current collaborative forms and processes, (2) the transition from traditional to collaborative forms and processes, and (3) perceptions of barriers and facilitators to collaboration. Finally, the implications section includes the implications of the research findings for development policies and for inter-organizational theory, and suggestions for further research.

SUMMARY OF THE STUDY

Statement of the Problem

The problem investigated in this study was the impact of structural economic changes on relationships between and within government, education, and private industry sectors at the state level for purposes of economic development.
As a focus, the study compares intersectoral relationships in North Carolina and Ohio in the movement from traditional independent to collaborative forms and processes of inter­action. The intersectoral focus raises the unit of analy­sis from the interorganizational network to the exploration of relations between groups of organizations in different functional categories. At a theoretical level, the study looks at the appropriateness of ecological concepts as alternatives to contingency theories for studying interor­ganizational phenomena. Contingency theories assume an almost unlimited choice for policy makers and negligible environmental influence in shaping forms of organizational interaction. The study uses ecological concepts to explore the degree to which environmental influences constrain strategic choice.

Statement of Procedures

Intersectoral problems exhibit conditions of organ­ized complexity—i.e., seemingly unattached and isolated events collectively act to produce changes which are unpre­dictable, based on observed relationships. Because the unpredictability generated renders quantitative tools rela­tively ineffective, qualitative research methods were utilized.

A preliminary survey of the forty-eight contiguous states of the United States was conducted in February and March 1983 to determine whether it was possible to
distinguish patterns of cooperation between government, education, and private industry sectors in state-level economic development efforts between the industrialized Midwest and Northeast on the one hand, and the South and Southwest on the other. North Carolina and Ohio were selected from the South and Midwest states, respectively, to compare environmental impacts on intersectoral relationships in economic development strategies in two states.

Ohio was chosen because of familiarity and previous research interest in its development strategies in the wake of structural changes in the economy. From the preliminary survey, North Carolina stood out as a state for closer study and comparison because of its establishment, through strategic planning, of a pattern of development distinct from other states in the Southern region and from Ohio.

Because of the functional interdependence of government, education, and industry in economic development processes, and the inability of a single sector to account for or control the consequences of their actions, it was felt that it was necessary to gain a collective or holistic view of the key factors affecting the interactive process from the perspective of the actors involved. Information was gathered in the two states from taped interviews with key actors in the three sectors backed by documents and reports as sources of factual and interpretive information. A guided interview technique was utilized to gain
unstructured, open-ended explanations and descriptions of events and processes. Interviews and research were conducted on site in North Carolina over a one-week period in December 1983 with follow-up telephone calls in March and April, 1984; and interviews and research were conducted over several days from December 1983 through April 1984 in Ohio. Because there is little known about intersectoral relations, a method of comparative analysis was used to emphasize the exploratory nature of the research rather than theory verification. The method involved a combination of (1) coding and analyzing data around a given point, and (2) constantly redesigning and reintegrating theoretical notions in reviewing materials to arrive at grounded theory (Glaser and Strauss, 1967)—the discovery of theory from the data as opposed to starting with a set of preconstructed hypotheses.

The Research Questions

Three research questions were used as a basis for guiding the interviews and around which other research was conducted:

(1) What are the collaborative forms and processes which exist among government, education, and private industry sectors at the state level for economic development in North Carolina and Ohio?
(2) How have the forms and processes of interaction among the sectors in the two states evolved with changing environmental conditions?

(3) What factors do state-level government, education, and private industry sectors perceive to be barriers and facilitators to collaborative efforts in the two states?

CONCLUSIONS

The conclusions are divided into three major parts based on the research questions, as follows: (1) collaborative forms and processes among the sectors in North Carolina and Ohio as of January 1984, and the demographic and economic conditions and strategic plans upon which they are based; (2) the influences of environment and strategic choice on forms and processes of interaction among the sectors; and (3) the factors perceived to be barriers and facilitators to collaboration among state-level government, education, and private industry in North Carolina and Ohio.

Part One: State-Level Forms and Processes of Intersectoral Collaboration in North Carolina and Ohio

The results of the research indicated that in spite of the highly apparent but superficial demographic and economic differences between North Carolina and Ohio, the two states are fundamentally the same in terms of economic
structure. First, the economies of both states have been based predominantly in manufacturing; second, both states have been dominated by a few traditional industries--textiles, furniture and tobacco in North Carolina and automobiles, steel, and rubber in Ohio. The fundamental similarities in economic structure have left the states similarly vulnerable to structural changes in the economy--the technological advancements in manufacturing, the growing importance of research and development and the service sector, and increased internationalization.

Fundamental similarities in the economic structures of the states are also reflected in both the strategic plans developed to address the structural changes, and in the similarities in collaborative forms and processes among the government, education, and private industry sectors in policy and program, human resource, and business and technologic development functions to implement them.

Though collaborative forms in the two states are highly similar in outward form, there are underlying differences in collaborative processes. First, collaborative processes have a much longer history in North Carolina, dating at least to the mid 1950s, with Ohio's originating in the late 1970s, providing North Carolina with a longer period for interorganizational learning. Second, processes in the development of North Carolina's strategic plan for economic development have been more participative--i.e.,
more deliberative, more inclusive, and from the bottom up; Ohio's by contrast have involved a shorter period for consideration, involved relatively fewer people, and have been primarily from the top down.

A third underlying difference is that functions in North Carolina are highly articulated across functional categories, whereas functions related to economic development have developed more independently in Ohio. Fourth, collaborative processes tend to be reciprocal arrangements, mutually arrived at between equal, autonomous units in North Carolina, while in Ohio there is more of a tendency for controls to be exerted in collaborative relationships. Finally, the education sector tends to be involved at higher levels in economic development in North Carolina than in Ohio.

Part Two: Transition from Traditional to Collaborative Forms and Values

A look at the processes that both Ohio and North Carolina have gone through in the transition from traditional to collaborative forms in development-related functions suggests, first, that similarities in collaborative forms adopted by the states were in response to similarities in economic structure; and second, that differences in time of adoption of collaborative forms were the results of differences in ability to perceive fundamental economic changes taking place in the post-World War II period. In
Ohio, the level of slack resources available from the state's prosperity acted to obscure signals of structural change. In North Carolina, on the other hand, the lack of resources drew attention to the changes taking place.

The results also show that there were differences in the degree to which collaborative principles were internalized and manifested throughout system processes in the two states. The research suggests that these differences in internalization were the results of differences in resource constraints on attitudes toward cooperation among the sectors. In Ohio, the level of slack resources allowed the sectors to operate with a high degree of independence, while in North Carolina, lack of resources created the necessity for cooperation to move toward a level of development competitive with the other industrialized states.

It has been argued from a theoretical perspective on behalf of contingency theories, and counter to population ecology concepts, that environmental factors exert little constraining influences on the choices open to policy managers for shaping organizational or interorganizational forms (Child, 1972; Aldrich and Pfeffer, 1976). The study shows, however, that the time of each state's perception of structural economic changes—the mid 1950s in North Carolina, and the late 1970s and early 1980's in Ohio—marks the beginning of a convergence in the movement from traditional independent to collaborative forms of
interaction. The recognition by the sectors of the high costs of continuing to operate independently and the organizational response suggests the imposition of environmental constraints on the viable forms of intersectoral relations open to choice.

The study also shows that the relationships between environment and strategic choice are mutually influential. As successful models of collaboration are developed and spread by diffusion processes, operational requirements for survival become higher. Thus, environments become the products of strategic choices which act to further constrain later choices as performance requirements for survival get pushed to new levels.

Part III: Perceptions of Factors Which Act as Barriers and Facilitators to Collaboration

Responses to the third research question revealed that actors in both states perceive the greatest barriers to collaboration to be the traditional bureaucratic structures and regulations governing operational procedures with their consequent participatory, institutional, and resource problems. The transition from traditional to emergent forms of interaction are evident as facilitators to collaboration are alternatives proposed to bureaucratic forms and processes in all cases.

While perceptions of barriers and facilitators transcend state boundaries, there are differences in emphasis
growing out of unique conditions in each state. In both states the strongest concerns tend to be in different aspects of participation problems. In North Carolina, collaborative efforts have had dramatic results attracting advanced technology industries and other collaborative projects to the Research Triangle area joining Raleigh, Durham, and Chapel Hill. Concern is expressed over the increasing differentiation of the Triangle area and the central region of the state in general from the eastern and western regions. Though a balanced-growth policy has been adopted, the need is expressed for greater development attention targeted to other regions of the state.

In Ohio, collaborative approaches to policy and program are regarded as far superior in the new administration to those which preceded it. An underlying area of discontent, however, tends to be with a perceived concentration of control over development processes within the Ohio Department of Development, and with the lack of mutual influence in collaborative programs.

IMPLICATIONS

The general lack of preparedness in the United States for the structural changes in the economy which manifested themselves in the years following World War II point up three conceptual shortcomings in traditional organization theory which have been carried over into
interorganizational concepts: (1) that of an omniscient owner/manager which serves to justify hierarchical relationships; (2) that organizations can be closed to or insulated from environmental influences, retained as an alternative conceptualization for policy formulation to be used contingent upon the rate of change in an environment, and (3) that resource acquisition is the major objective of organizations rather than a means for performing a given function in society. The concepts have been derived from and are therefore more reflections of actual practices among organizations than policy guides.

The first, the omniscient owner/manager concept, has reinforced the tendency to underdevelop human resources in deference to the maintenance of elites for organizational leadership. Thus the creativity and invention necessary for societal advancement has rested with a small percentage of the population. The United States has, therefore, become vulnerable to competition from those societies which have been successful in developing and utilizing a greater percentage of their population. The problem has been pointed to as the main factor in the demise of England as an industrial leader beginning in the third quarter of the 19th century (Crouzet, 1982).

The second, the closed organizational concept, has obscured to policy managers the continuous processes of change, although at times imperceptible, occurring both
within and outside of systems, which impinge on system operations. The tendency not only closed the eyes of manufacturers in the United States to technological advances which were occurring in Europe and Japan in the post World War II period, but also increased its vulnerability to the Oil Crisis of 1973, which accelerated and exacerbated previously established trends.

The third, the primacy of resource acquisition, has served to obscure the functional interdependence of organizations, and focused on the needs of the single organization rather than providing a holistic perspective required for systems to adapt to environmental changes. Moreover, it has fostered the pursuit of short-term over long-term goals to the detriment of the individual, the organization and the society. Competition came to be regarded as the chief mode of interaction and power as the most important organizational asset. Ultimately it led to depletion of societal resources because of duplication and lack of coordination.

This study has shown that environmental conditions will no longer tolerate the independent intersectoral operations in Ohio and North Carolina if high performance is to be attained in economic development. There are still, however, differences between states in the extent to which cooperative and collaborative relations have replaced independent ones. And, though there is a burgeoning
movement toward the adoption of collaborative models in
development strategies, there is a need for the underlying
principles upon which such models rest to be clearly delin­
eated (1) to avoid the inconsistencies of collaborative
models resting on foundations of traditional relationships,
and (2) to foster innovation in the development of collab­
orative forms of interaction through the inculcation of
values rather than waiting for environmental conditions to
force the movement.

What is needed, then, is a conceptual framework
which can look beyond current practices among organizations
or groups of organizations to principles of interaction
against which practices can be held and problems pointed
out. Ecological concepts drawn from Darwinian biology
offer a number of advantages as an alternative conceptuali­
zation to traditional theory for policy guidance in inter­
sectoral relations. First, it provides a conceptual frame­
work for relating interactions at all levels of organiza­
tional activity--(a) the organization and its internal
components, (b) the single organization in interaction with
other organizations, and (c) among populations of organiza­
tions. Second, it is a dynamic rather than static concept,
recognizing constant change and the likelihood of sudden
change at anytime. Third, it emphasizes a systemic or
holistic perspective rather than the interests of a single
organization or category of organizations to the exclusion
With ecological concepts, unlike contingency theories, the basic principles of organization are unchanging, though specific environmental conditions might change. Recognition of the constancy of change requires system adaptability under changing conditions. Adaptability presupposes flexibility which has implications for (1) the system's information processing capacity and (2) its control capacity. Both suggest directions which serve to guide organizational policy.

Adaptability requires of the system the capacity to interpret information from feedback processes in order to make automatic adjustments to change. Information, therefore, becomes a premium. The requirement suggests that all development policies, then, should be directed toward increasing the system's capacity to receive, interpret and act on information at the level of the individual, the organization, and the interorganization. Both states have already begun a number of measures to increase the information processing capacity across functions related to economic development--e.g., (1) the expansion of participatory processes in policy development, (2) the increased emphasis on broad educational skills in human resource development, and (3) the emphasis on entrepreneurial development in business/technology development.
Two other means of increasing the adaptability of the system through increased information processing capacities are suggested for illustration. First, in both states, the environment has already begun pushing education toward a blurring of the fine lines of demarcation between academic and vocational/technical education, on the one hand, with increasing numbers of graduates of four-year colleges and universities going to two-year technical institutes to gain skills for employability, and with increased requirements for academic skills among vocational/technical students, on the other. The current system which allows each institution to independently establish its own minimum standards for entrance acts to impede flexibility because of the infinite number of interinstitutional agreements which must be reached. While institutions cannot be coerced into cooperation, incentives should be provided for increased vertical and horizontal articulation to facilitate student mobility between vocational/technical and academic institutions.

Second, the customized training programs offer examples of collaborative programs based on traditional concepts—that is, the training of workers to narrow industry specifications on specific equipment, thereby reducing the workers' flexibility. To increase the long-term employability of the workers, the states should, in return for free or subsidized training initially, require companies to
participate in a plan for offering continuing education in broader skill areas as insurance against future unemployment.

Control capacities are another factor in system adaptability. Ouchi (1980) draws the distinction between control through contractualism and coercion in traditional organizations, as opposed to control through self-surveillance and commitment under organic solidarity at the level of the organization. In emergent systems, the institutionalization of values which require little in the way of hierarchy replace more formalized controls. The interests of the individual at the organization level, or of the organization at the interorganization level are congruent with interests of the group or system, respectively.

Policies relative to the structure of systems would be directed at forming flat as opposed to hierarchical interorganizational arrangements as a means of control. In education, the move in North Carolina to grant the community college system departmental status represents a move in keeping with emergent organizational principles, while the proposed move of Governor Celeste in Ohio, prior to assuming office, to centralize education under one department represents a move in keeping with traditional organizational principles.

A problem which transcends state boundaries is that related to perceived status differences between two-year
and four-year institutions, and the former's feelings of domination by systems biased toward the interests of four-year institutions. Where components find inadequate avenues of representation through prescribed channels, there is increased likelihood of using alternative routes which circumvent collective policy formation, such as gaining access to the decision-making process through the legislature. By granting the two-year schools departmental status, they moved to a position of equality in the system which encouraged their turning their attention to system, as opposed to strictly individual, interests.

The organizational concepts which supported industrialism marked a revolutionary departure from the organic solidarity which formed the basis of work relationships in the pre-industrial era. A return to relationships based on organic solidarity are likely to be as, if not more, revolutionary. It is left to the states to either control, or be controlled by the change.

Suggestions for Further Research

Some research lines I would like to pursue:

Further research is recommended using similar research methods to identify patterns of intersectoral relationships in other states influenced by high or low resource levels and other relevant variables.

Further work also needs to be done with ecological concepts to enhance their applicability to practical
problems of interorganizational relationships confronted by those in the process of shaping policies. Of particular importance is a clearer delineation of principles of organization design which increase system adaptability.

Finally, longitudinal studies are needed to show a clearer relationship between environmental changes and their impact on intersectoral relationships across functional areas in economic development.
Appendix A

Interview Guide

A. Introduction
(1) Express appreciation for taking time for interview
(2) Points about the study
   . Interested in patterns of collaboration between
government (state development departments) educa-
tion and private industry at state-level for
economic development.
   . Completed preliminary national survey
   . More in-depth study of patterns in N. Carolina and
Ohio
(3) Discussion format—will ask general questions about--
   . Your organization unit
   . Linkages, interactions with State Dept. of Devel-
opment (Commerce)/Education/Private Industry
   . How relationships have changed over time
   . Factors which inhibit relationships
   . Ideas for change, improvement

B. Background and Current Linkages
(1) Start with unit—what is purpose/function/responsi-
bilities?
(2) In what ways is unit involved in economic develop-
ment in state?
(3) Does your unit work with, interact with--
   (a) State Dept. of Development (Commerce)?
   (b) Education (college/university system—4-year,
2-year, technical)?
   (c) Private business/industry?
(4) How are relationships structured?
   (a) Type of agreement (legislative mandate,
interagency agreement, working relationship,
etc.)?
   (b) How governed (board, committee, etc.)?
   (c) How funded?
   (d) How staffed?
   (e) How often are meetings, interactions?

C. Evaluation of Relationship
(1) How long has current relationship existed?
(2) To your knowledge, has relationship changed over
time?—Through State administrations?
(3) How?

D. Barriers/Facilitators
(1) Looking at relationships generally between the

and sectors, are

there factors that you can identify, from your
experience or knowledge, which inhibit relationships or act as barriers to interaction? (Start with those that originate with one sector, then other).

(2) If you could make suggestions/had the power to make changes that would improve relationships, what would you suggest/do?
Appendix B

Interviewees, North Carolina and Ohio

North Carolina

Earle Bradley—Chief
Labor Resources
Business Assistance Division
North Carolina Department of Commerce

Donald Brannon
Chief Consultant for Vocational Education
North Carolina Department of Public Instruction

Al Calloway—Assistant Director
Business Assistance Division
North Carolina Department of Commerce

James Clay—Director
Institute for Urban Studies and Community Service
University of North Carolina Charlotte

Charles R. Eilber—Director
North Carolina School of Science and Mathematics

Seddon Goode—President
University Research Park
Charlotte, N.C.

Ned Huffman—Executive Director
Research Triangle Foundation of North Carolina

Mike Latta—Director
North Carolina Advisory Council on Education

Quentin Lindsey—Science and Public Policy Adviser to the Governor

Larry Monteith—Dean
School of Engineering
North Carolina State University

Douglas Orr—Vice Chancellor for Research and Public Service
University of North Carolina at Charlotte

Rudolph Pate
North Carolina State Foundation
North Carolina University
Michael G. Rakouskas—Chief
Research Section
Business Assistance Division
North Carolina Department of Commerce

Sandy Rothschild
Microelectronics Center of North Carolina

Tom Stephenson—Manager
Field Services
Industrial Extension Service
North Carolina University

Joe Sturdivant—Director
Industrial Service Division
Department of Community Colleges

Bob Wheeler—Director
Economic Development
Raleigh Chamber of Commerce

Ohio

Thomas Albaugh
On-Site Coordinator
State of Ohio
At North American Aircraft Operations
Rockwell International Corporation
Columbus Plant

Arthur E. Adams—Coordinator,
The Ohio State University Research Complex

George Ashton—Chairman
Ohio Economic Development Council

William Coulter—Acting Chancellor
Ohio Board of Regents

Charles Dygert—Supervisor
Ohio Industrial Training Program
Ohio Department of Education

John Fightner—Coordinator
Training and Education
Fisher Guide Division
General Motors Corporation
Columbus Plant

Cindy Flaherty—Special Assistant to the
Director, Ohio Department of Development
Elaine Hairston—Director
Special Programs
Ohio Board of Regents

Stephen Holtzman—Director
Thomas Alva Edison Partnership Program
Ohio Department of Development

Ray Lorello—Assistant Director,
Ohio Department of Development

Ann Moore—Assistant to the Chancellor,
Ohio Board of Regents

D. A. Meyer—Manager
Technical Training, Human Resources
North American Aircraft Operations
Rockwell International Corporation
Columbus Plant

Harold Nestor—President
Columbus Technical Institute

Larry Palur—Coordinator,
Ohio Technology Transfer Organization

Russell Spillman—member
Advisory Council for College
Preparatory Education

John Venters—Manager,
Ohio Industrial Training Program
Ohio Department of Education

Franklin B. Walter—Director
Ohio Department of Education
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