# ENVIRONMENTAL CONTEXT, FIRM STRATEGY, STRUCTURE AND PERFORMANCE: THE DEVELOPMENT OF A HOLISTIC MODEL

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# PREFACE

This study is intended as an initial attempt to investigate systems of complex organizational variables in the context of a holistic, causally ordered model. The primary purpose of the study was twofold: First, to integrate findings of prior research in the fields of corporate strategy/business policy and organization theory, and second, to bring the methodology of causal modeling to bear on such research.

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STATEMENT OF THE PROBLEM

In many ways, policy and strategy research is concerned with the singular firm in a changing environment, and seeks to understand why, for example, one firm will flourish while other apparently similar firms wither and die (and vice versa). In pursuit of such understanding, early policy research was based primarily on the case study approach. Case study constitutes an important research tool in a relatively new area of inquiry where investigators are seeking to identify the relevant variables.

However, the viability of Business Policy as a field of study depends in part on the ability to use the conceptual insights generated by case studies as a foundation from which to move beyond the constraints of what Andrews (1980) refers to as "situation-bound reality". Such movement involves conducting more rigorous and analytical research the results of which allow us to draw inferences and make generalizations about many firms that share some common characteristics.

More recent strategy research studies have employed a number of univariate and multivariate techniques designed to provide empirical support for the proposed relationships among, for example, strategy, structure and performance (such as Rumelt, 1974; Grinyer and Yasai-Ardekani, 1981). These studies have provided evidence that many of the phenomena and relationships among them, presumed to be important on the basis of case study analysis, do exist and can be studied in a scientific fashion.

In any area of inquiry, contributions to theory and resulting advancement of knowledge depend on using such early insights in the process of building models of relationships. Furthermore, the quality of any science rests on the quality of its measurement instruments. Thus, in the process of determining the relevant constructs for study, and relationships among them, it is important to evaluate the measures used as indicators of those constructs.

The present research is intended as a preliminary step in a program of research designed to contribute to both areas--model building and measurement. It is hoped that such a stream of research will provide a framework for more rigorous as well as relevant strategy/policy research.

## Purpose of the Study

The purpose of the study is to integrate certain theoretical perspectives and research findings from the literatures of organization theory and strategy/policy in the development of a rudimentary model of corporate level diversification strategy and structural divisionalization. The model is designed to test relationships among environmental dimensions and firm-specific dimensions, and their impact on economic measures of performance. The selection of the dimensions for inclusion in the study is based on indications of their importance in the literature. The hypothesized specifications of relationships among them is derived primarily from theoretical models of natural selection and adaptation as they relate to populations of organizations.

## Contribution of the Study

This research provides a contribution in a number of ways. First, it takes an integrative approach to increasing our understanding of strategy, the importance of which has been suggested in several recent papers (Bourgeois, 1980; Christensen and Montgomery, 1981; Jemison, 1981; White and Hammermesh, 1981; Zeithaml and Fry, 1982). Second, it builds a holistic model in order to examine the structure of relationships in terms of a causally ordered system. Third, the methodology employed in the modeling process will allow for explicit examination of reliability, and convergent, discriminant and predictive validity of constructs and variables frequently addressed in the strategy literature.

## Outline of the Dissertation

The remainder of this chapter will present a brief overview of the concept of diversification strategy and the level of analysis at which the study will be conducted. It will conclude with certain assumptions and limitations related to the study.

The following chapter presents a review of the literature related to the questions of interest in the study. Chapter III draws on the literature in Chapter II and presents the holistic model in conceptual form.

Chapter IV describes the operationalizations of the constructs, the sources of data and the firms studied. Chapter V presents the analytical methodology employed. The results of this analysis are presented in Chapter VI. Chapter VII presents the discussion and conclusions drawn from those results as well as suggestions for future study.

# The Concept of Strategy

The concept of organizational strategy has received various definitional treatments in the literature (Learned, Christensen, Andrews and Guth, 1969; Ansoff, 1965; Schendel and Hofer, 1979; Andrews, 1980). Although there is some variation among the components of these definitions, they generally consider strategy to be the result of a process of integration, relating two major sets of variables: the strengths and weaknesses of the organization and the threats and opportunities present in the environment.

Recent treatments of the concept have further recognized the need for consideration of strategy at different levels of decision making, each of which addresses very different issues. In general, strategy research and theory development have focused on two of these levels: (1) corporate level strategy, which seeks to address questions relating to scope, mission, domain, etc., and (2) business level strategy, which seeks to address questions relating to firm behavior ("navigation") within a given domain or task environment (Vancil and Lorange, 1975; Schendel and Hofer, 1979; Andrews, 1980; Bourgeois, 1980; Beard and Dess, 1981). The present research is concerned with issues related to scope and domain definition, and thus is concerned with strategy development at the corporate level.

Strategy is a complex variable encompassing many "organizational actions" (Thompson, 1967). Such actions may be in support of organizational growth strategies (either to maintain or increase growth with respect to current objectives), stability or profit strategies, retrenchment or turnaround strategies, or some combination of these, either in a simultaneous or sequential fashion (Glueck, 1980; Hitt, Ireland and Palia, 1982; Steiner, Miner and Gray, 1982). Since the 1920's, and particularly since the end of World War II, strategies of growth through diversification have appeared to play an increasingly dominant role in organizational strategy development among firms in the United States (Gort, 1962; Chandler, 1962; Wrigley, 1970; Rumelt, 1974).

Growth through diversification may be pursued internally, as when new products or services are added internally to the existing product line, or externally, through acquisition, merger or joint venture. In either case, important differences have been observed in the ways in which firms have elected to diversity (Wrigley, 1970; Rumelt, 1974; Montgomery, 1979). Furthermore, it has been suggested that diversification activity will affect both the structural configuration and the performance of the organization (Chandler, 1962; Wrigley, 1970; Rumelt, 1974).

The present research constitutes an inquiry into the nature of certain environmental influences on diversification activity, and the relationships among diversification, overall corporate structure and organizational performance. This inquiry will approach these issues in the general context of the population ecology perspective (Aldrich, 1979; Hannan and Freeman, 1977), which suggests the importance of the notion of "fit" among strategy, structure and environmental context. The modeling methodology employed permits the study of firms in a variety of industry contexts, as suggested by Harrigan (1983). Such activity generally involves alterations in the scope of organizational operations, the domain, and relationships among diversification, structural divisionalization and organizational performance.

## Limitations and Assumptions

There are certain limitations inherent in the process of modeling organizational and environmental characteristics and relationships. For example, substantial arguments may be made for the existence of a number of feedback loops involving the variables of interest here. Unfortunately, in the modeling process certain relationships must be excluded from consideration. Little useful information would be generated by a model in which "everything is related to everything else", even if the model were mathematically soluble. For this reason, the paths of primary interest were selected for analysis, under the assumption that such selection does not deny the existence of possibly relevant others.

Furthermore, additional arguments might be made for the potentially interesting effects of numerous environmental attributes not addressed in the present study, such as institutional influences and constraints. Again, the selection process reflects the dimensions of greatest immediate theoretical interest, and in no way denies the existence or influence of others.

# CHAPTER II

## REVIEW OF THE LITERATURE

This chapter will present the major theoretical and empirical bases for the development of the structural relationships in the hypothesized model. The domain of the research includes four major categories of variables: the organization environment, diversification strategy, structure (divisionalization) and organizational performance. These variables receive various definitional treatments in the literature cited. The definitions developed for the present study will be given in the following chapter.

Since the research of Lawrence and Lorsch (1969), the environment has been considered a source of critical contingencies to which the organization must respond in terms of its goals, structure, technology and size (Thompson, 1967; Pugh, Hickson, Hinings and Turner, 1969; Blau and Schoenherr, 1971; Aldrich, 1972). Contingency theorists have posited that effectiveness is a result of the actions taken by organizational participants with respect to firm-specific variables, over which some discretion is possible, in response to the environmental context.

From this point of view, the shaping of an organization's destiny, and ultimately its survival, is largely dependent upon the quality of the process of "matching" the characteristics of the organization (such as strategy and/or structure) to environmental contingencies by organizational participants (Terreberry, 1968; Hickson et al., 1971). This view is reasonably consistent with the normative literature on strategy formulation (Learned, Christensen, Andrews and Guth, 1969; Andrews, 1980).

Problems arise, however, in the attempts to (1) identify and define the relevant environmental attributes and (2) operationalize those attributes. Thus, the first section of this chapter will be devoted to tracing the development of the conceptualization and dimensionalization of the environment. The important features of this process are the suggestion of the evolutionary quality of environmental attributes and the development of methods of operationalizing those attributes in terms of secondary data sources.

The next section will discuss the literature relating environmental attributes to organizational actions, particularly those associated with diversification and structural elaboration. The chapter will then proceed to a discussion of the relationship between diversification strategy and divisionalization, their effects on one another, as well as their effects on organizational performance. The final section of the chapter will bring together these lines of research into a conceptual representation of the hypothesized model.

## Dimensionalization of Organizational Environments: Conceptual Foundations

Early management thought tended to treat organizations as closed systems, such that only forces internal to an organization were important in understanding it (for example, the rational view of

Taylor (1911)). The development of an open systems perspective suggested that elements both internal and external to an organization interact and are interdependent (Katz and Kahn, 1966). It further required the ability to conceptualize and dimensionalize those external elements, collectively referred to as the environment.

One of the earliest attempts at conceptualization was the work of Emery and Trist (1965). They presented four generic environment types ranging from stable-dispersed ("placid-random") to unstable, concentrated and turbulent ("turbulent field"). Terreberry (1968) suggested that these four types represented an evolutionary pattern, and that the path of this evolution was toward increasing turbulence and interdependence. A major contribution of both papers was the distinction between the input/output transactions occurring within a focal organization's "organization set" and the interactions occurring in the larger social context within which the organization set is embedded (task environment versus general environment).

## Perceived Attribute Models

The research of Lawrence and Lorsch (1969) suggested that, in order to understand the nature of the influence of environment on organizational processes, we must examine the perceptual characteristics of organizational decision makers. This led to a series of investigations of the construct PEU (perceived environmental uncertainty) to explain organizational structures (Duncan, 1972; Leblebici and Salancik, 1981). PEU was considered to be related to two dimensions of the environment: stable-shifting and simple-complex (Duncan, 1972). These dimensions were drawn from Thompson (1967). Thompson's strong emphasis on "coping with uncertainty" coupled with Weick's (1969) argument that the environment can only be known to the organization through managerial perceptions provided strong support for the primacy of PEU as an explanatory variable related to managerial behavior and organizational structure (Anderson and Paine, 1975; Hambrick and Snow, 1977).

The exclusive use of perceived attributes in the study of environmental influences has created considerable debate (Downey, Hellriegel and Slocum; 1975; Tosi, Aldag and Storey, 1973; Downey and Ireland, 1979). Bourgeois (1980) suggested that such variables may justifiably be considered as one source of influence, but that task environment attributes may be measured apart from their interpretation by organizational participants.

Resource Dependence Models

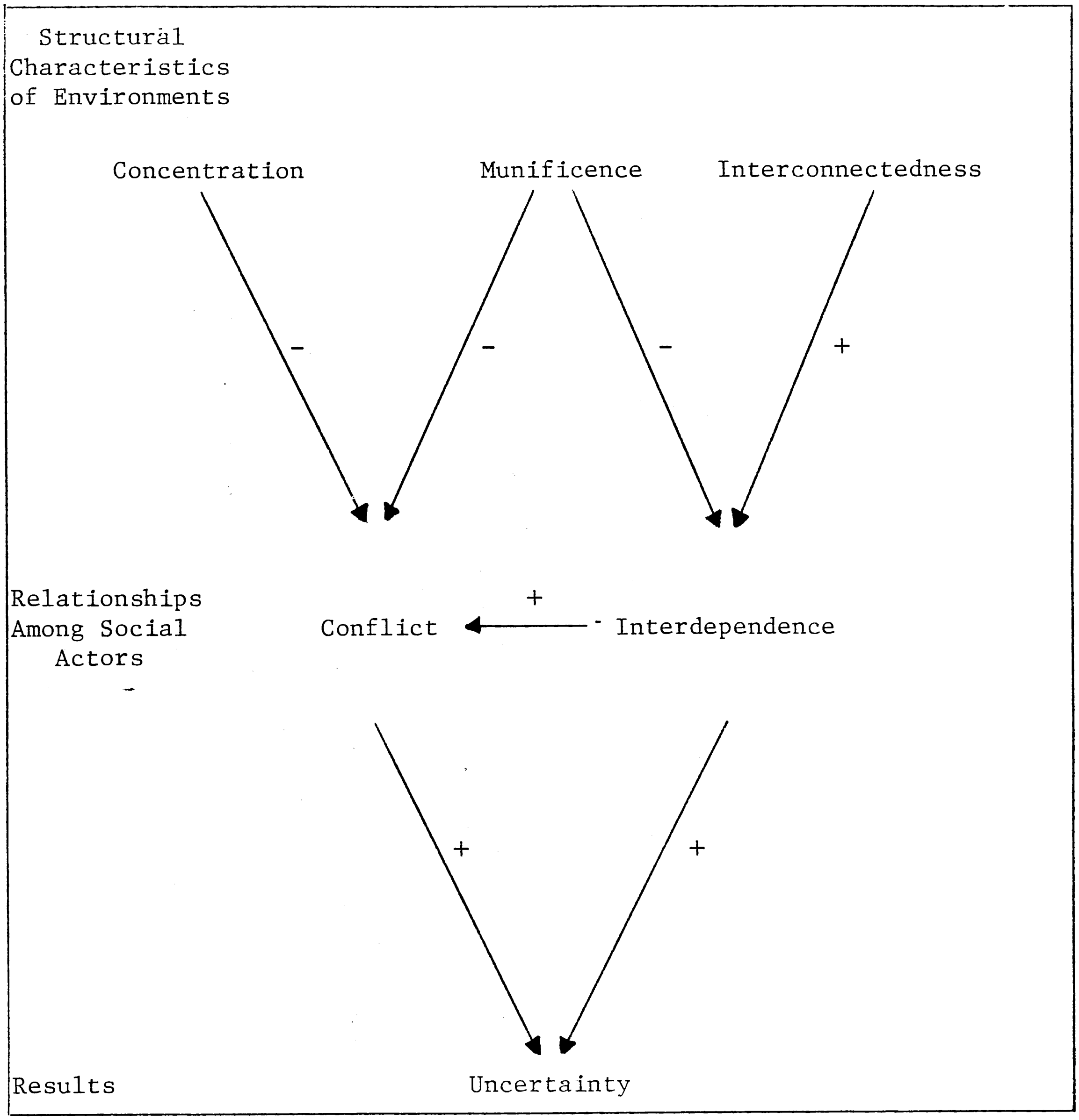
The process through which environments affect organizations primarily involves the offering or withholding of resources. As Yuchtman and Seashore (1967, p. 900) suggest, resources may generally be considered as, "generalized means, or facilities, that are potentially usable--however, indirectly--in relationships between the organization and its environment." This definition suggests that much of the relative effectiveness of organizations can be accounted for in terms of their relative control and/or bargaining power with respect to critical resources.

Pfeffer and Salancik (1978) and Aldrich (1979) present attribute dimensionalization schemes which lend themselves to operationalization in terms of quantitative variables. The Pfeffer and Salancik scheme suggests that the concentration-dispersion of power and authority in the environment, availability-scarcity of critical resources and interconnectedness among organizations characterize the "three most elemental structural characteristics of environments" (p. 68).

These structural characteristics, then, determine the relationships among social actors, particularly conflict and interdependence. Conflict and interdependence, in turn, determine the level of uncertainty experienced in the focal organization. This uncertainty is one outcome of these other environmental dimensions. This model is summarized in Figure 1.

Aldrich's (1979) dimensions are presented in the context of a population ecology/natural selection model (Campbell, 1969; Hannan and Freeman, 1977). Like that of Pfeffer and Salancik, his scheme refers to the nature and distribution of resources in the environment. It further reflects the population ecology model's casting of the environment as a major force shaping organizational change. The assumption of a natural selection model does not suggest that at any "slice in time" what exists is the fittest. Equating fitness with survival in this manner would reduce the model to a tautology. The model refers to a tendency toward survival among forms most fit vis-a-vis their environments. Those among the "fittest" may sometimes fail, and maladaptive forms may survive due to random variations in the selection process. The model deals in terms of likelihoods and probabilities, not certainty of survival.

The model does suggest, however, that environmental requirements set the limits within which any rational selection (strategic choice) may occur. Organizational actions are not unimportant in an absolute sense, but are overwhelmed by the power of environmental selection.




Source: Pfeffer and Salancik (1978).

Figure 1. Pfeffer and Salancik's Model of Relationships Among Environmental Dimensions

Recent literature has offered some empirical support for this model (Aldrich and Reiss, 1976; Nielsen and Hannan, 1977; Carroll and Delacroix, 1982).

Aldrich (1979) conducted an extensive review of the literature relating to organizational environments. As a result of the process of integration of this literature, he proposed six dimensions to characterize organizational environments. They "refer to the nature and distribution of resources in environments, with different values on each dimension implying differences in appropriate structures and activities" (Aldrich, 1979, p. 63). The dimensions are defined as follows: (1) capacity, which may be thought of as the richness of the environment, or "the extent to which the organization has to expand its area of operation (domain) to obtain the resources it requires" (p. 63); (2) homogeneity-heterogeneity, or the degree of similarity (or lack of it) between elements of the focal population and "any social forces affecting resources" (p. 66); (3) stability-instability, "the degree of turnover in the elements of the environment" (p. 67); (4) concentration-dispersion of resources in the environment; (5) domain consensus-dissensus, "the degree to which an organization's claim to a specific domain is disputed or recognized by other organizations, including government agencies" (p. 68); and (6) environmental turbulence, or "the extent to which environments are being disburbed by increasing environmental interconnection, and an increasing rate of interconnection" (p. 69). The definition includes increasing potential linkages as well as actual ones.

## Dimensionalization of Organizational Environments: Empirical Foundations

A set of dimensions which are clearly differentiated and defined, such as that presented by Aldrich (1979), facilitates the process of operationalization. Dess (1980) hypothesized that five of Aldrich's dimensions could be operationalized using secondary data sources. His research revealed that these five could be collapsed into a more parsimonious set of three using factor analysis. Dess did not attempt to deal with the domain consensus dimension, as he felt that secondary data sources would not provide for such inquiry. He did, however, obtain a set of three dimensions which accounted for over 60 percent of the variation in the 17 component variables that were retained following interitem analysis of his original 23.

Dess labels these dimensions environmental (1) munificence, (2) dynamism and (3) complexity. These dimensions and their relationships to Aldrich's dimensions are summarized in Table I. It may be seen that there is a strong similarity between these empirically-based dimensions and the three elemental structural characteristics of environments suggested by Pfeffer and Salancik (1978) discussed above (concentration, munificence, and interconnectedness).

Dess's research affords strategy researchers the opportunity to address environmental attributes in a quantitative fashion. Although the normative literature in the area has generally assumed the importance of a consideration of environmental variables as well as firm-specific variables, there has existed no body of generally accepted theory or practice to address these critical environmental issues. The present research treats environmental dimensionalization in a manner similar to that used by Dess (1980) to examine the separate effects of selected dimensions on the diversification component of corporate level strategy, and the divisionalization of organizational structure.

TABLE I

DESS'S THREE DIMENSIONS OF ORGANIZATIONAL TASK ENVIRONMENTS AND THEIR RELATION TO ALDRICH'S DIMENSIONS

| Environmental Munificence | Environmental Dynamism | Environmental Complexity |
|---|---|---|
| --Capacity | --Stability/ Instability | --Homogeneity/ Heterogeneity |
| | --Turbulence | --Concentration/ Dispersion |

Source: Dess and Beard (1982, p. 246).

## Environmental Dimensions and Diversification

As set forth in the preceeding chapter, the focus of the present study is on strategy development at the corporate level. It is therefore concerned with issues relating to domain definition, which Bourgeois (1980, p. 27) defines as "the organization's choice of domain or change of domain that occurs when, for example, a firm diversifies into or exits from particular products or markets."

The issues of domain choice and/or domain change are quite complex, and involve more than just the question of diversification. However, a good deal of interest has been focused on this diversification component of strategy in the strategy/policy literature (Chandler, 1962; Wrigley, 1970; Rumelt, 1974; Montgomery, 1979; Bettis, 1981).

This stream of literature will be discussed in greater detail in the following sections. For the present, it is sufficient to note that the results of these and other studies suggest that since World War II, firms have become increasingly diversified. However, this diversification appears to be characterized by decreasing measures of return with no accompanying decrease in risk, as might be suggested by portfolio theory. Bettis (1981, p. 379) suggests that these findings may reflect an evolutionary process (from related to unrelated) which "could logically result in performance declines."

This suggestion is consistent with Terreberry's (1968) notion of environmental evolution. That is, the explanation for such observations may involve a consideration of the nature of the changing environment in which organizations must function. Ansoff (1979) describes a number of patterns of environmental challenges and changes faced by organizations since the turn of the century. Many major shifts in environmental structure and social legitimation considerations have occurred and are expected to continue to occur in the foreseeable future (IIE, 1981). These changes include both absolute levels of capacity for growth in various industries (increases as well as decreases) and the rate at which change is taking place.

The population ecology model would suggest that changing environmental structures and levels of resource abundance may create pressures for change in organizational characteristics and/or behavior, even though organizational participants may not recognize or clearly understand the nature or sources of such pressures. Economic theory would suggest that organizations competing for the same resources would be pressured to adopt the same characteristics and/or behavior in order to survive (Scherer, 1980). However, most business organizations operate in environments which provide for some flexibility in deviation from the notion of a single best form, or set of characteristics or behaviors.

These latter environments may be characterized as being composed of some number of niches, or distinct combinations of resources (Aldrich, 1979). Some organizations tend to specialize, operating over a narrow range of activities (that is, attempting to operate in one, or a few very similar niches). Others attempt to "spread their fitness" over a broader range of environmental conditions, that is, diversify.

According to theory, specialists can perform much better than generalists within their selected niche(s), but are dependent on stability and homogeneity of structure within that (those) niche(s). Generalists, on the other hand, are better suited to deal with unstable or heterogeneous environments (which may result in a reduction of perceived risk). However, to do so, they must maintain greater levels of organizational slack (Cyert and March, 1963; Bourgeois, 1980) and/or excess capacity in order to cope with the potential for changes in state (Aldrich, 1979).

## Environmental Dimensions and Organizational Structure

The work of Ashby (1956), Thompson (1967), and McCann (1982) relating to organizations in particular and systems in general, suggests that increasing complexity in the environment (one system) requires increasing complexity in the organization (another system). Complexity in the organizational system may be considered in terms of the number of autonomous or semi-autonomous units that constitute the overall organizational structure.

Bobbitt and Ford (1980), MacCrimmon and Taylor (1976), and Simon (1969) argue that when the environment is perceived as one of complexity organizational decision makers may deal with it through strategies of structural decomposition or differentiation. Such arguments are supported by the work of Lawrence and Lorsch (1967), for example.

As described above, Dess's (1980) complexity dimension subsumes both the heterogeneity and concentration of resources in the task environment. Thus it may be considered an indication of both the number and diversity of elements in the environment impinging on organizational decision making. It may also be thought of in terms of the information processing requirements facing the organization. This is consistent with the open systems view of organizations, and may be logically incorporated into the framework of a population ecology model.

## Studies of Firm Diversification: Historical Perspective

Traditionally, studies of diversification were reported by economists who were interested in questions related to pricing behavior, concentration and public policy issues raised by diversification activity. Their statistical analyses, based on simple product count measures, indicated that diversification has been increasing since the 1920's, primarily in industries based on new technologies and primarily based on internal growth rather than merger (Gort, 1962). The seminal work of Chandler (1962) suggested that diversification tended to follow certain patterns, and furthermore, created pressures on traditional administrative systems. The result was the emergence of the multi-divisional structure, which in turn served to institutionalize diversification.

Since that time, a number of studies have addressed the issue of firm diversification strategy and its relationship to organizational structure and performance. Wrigley's (1970) survey of the 1967 Fortune 500 built upon Chandler's work by recognizing that diversification may occur in a variety of ways. He rejected the simple product count method of measuring diversification and developed a system of four categories based on a qualitative evaluation of the firm's product-market scope and diversification rationale. These categories included: (1) single product, or firms that were not diversified; (2) dominant product, or those that were primarily committed to a single product which accounted for more than 70 percent of sales, but had diversified to a small degree; (3) related product, referring to those that had expanded into new areas that were related in some fashion to current activity; and (4) unrelated product, referring to those that had diversified without regard to maintaining such relationships. Wrigley's results indicated that diversification had become a widely accepted pattern of activity by 1967, as had the multi-divisional structure.

## Rumelt's Research: Patterns of Diversification

Rumelt's (1974) landmark study examined a number of issues raised by Wrigley's (and Chandler's) work. Rumelt sought to refine Weigley's (1970) classification scheme. He did so by doing away with the "product" notion and turning instead to a consideration of "discrete businesses". He then subdivided Weigley's four main categories (Single, Dominant, Related, and Unrelated) such that a total of nine categories resulted (Table II). A firm was assigned to one of the four main categories on the basis of percentage of total sales attributable to one discrete business (specialization ratio), or a group of businesses (related ratio). Assignment was made to a subcategory based on the pattern of linkages observed among the firm's businesses.

TABLE II

RUMELT'S NINE CATEGORIES OF DIVERSIFICATION

| |
|---|
| Single Business |
| Dominant Business |
| --Dominant Vertical |
| --Dominant Constrained |
| --Dominant Linked |
| --Dominant Unrelated |
| Related Business |
| --Related Constrained |
| --Related Linked |
| Unrelated Business |
| --Unrelated Passive |
| --Acquisitive Conglomerate |

Source: Rumelt (1974, pp. 29-32).

Of major importance is Rumelt's distinction between constrained and linked diversification. Constrained diversifiers are those whose businesses are all related through a central core or strength. In the case of linked diversifiers, on the other hand, any given business is related to at least one other in the organization, but not necessarily to all. The relatedness may be through any one of a number of possible strengths. Rumelt's results indicated support for the notion that firms were becoming more diversified.

## Diversification Patterns and Structure

An important corallary to the study of diversification strategy was the suggestion that increasing levels of diversification led to the creation of the multi-divisional organizational structure (Chandler, 1962). As mentioned above, Chandler's thesis was that structure follows strategy. That is, as firms become more diversified, the increasing burdens on traditional functional structures lead to the implementation of increasingly divisionalized structures.

With respect to organizational structure, Rumelt's (1974) results did not provide clear evidence of a causal relationship between strategy and structure in either direction. He attempted to separate the data by decade, by movement among stragey categories and by movement among structure categories. Rumelt (1974) concluded:

> The trend toward divisionalization paralleled the increase in diversification but was not wholly dependent upon it. While diversification and divisionalization were clearly linked in the 1950's, during the 1960's the link was less clear, although both trends continued unabated (p. 77).

## Diversification Patterns and Performance

Rumelt (1974) examined differences among the nine categories on ten performance measures, and concluded that they could be grouped into three major performance categories. These are summarized in Table III. It may be seen from the summary that constrained diversification strategies were associated with higher overall levels of performance than linked strategies, and the linked were more successful than the vertical and unrelated strategies. In fact, the unrelated strategy was found to be one of the lowest in terms of performance, on the average.

TABLE III

RUMELT'S PERFORMANCE CLUSTERS

| Performance | | |
|---|---|---|
| High | Medium | Low |
| Dominant-Constrained | Related-Linked | Dominant-Vertical |
| Related-Constrained | Single Business | Unrelated-Passive |
| | Acquisitive Conglomerate | |

Source: Rumelt (1974, p. 94).

Rumelt was unable to demonstrate conclusively the reason for the performance differences. However, he did suggest that they were related not to the diversity itself, but to the "central organizing principle used to manage diversity" (p. 95). He further speculated that some of the variation in observed strategy-related performance could be due to industry differences, but felt that the effects were not separable.

In a subsequent working paper, Rumelt (1977a) shifted focus from an investigation of firms that had maintained a constant strategy for at least a decade, to an investigation of the relationship between strategic change and financial performance. In this paper, he altered the categories associated with unrelated diversification somewhat. Recognizing that "rapid growth through acquisition may be a very transitory stage of corporate development" (p. 10), he settled on the categories of "Unrelated Concentrated" and "Unrelated Portfolio" to describe, not behavior or rates of growth, but firms comprised of a few large units or many smaller ones, respectively. The resulting revised classification scheme is presented in Table IV.

TABLE IV

RUMELT'S TEN CATEGORIES OF DIVERSIFICATION

| | |
|---|---|
| SB | Single Business |
| SV | Single Vertically Integrated Business |
| DV | Dominant Product Vertically Integrated Business |
| DC | Dominant Constrained |
| DL | Dominant Linked |
| DU | Dominant Unrelated |
| RC | Related Constrained |
| RL | Related Linked |
| UC | (now called MB) Multibusiness (a few large unrelated businesses) |
| UP | Unrelated Portfolio (many unrelated businesses) |

Source: Rumelt (1978).

As with his earlier study (Rumelt, 1974), this later paper also supported the existence of stable category effects. However, it also revealed a constant exodus from the Dominant Constrained category to Related and Unrelated Business categories from the mid 1960's through the mid 1970's, with lower overall performance results. In general, Rumelt posits the existence of a "defensive diversification" effect. That is:

> . . . firms which diversified out of the constrained categories almost seem to have 'falled out' of these higher performing categories, endured lower levels of profitability for five to seven years, and then diversified (Rumelt, 1974, p. 27).

Among the patterns of performance following such transitions, only those moving from Dominant Constrained to Related Constrained moved back to an above average level of return on capital. The others did not. The DC to RC group were also the only ones to demonstrate an improvement in Rumelt's risk ratio (a ratio of the average return on capital for a period to the standard deviation of returns on capital for the same period). Rumelt (1977a) notes that:

> The high variability shown by unrelated businesses, and especially Unrelated Concentrated firms, runs counter to the frequently expressed argument that far flung diversification should at least reduce the variability of a company's earnings stream (p. 19).

In a later working paper, Rumelt (1977b, 1982a) returned to the issue of industry effects left unresolved in his 1974 study. The question addressed was whether or not one could observe a correlation for the effects of industry profitability. This examination of the data revealed a regularly descending pattern of calculated residuals (differences between actual and "expected" return based on industry performance) from single businesses to conglomerates. Rumelt concluded:

> The declining pattern suggests that specialists are more profitable than generalists if the industry effect is held constant. In other words, given an industry, those specializing in it will tend to be more profitable than those for which it is a sideline (p. 13).

This work suggests the possibility of a continuous relationship between diversity and performance, in contrast to Rumelt's earlier (1974) conclusion that it was not diversity per se but the basis for diversity and its management that explained performance differences. The latter work is consistent with the population ecology model's theoretical treatment of specialists and generalists, as previously discussed.

## Further Tests and Extensions of Rumelt's Work

A number of recent studies have attempted to examine the results and conclusions presented in Rumelt's work, particularly his original (1974) study. Several of the studies discussed below suggest the importance of a consideration of environmental (task-environment or industry) effects in the study of the relationship between patterns of diversification and performance.

Montgomery (1979) undertook a replication and extension of Rumelt's (1974) study, questioning Rumelt's simple stated diversification-profitability linkage and his assumption that firm effects and industry effects were not separable (Rumelt, 1974). She took account of the results of Rumelt's working paper regarding industry effects (Rumelt, 1977b), but felt that his measures of industry profitability and concentration were so imprecise and highly aggregated, respectively, that the conclusions drawn were not acceptable. Montgomery sought instead to draw on the methodology of Industrial Organization Economics

(IO) to evaluate the separate effects on performance of certain market structure variables (Mason, 1939; Bain, 1968; Caves, 1977; Scherer, 1980).

In an attempt to replicate Rumelt's (1974) findings for simple performance differences among categories, Montgomery (1979) was unable to observe a significant effect among the six categories under examination, although she indicates that the results were in the appropriate direction. Montgomery then tested for category differences in market structure variables, including weighted market share, concentration ratios and market growth.

Significant effects were obtained in two categories. Unrelated Portfolio firms exhibited lower market shares and were positioned in less profitable and less concentrated markets. In contrast, Related Constrained firms were located in more profitable, faster growing and more highly concentrated markets than other firms. (Montgomery did not examine the question of firm structure.) These results led Christensen and Montgomery (1981, p. 338) to conclude that "differences in diversification strategy go beyond skeletal patterns of product linkages and include the characteristics of the markets in which firms participate."

Bettis (1981) used both non-interactive and interactive regression models to examine performance and the relationship between risk and return among firms in three of Rumelt's categories (Related Constrained, Related Linked and Unrelated). About two-thirds of his sample of 58 firms was drawn from Rumelt's (1974) original sample, and these firms were in the Related Constrained and Related Linked categories. The remainder of the sample consisted of Unrelated firms drawn "at random" from the Fortune 500. In this study, Bettis did not examine industry level data, nor did he look for inter- or intra-industry differences. His intent was to examine average differences among different types of diversified firms. However, he worked from both Rumelt's (1974) and Montgomery's (1979) findings in developing his independent variables.

For example, Rumelt speculated that related firms tend to participate in industries characterized by opportunities for differentiation and segmentation, and effectively exploit a "core skill". Thus, Bettis included ratios of advertising expenditures to sales and research and development expenditures to sales, to measure a large portion of differentiation and segmentation opportunities.

Montgomery's (1979) work suggested that Related Constrained firms participate in more highly concentrated markets and have higher market shares. Given her results, and standard arguments regarding the positive relationships among concentration, economies of scale and firm size, Bettis also included a measure of firm size. An additional entry barrier variable in the form of capital intensity was included. His measure of return was five-year average ROA, and the measure of risk used was the five-year standard deviation of ROA.

Bettis's (1981) results indicated that related diversifiers (1) outperformed unrelated diversifiers, (2) spent more on advertising than unrelated diversifiers, (3) achieved higher returns for research and development than unrelated diversifiers, and (4) were more capital intensive than unrelated diversifiers. The results further indicated that while his measures of risk and return on assets are positively related for large diversified firms, increasing levels of diversification do not necessarily result in a reduction of risk.

Although Bettis's (1981) study did not directly address the question of industry effects, his findings suggest that:

> . . . performance (measured by ROA) in large diversified firms is in some measure due to barriers to entry in terms of advertising, research and development and capital intensity. Since high levels of concentration are associated with high barriers to entry, this also supports Montgomery's (1979) view. Certain industries are more susceptible to developing barriers to entry than others. Those that are will eventually be characterized by the structural characteristics discussed by Montgomery (p. 390).

With respect to one potential entry barrier source given close attention in the study by Bettis (1981), he points out that firms with a relatedness based on a "core skill" of research and development may have been largely responsible for the performance advantage demonstrated by related diversifiers. In a later paper (Bettis and Hall, 1982), closer scrutiny is given to the fact that four of the six highest performers in the Related Constrained subsample of the earlier study were major participants in the pharmaceutical industry.

In this later study, the analyses were reworked to both include and exclude the pharmaceutical firms. The results indicated no statistically significant performance differences between Related Constrained and Related Linked diversification strategies, as had been reported by Rumelt (1974). Bettis and Hall suggest that at least some of the performance differences reported by Rumelt may be attributable to the presence of a number of pharmaceutical firms in the Related Constrained category, rather than to the differences in diversification strategy per se. That is, that the environment in which a firm is operating will, <u>ceteris paribus</u>, have an impact on the firm's economic performance. This conjecture is supported by Hirsch (1975) in a paper that relates institutional characteristics in the task and general environments to differential levels of profitability and effectiveness in two industries, including pharmaceuticals.

Furthermore, the Bettis and Hall (1982) paper reaffirmed the absence of a statistically significant difference in their measure of risk among diversification strategy categories. This suggests that risk reduction is not a valid rationale for selecting unrelated (as opposed to related) diversification. Unrelated firms did not demonstrate superior risk pooling characteristics. Thus, the understanding of the forces influencing such diversification activity, and its relationship to performance remains as area of research interest.

## Diversification Strategy, Structure and Size

It may be recalled that Bettis (1981) included an independent variable representative of firm size. He did not observe a significant effect of size on returns for Related Constrained firms, as he had hypothesized. This finding is consistent with that of Christensen and Montgomery (1981) and Beard and Dess (1981). In these cases, relative firm size within a given industry does not appear to be a powerful predictor of performance.

However, while size may not bear directly on performance, its role in strategy research cannot be dismissed lightly. A large study by Grinyer and Yasai-Ardekani (1981) examined, among other things, relationships among organizational size, diversification strategy and structure. Their results provided strong evidence that size was correlated with each of strategy and structure when controlling for the other. They suggest that "size is obviously the dominant, possibly intervening, variable with respect to both diversification and macro-organizational characteristics" (p. 479).

This conclusion is consistent with Rumelt's (1974) study and with observations summarized in a paper by Pethia (1982). In his review of Chandler's (1962) study, he suggests that "growth in size, not product diversification, led to problems that the multidivisional structure was designed to address" (p. 5). As a result of a review of a number of studies of shifts in strategy and structure, Pethia (1982) concludes:

> Data on size of firm from the American, French, German, and Japanese studies show that, in every country except Japan, firms with functional structures were smaller on the average than firms with one of the alternative structures. The data also show that, except in Japan, firms that had achieved some degree of diversification were larger on the average than single product firms. In other words, except in Japan, smaller firms were less diversified and had a functional structure (p. 19).

Pethia, like Grinyer and Yasai-Ardekani (1981), speculates that to a large degree, results indicating a direct causal effect of strategy on structure between strategy and structure may be accounted for by size.

With respect to the effects of structure on strategy, studies by Scott (1971) and Rumelt (1974) suggested that the multidivisional structure would exert a direct facilitative effect on growth through diversification. Results reported by Donaldson (1982a) cast some doubt on this relationship, although the study exhibited some inherent weaknesses.

The theoretical relationships among these firm-specific variables, and empirical studies of them, have continued to arouse considerable debate (Donaldson, 1982b; Grinyer, 1982). However, it should be noted that in all cases, the studies are conducted at a single level of analysis. That is, these firm-specific variables are examined only in terms of their relationship to one another.

## Size, Structure and Performance

Williamson (1975) hypothesized an information (rather than technology) imperative of organizational form. His M-form (multi-divisional) hypothesis suggests that the organization and operation of a large enterprise are not efficiently served by organization along functional lines (the U-form, or unitary form). Williamson proposed that due to limitations on rationality (Simon, 1961), information impactedness and individual opportunism, product flows through functional divisions place increasing demands for control and coordination on these functional divisions.

The M-form involves "substituting quasi-autonomous operating divisions (organized mainly along product, brand or geographic lines) for the functional divisions of the U-form structure" (Williamson, 1975, p. 136). A number of simulation studies of structure and performance (Armour and Teece, 1978; Obel, 1978; Steer and Cable, 1978; Burton and Obel, 1980), suggest that when a firm is relatively small, such that effective control can be realized a centralized U-form may be appropriate. However, as the firm grows larger, centralized control is no longer feasible. The studies seem to suggest that large firms have a choice between a decentralized U-form and a decentralized M-form, but that the M-form is most appropriate when growth is accomplished through diversification (Burton and Obel, 1980). Thus, both diversification and divisionalization may be related to performance.

Drawing upon the relationships set forth in the literature cited above, a holistic model of the process of firm diversification is developed. The hypothesized structural relationships in the model are summarized below. A more specific development of the hypotheses and the model will be set forth in the following chapter.

## General Propositions

1. Increasing levels of observed diversification and divisionalization among firms in general in the post World War II era are related to one another indirectly, but are the direct results of different sets of factors.
    a. The effects of environmental munificence and dynamism bear directly on diversification behavior, while
    b. the direct influence of environmental complexity is reflected in structural complexity.
    c. The relationship between diversification and divisionalization is mediated by organizational size.
2. Economic measures of firm performance reflect direct, indirect and interactive effects of the environmental and organizational attributes under investigation. Performance may be considered a multidimensional construct, two dimensions of which are considered in the present research. The first includes internal "accounting measures" of performance generated for purposes of organizational decision making. The second includes evaluations of the organization as an investment by the marketplace.

With respect to this last proposition, it is relevant to the understanding of the implications of the proposed model to reflect on Thompson's (1967) statements regarding the assessment of organizations. Thompson suggests that regardless of the basis for assessment (efficiency, instrumental or social tests), the important question for the organization as a whole refers not to what the organization has accomplished but to its "fitness for future action" (Thompson, 1967, p. 88). This "fitness" must, by definition, be judged in terms of uncertainty, and will thus be measured in "satisficing" terms (the reader may recall the population ecology model's emphasis on relative performance). Such terms are typically in the form of economic information in a for-profit organization such as those to be included in the proposed research. Furthermore, Thompson (1967) notes that:

> Even if the organization itself were convinced of its readiness for the future, its measurements must lead significant others to the same conclusion. Their judgments, right or wrong, are part of the reality the organization must face (p. 88).

It is of considerable interest in the present research to examine whether or not the set of hypothesized relationships derived from the literature and presented in the following chapter, will hold in the context of a holistic "system" or "process" model.

## CHAPTER III

## DEVELOPMENT OF A HOLISTIC MODEL

The purpose of this chapter is to develop a holistic model of the environment-strategy-performance interface (ESPI). The constructs selected for inclusion in the model are those that previous research has suggested are important. The hypothesized specification of relationships among them is derived primarily from the theoretical perspective of the population ecology model. Thus, they are reflecting the notions of selection and adaptation as they relate to populations of organizations.

Certainly other relationships might be specified among certain of the components of the model in the context of some other theoretical perspective. The approach used here was adopted to provide theoretical consistency for the model as a whole.

Each construct included in the model will be defined, and its place in the scheme of relationships made explicit. The model will then be ready for the process of empirical testing, which involves operationalization of the constructs, data collection and the appropriate analysis. These processes will be described in the following chapters.

### The Nature of the Constructs

In the development of theory, three major types of concepts may be employed: theoretical concepts, derived concepts and empirical concepts (Bagozzi and Phillips, 1982). Both theoretical and derived concepts are unobservable. They are different, though, in that theoretical concepts represent the highest level of abstraction, and their meaning may be given by definition in the conceptual terminology of theory as well as by connections to empirical concepts. Derived concepts, on the other hand, are given at a lower level of abstraction and must be tied directly to empirical concepts.

Empirical concepts refer to "properties or relations whose presence or absence in a given case can be intersubjectively ascertained, under suitable circumstances, by direct observation" (Hempel, 1965, p. 22). They include records of observable phenomena to which numerical or symbolic coding may be assigned. For the remainder of the paper, concepts will be treated in the following manner: theoretical concepts will describe the domain of the study, while derived and empirical concepts will comprise the model. The latter will be referred to as theoretical (unobserved) constructs and measured variables, respectively.

## Domain of the Study

The literature reviewed in the preceeding chapter suggests that in the study of organizational actions related to growth and survival, it is important to include a consideration of four major concepts. These include the environment, the organization's relationship to that environment in terms of its strategy and structure, and the results of that relationship in terms of performance variables. These concepts, which form the domain of the proposed study, are defined as follows:

1. Environment--Those forces external to an organization's boundaries.

2. Strategy--The pattern of decisions in an organization that reveals its mission, character, goals and objectives. At the corporate level, this concept it defined in terms of organizational domain.

3. Structure--The relatively enduring allocation of work roles and administrative mechanisms that creates a pattern of interrelated work activities and allows the organization to conduct, coordinate and control its work activities. At the corporate level, this concept is defined as the macrostructure of the enterprise, in terms of organizing along functional or divisional lines.

4. Performance--Fitness for future action.

## Constructs in the Model

This section will present the specific constructs used in the development of the model, and the definition of each. The specification of the relationships among them will be presented in the next section.

The constructs used in the development of the ESPI model are derived from the domain of theoretical concepts. In certain cases, a multidimensional construct will be presented in the model that, for purposes of empirical testing will be represented by a single dimension of that construct. Although this simplification may reduce the understanding of the nature of relationships among multidimensional constructs to some degree, it is necessary for the process of submitting the model to empirical test.

### Exogenous Constructs

Exogenous constructs are those whose values are determined outside the system. They are considered as inputs to the model ("given"), and are never modeled as a function of any other construct. Relationships among exogenous constructs are not specifically hypothesized. In experimental terms, they may be considered the independent variables (Bagozzi and Phillips, 1982). The exogenous constructs in the ESPI model are dimensions of the task environment, including munificence, dynamism and complexity, as suggested by Dess and Beard (1982). Each will be defined individually below. For the purposes of the present research, the task environment is defined as those parts of the environment that are relevant, or potentially relevant, to goal setting or goal attainment for a given firm. The assumption is made that the concept of task environment as defined above may be extended to decision making at the corporate level, although the term is more often applied to business level analysis. This assumption will be discussed in greater detail in the following chapter.

Environmental Munificence. Munificence is defined as the capacity of the environment to support sustained growth. The literature associated with the population ecology model or resource dependence models, as well as the literature associated with the traditional Industrial Organization paradigm (Bain, 1968; Caves, 1977; Scherer, 1980), all suggest the existence of strong relationships between environmental characteristics and organizational characteristics such as strategy or economic performance.

Environmental Dynamism. Dynamism is defined as volatility in the task environment. It is generally considered to imply increasing rate of change and unpredictability of change. The population ecology model suggests that dynamism will affect the organization's pattern of domain specialization or generalization.

Environmental Complexity. Complexity is defined in terms of the heterogeneity and concentration of task environment elements. This dimension of the environment affects information processing requirements, and interorganizational relationships.

Endogenous Constructs

As stated by Bagozzi and Phillips (1982):

> Endogenous theoretical constructs are functions of, predicted by or caused by other theoretical constructs. They are thus dependent on other variables in a functional, predictive or causal sense. (They) may additionally serve as antecedents to other endogenous concepts. Similarly, intervening and moderating variables are endogenous concepts because they are both dependent upon and influence other variables (p. 480).

The endogenous constructs in the ESPI model are the dimensions of organizational action reviewed in the preceeding chapter: the diversification component of corporate level strategy, organization size, the divisionalization component of corporate level structure and two constructs related to performance assessment. The latter reflect an internal assessment dimension and an external assessment dimension. Each of these will be defined below.

Corporate Level Strategy: Diversification. This construct defines the businesses (or domains) in which an organization will compete (or operate), and patterns of resource allocation considering the enterprise as a whole. The degree of diversification reflects both the number of and linkages among these domains.

Organization Size. This construct represents the notion of organizational magnitude.

Corporate Level Structure: Divisionalization. This construct reflects the degree to which the organization's structure is divided into several autonomous or semi-autonomous units. The degree of divisionalization reflects both the autonomy of, and the bases for, divisions.

Organizational Performance. Performance is assumed to be a multidimensional construct. For the purposes of the present research, it is treated in terms of two dimensions of economic performance, to include information related to assessments by "significant others" as well as organizational criteria (Thompson, 1967). They are defined as follows:

1. "Internal" Performance Assessment--The dimensions of performance used by organizational decision makers to assess the efficiency of past and current organizational activities, and to shape decisions regarding future activities.

2. "External" Performance Assessment--The dimension of performance that reflects the overall desirability of the organization and an investment.

## Specification of Relationships

The hypothesized relationships among the constructs are presented below. This specification of the model reflects both the existence of the hypothesized relationships and their temporal order.

They are divided into two major groups: the relationships between exogenous and endogenous constructs, and the relationships among endogenous constructs. The manner in which they are stated is consistent with that used by Bagozzi (1981) in the development of a complex system of relationships.

### Exogenous/Endogenous Relationships

H1: Firm strategy is a function of environmental munificence.

H2: Firm strategy is a function of environmental dynamism.

H3: Firm size is a function of environmental munificence.

H4: Firm structure is a function of environmental complexity.

H5: "Internal" performance is a function of environmental munificence.

H6: "External" performance is a function of environmental munificence.

<u>Endogenous/Endogenous Relationships</u>

H7: Firm structure is a direct function of firm size and an indirect function of firm strategy.

H8: Firm size is a function of firm strategy.

H9: Firm strategy is a function of firm size.

H10: Firm strategy is a function of firm structure.

H11: "Internal" performance is a function of firm strategy.

H12: "Internal" performance is a function of firm structure.

H13: "External" performance is a function of firm strategy.

H14: "External" performance is a function of firm structure.

In the causal ordering of the model described above, it has been hypothesized that the performance dimensions receive direct effects from environmental munificence, firm strategy and firm structure. However, given the nature of the system of relationships, they also receive indirect effects from all other constructs in the model.

It should be noted that, for purposes of empirical testing, the assumption of linearity must be made. This assumption allows for the use of linear structural equations. The presence of non-linearity in the "true" relationships may result in an underestimation of that true relationship. However, as will be discussed more fully in a subsequent chapter, the method selected for empirical testing is quite robust over non-linearity.

Also for purposes of empirical testing, feedback, or simultaneity, is not explicitly hypothesized in the model (with one exception involving the strategy structure, size constructs). Such exclusion does not deny the existence, or even the importance, of these effects, but their inclusion would make it impossible to estimate all of the relationships. The paths chosen are those whose importance is most strongly asserted by the literature.

A conceptual representation of the constructs and hypotheses is presented in Figure 2. The operationalizations of the constructs in preparation for empirical testing will be described in the following chapter.

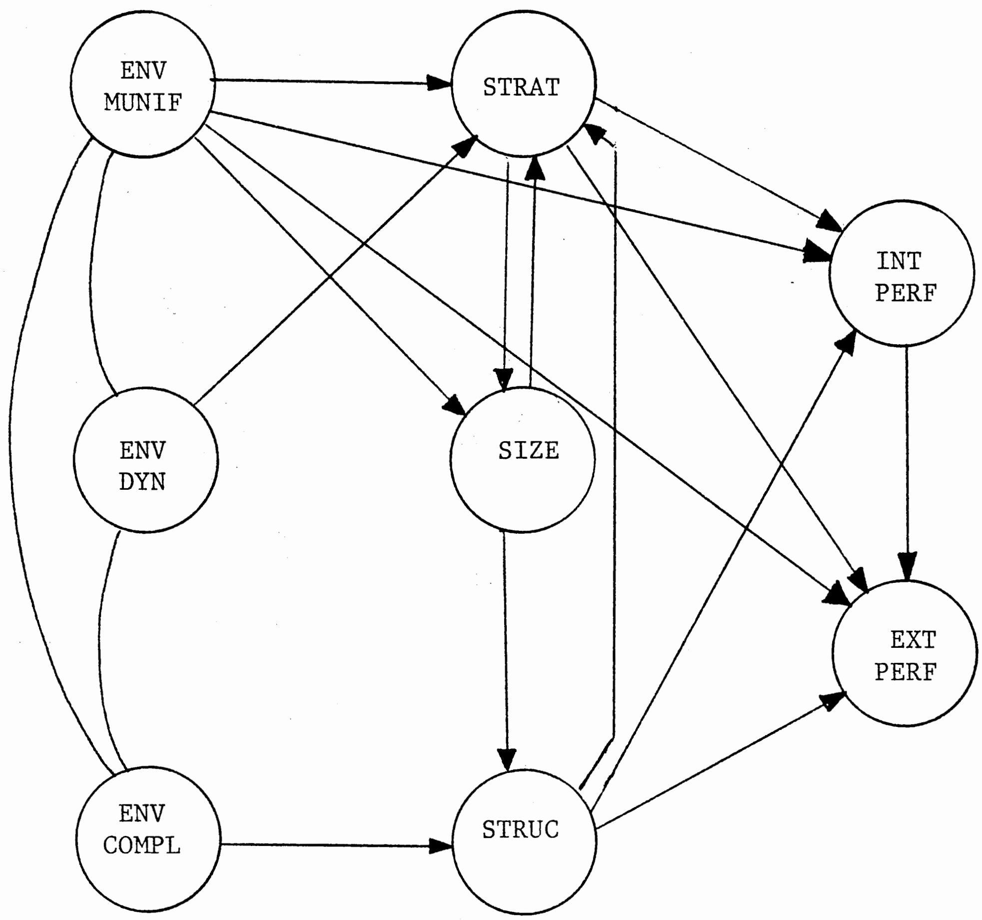



Figure 2. A Conceptual Representation of the ESPI Model

# CHAPTER IV

## OPERATIONALIZATIONS, SAMPLE AND DATA COLLECTION

This chapter will present descriptions of the measured variables selected to serve as indicators of the constructs in the model and the rationale underlying their selection. It will further provide information regarding the sources from which the data are collected. Finally, it will present a general description of the firms selected for study.

Before discussing the variables in the study, the first section of the chapter will be devoted to a discussion of the use of multiple indicators of unobservable constructs. This issue relates directly to considerations of validity and reliability.

### The Use of Multiple Indicators

The typical linear regression model consists of a set of independent variables and a dependent variable. Each variable represents a theoretical construct. It is assumed that each construct is measured without error by the single variable. That is, the assumption is made of perfect correspondence between variable and construct with no measurement error.

In order to avoid such an unrealistic assumption, more empirical information is required. That is, two, three or more indicators of each theoretical construct are desirable. The method for incorporating such a system of indicators into the overall model will be discussed in the following chapter.

There are a number of problems that can arise in the attempt to choose "good" indicators. One such problem is the influence of non-systematic or random measurement error, that is, the problem of reliability. A number of psychometric techniques have been developed to approach the problem of random measurement error (Nunnally, 1976).

In the case where error is not random, the problem becomes one of validity--the extent to which the indicator measures what the researcher claims it does. To the extent that an indicator is reliable, then, it contains systematic sources of variation. Validity is the degree to which this systematic component is related to the abstract construct as it was theoretically defined.

The assumption that measurement error is random simplifies the task of estimating and correcting for unreliability. All that are required are some fairly simple assumptions and models. Validity is much more difficult to deal with, since it involves the extent to which systematic sources of variance other than the theoretical construct are affecting the indicator. But the construct is by definition unobservable. It is therefore impossible to be certain that there is only a single source of systematic variance in the measure.

The use of structural equations models, as described in the following chapter, allows the use of multiple indicators of theoretical constructs, the explicit introduction of measurement error, and the formal specification of the relationships between the theoretical construct and the observable indicators. Furthermore, it provides for the assessment of convergent, discriminant and predictive validity of the constructs in the model (Aaker and Bagozzi, 1979; Burnkrant and Page, 1982). For this reason, multiple indicators of theoretical constructs were used whenever possible. However, not all constructs were amenable to such treatment. Of necessity, in such cases, single indicators were used, but with the understanding that such use assumes perfect correspondence between indicator and construct.

The following sections describe the indicators selected for the present research, the rationale underlying their selection, and the sources from which values for these indicators are obtained.

## Indicators of Exogenous Constructs

The exogenous constructs in the ESPI model are task environment dimensions, as suggested by Dess and Beard (1982). As previously mentioned, the assumption is made in the present study that the concept of task environment can be generalized to decision making at the corporate level. That is, that the task environment of a firm, even a diversified firm, may be defined in terms of a major line of business.

This is somewhat easier at the business level than at the corporate level of analysis. The most serious problem facing the researcher in the attempt to identify the relevant task environment at the corporate level is the recognition of the possibility of differential impact among the multiple operating environments. Thus, this assumption is used with the greatest caution, for its use may leave a substantial amount of information unaccounted for in the case of highly diversified firms. Despite such problems, it is suggested that this assumption provides a basis for addressing the issues in the model, at least in an exploratory fashion. The manner in which the assumption is applied to the model is described below.

Identification of the Task Environment

The basis for operationalization of task environment characteristics is the concept of industry, specifically the classification code assigned to each firm in Standard and Poor's COMPUSTAT files. These industry classification codes conform closely to the Bureau of Budget Standard Industry Classification (SIC) codes.

The SIC is a four-digit system of classification under which a concern may be identified according to its activity. The first digit represents the sector of the economy (e.g., manufacturing, trade, etc.). The first two digits together identify the major industry group within the sector (e.g., 20, food and kindred products). The third digit reflects a major product group (e.g., 208, beverages). The fourth digit classifies a firm by a particular product or process within that major product group (e.g., 2086, bottled and canned soft drinks).

The use of the industry concept as a suitable aggregate for the purposes of studying organizational actions has been subjected to critical review, and generally has been supported (Dess, 1980). However, there are a number of problems inherent in the SIC scheme. The Bureau must use terms that facilitate accurate reporting by businesses. Scherer (1980, p. 60) states that this "usually means that they must follow the way firms have grouped or segregated their production operations. Emphasis is often on similarity of production processes, which may not reflect competitive interrelationships." Furthermore, there is substantial variability in the breadth of the SIC classes, and an underlying assumption of "equal dissimilarity" between distinct SIC classes (Rumelt, 1982b).

Some of these problems are minimized in the method of industry code assignment used for the Compustat files. In developing those files, classification numbers are assigned by analyzing (1) the product line breakdown reported in each firm's 10-K report, (2) stock reports and (3) annual reports. The product line accounting for the largest percent of sales determines the classification. As a result, the numbers are assigned in a way that, to some extent, reflects the level of specificity of the task environment. That is, more general classifications (e.g., 2-digit as opposed to 4-digit) are assigned to firms involved in more than one aspect of an industry (such as General Electric, for example).

In general, the SIC-based scheme provides the single most consistent basis for assessing task environment attributes such as those employed in the present research. However, it is important to remain cognizant of the assumption underlying its use with increasing dissimilarity among the various components of a diversified firm.

Certain other problems aries in the attempt to use the concept of industry as defined above. These issues and the decisions and assumptions made in order to deal with them are described below.

1. Rumelt's (1978) data bank includes each firm's industry classification number as assigned by Compustat Services as of 1974. However, the Compustat Service does not retain archives of old tapes, such that one might identify the constituents of a given industry classification as it existed at that time. Classifications are reviewed annually and revised accordingly. Thus, a firm's file contains only its most recent classification.

In order to address this problem, the assumption was made that the concept of "industry" is a relatively stable one, and that the constituents of a given classification as of 1982 are a reasonable reflection of industry membership as of 1974. Furthermore, any firms in the data bank that were reclassified at the 2-digit (major industry group) or 3-digit (major product group) level between 1974 and 1982 were removed from the sample, despite the fact that the reasons for a shift in major line of business might be related to the very factors under investigation in the present research. The result will be a conservative approach to the modeling process.

2. Certain 4-digit classifications include only two or three firms. A small number of firms in the sample fall in such classifications, such as A. E. Stanley Manufacturing Company (2046, wet corn milling).

In such cases, the task environment was defined in terms of the 3-digit major product group of which that firm's 4-digit classification was a component (in this case, 204, which includes 2041, flour and other grain mill products, and 2048, prepared feeds for animals).

In general, the approach to task environment definition and measurement is consistent with that used by Dess and Beard (1982). However, the specific procedures used differ somewhat from theirs. Dess and Beard gathered data on certain environmental characteristics (described below) from the Census of Manufactures. For the purposes of the present study, it was felt that the data reporting processes may be somewhat "cleaner" in the development of the Compustat files than in the compilation of census data. Furthermore, major revisions were made in the numbering and definition of some industries by the Bureau of Budget in 1972 which would have a significant impact on attempts to track changes over the period of interest (discussed below) within a given classification. The method used in the present study analyzes such changes based on industry constituents as described above.

## Environmental Dimensions: Munificence and Dynamism

Dess (1980) hypothesized that five of Aldrich's (1979) six environmental dimensions would load onto three factors which he called munificence, dynamism and complexity. The factor structure that resulted from Dess's analysis is presented in Table V. The table reveals that the operationalizations associated with the sales, total employment and value added by manufacture variables demonstrated consistently high loadings on their respective factors, with relatively low loadings on the others. With one exception (instability of total employment), they all exhibit communalities above 0.50. Thus, measures were selected from the Compustat files that were consistent with the nature of these variables as defined and reported by the Census Bureau (the definitions of both sets may be found in the appendix). The application of each in terms of the munificence and dynamism dimensions is described below.

Munificence. The indicators of munificence are the growth rates of net sales (GSALES), employment (GEMP), and operating income (GOPINC) in the task environment (industry). As noted above, the definitions of these variables as recorded on the Compustat database are given in the appendix. Using annual figures, the natural logarithms of the net sales, employment and operating income data are treated in a quasi-time series approach over the five year period preceeding the model year ("quasi-" because five data points are used in the regressions rather than the 30+ commonly employed in time series analysis). The growth measure of each is the antilog of the regression slope coefficient.

TABLE V

DESS AND BEARD'S ENVIRONMENTAL (INDUSTRY) VARIABLES: FACTOR STRUCTURE AND COMMUNALITIES

| Industry Variable | Factor One Munificence: Factor Loadings ($a_{j1}$) | Factor One Munificence: Squared Factor Loadings ($a_{j1}^2$) | Factor Two Complexity: Factor Loadings ($a_{j2}$) | Factor Two Complexity: Squared Factor Loadings ($a_{j2}^2$) | Factor Three Dynamism: Factor Loadings ($a_{j3}$) | Factor Three Dynamism: Squared Factor Loadings ($a_{j3}^2$) | Communalities ($h_j^2$) |
|---|---|---|---|---|---|---|---|
| 1) Growth--Sales | .92095 | .84815 | -.07482 | .00560 | .04196 | .00176 | .85551 |
| 2) Growth--Price Cost Margin | .89898 | .80817 | -.10973 | .01204 | .06985 | .00488 | .82509 |
| 3) Growth--Total Employment | .89310 | .79763 | .09359 | .00876 | -.05010 | .00251 | .80890 |
| 4) Growth--Value Added | .96117 | .92385 | -.08532 | .00728 | .03215 | .00675 | .93788 |
| 5) Growth--No. of Establishments | .46774 | .21878 | .11835 | .01401 | -.00685 | .00004 | .23283 |
| 6) Diversity of Inputs | -.18339 | .03363 | -.15073 | .02272 | -.04804 | .00231 | .05866 |
| 7) Specialization Ratio | -.02895 | .00084 | -.30621 | .09376 | -.53626 | .31726 | .41186 |
| 8) Geographical Concentration--Sales | -.04131 | .00171 | .97554 | .95168 | .06298 | .00397 | .95736 |
| 9) Geographical Concentration--Value Added | -.01437 | .00021 | .96786 | .93675 | .07796 | .00608 | .94304 |
| 10) Geographical Concentration--Total Employment | .00989 | .00010 | .96892 | .93881 | .98547 | .00731 | .94622 |
| 11) Geographical Concentration--No. of Establishments | -.08894 | .99755 | .83587 | .69868 | -.06210 | .00375 | .70998 |
| 12) Instability--Sales | .08894 | .00791 | -.09246 | .00855 | .83417 | .69583 | .71229 |
| 13) Instability--Price-Cost Margin | .19111 | .03652 | .07399 | .00547 | .65123 | .42410 | .46609 |
| 14) Instability--Employment | -.19607 | .03844 | .04213 | .00178 | .64185 | .41197 | .45219 |
| 15) Instability--Value Added | .02228 | .00050 | -.02898 | .00084 | .92508 | .85577 | .85711 |

TABLE V (Continued)

| Industry Variable | Factor One Munificence: Factor Loadings ($a_{j1}$) | Factor One Munificence: Squared Factor Loadings ($a_{j1}^2$) | Factor Two Complexity: Factor Loadings ($a_{j2}$) | Factor Two Complexity: Squared Factor Loadings ($a_{j2}^2$) | Factor Three Dynamism: Factor Loadings ($a_{j3}$) | Factor Three Dynamism: Squared Factor Loadings ($a_{j3}^2$) | Communalities ($h_j^2$) |
|---|---|---|---|---|---|---|---|
| 16) Indirect Effects on Industry Output | -.11866 | .01408 | -.10979 | .01205 | .00600 | .00004 | .02617 |
| 17) Intermediate Mkt. Orientation | -.15797 | .02495 | -.14126 | .01995 | .31519 | .09934 | .14424 |
| Eigenvalue | | 3.92140 | | 3.73708 | | 2.83367 | 10.49215 |
| Percent of Common Variance | 35.37 | | 35.62 | | 27.01 | | 100.00 |
| Percent of Total Variance | 23.07 | | 21.98 | | 16.67 | | 61.72 |

Source: Dess and Beard (1982).

Dynamism. The indicators of dynamism are the instability of growth in net sales (DSALES), employment (DEMP), and operating income (DOPINC) in the task environment. The measure of each is derived from the equations described above, and consists of the antilog of the standard error of each regression slope coefficient.

## Environmental Dimensions: Complexity

There are two indicators of the complexity dimension. The first is based on a dynamic measure of industry concentration (DYCON) developed by Grossack (1965). It may be thought of as an index of a trend toward (or away from) dominance by large firms in the task environment. This trend is represented by a linear regression of the "terminal" year market shares of all the firms in a given industry upon their shares in the initial year. In this case, the terminal year (1973) is the year preceeding the model year, and the initial year is the terminal year minus four (1969), providing a five-year index.

The resulting regression coefficient will "differ from one in an amount and direction that is a function of a weighted average of the relative changes from year X to year Y in the deviations of the firms' market shares from their means" (Grossack, 1965, p. 303). That is, a regression coefficient greater than one suggests that the larger firms of the initial year increased their market share, while a coefficient less than one suggests that larger firms of the initial year were not able to maintain their market share. Thus, given the relatively short time period involved, the regression coefficient values provide evidence of the presence of monopoly power in the industry or, on the other hand, evidence of a lack of (or erosion of) such power.

The underlying rationale for this measure stems from the Williamson (1965) and Starbuck (1976) arguments mentioned in the previous chapter. That is, it is suggested here that industries exhibiting strong monopoly power (concentration) will tend to present a less complex task environment to their constituents than those exhibiting a lack of, or erosion of, monopoly power. The erosion may be due to the growth of smaller firms, the entrance of new firms, or some combination of such factors.

The values for this measure are obtained from sales data reported on the COMPUSTAT tapes, combined primary, supplementary and tertiary industrial files. Market share figures are computed as a proportion of total sales in the industry with which a given firm is identified as described in the previous sections.

The second indicator of the complexity construct is a simple measure based on the firm's industry classification. Each organization is given a score of two (02), three (03), of four (04) to reflect the level of specificity of its industry classification in the COMPUSTAT files (02 = 2-digit, etc.).

The second measure (SIC) provides information on the level of specificity of industry identification, thereby reflecting a firm's task environment. Organizations identified only at the 2-digit level (such as General Electric) are assumed to be facing a far more diverse and complex task environment than those whose product lines are more narrow, and thus may be identified at the 3-digit or 4-digit level. Taken together, these indicators are intended to provide a rough multidimensional perspective on task environment complexity.

It should be noted that this approach to the scoring is taken in order that both indicators of the complexity dimension be consistent. Higher values of the first indicator, by definition, indicate less complexity, and vice versa. Therefore, higher scores on the second measure are used to indicate less complexity. To interpret the analysis, then, a positive relationship between complexity and other constructs is actually indicated by a negative relationship.

## Indicators of Endogenous Constructs

The endogenous constructs in the ESPI model include diversification, divisionalization, size and performance. The indicators of those constructs and the rationale underlying their selection are given below.

### Stragey

Strategy (STRAT) is one of two constructs that, of necessity, is represented by a single indicator. This indicator reflects a degree of diversification, scored from one to ten. The values for this variable are obtained from Rumelt's (1978) strategy and structure databank. They are based on the categories as used in that databank. The categories were presented in Table IV.

This treatment of the categories is similar to that by Grinyer and Yasai-Ardekani (1981). Further support is provided by the fact that (1) initial category assignments are based on a continuous specialization ratio, and that (2) Montgomery's (1982) results suggest that the patterns Rumelt studied (constrained vs. linked) are associated with a degree of diversification, not just a type of linkage.

A "strategic" measure of diversification is selected, as opposed to a simple product or business count method for example, for a number of reasons. These reasons relate primarily to the scope of the question at hand. While business count methods may be appropriate for investigating differences between diversified and non-diversified firms, such methods are less useful for investigating differences among diversified firms. As suggested by Pitts and Hopkins (1982):

> The sheer number of diversified firms' businesses generally will have far less influence on the variables of interest to researchers (e.g., organizational structure, performance) than will the strategy underlying firm diversification and growth (p. 625).

The authors further suggest that empirical findings provide support for the notion that knowledge of between-group differences has come primarily from business count methods, while that of within-group differences has come from investigations using strategic measures. For example, among studies of organizational performance, results based on business count methods have been inconclusive (Gort, 1962), but "interesting and significant" findings have resulted from the use of strategic measures (Rumelt, 1974).

## Structure

Structure (STRUC) is the second construct for which a single indicator is employed. This variable reflects the degree of divisionalization, and is scored from one to five. Values are obtained from Rumelt's (1978) databank, and are based on the categories used therein.

Arguments of a similar nature to those discussed above may be made for the selection of divisionalization as an indicator of structural complexity. The levels of complexity are based on Rumelt's

(1978) scheme, which is presented in Table VI. This approach to representing organizational structure is useful, given the questions of interest in the present research, as it addresses the dimension of structure in terms of the enterprise as a whole.

TABLE VI

RUMELT'S CATEGORIES OF STRUCTURAL COMPLEXITY

| |
|---|
| Functional Organization |
| Functional with Subsidiaries for Separate Products |
| Geographic Divisions (U.S.)<br>World-Wide Geographic Divisions |
| Product Division Organization |
| Holding Company Organization (Small HQ Office) |

Source: Rumelt (1978).

Size

Size is represented by two indicators, dollar sales volume (SVOL) and the natural logarithm of net assets (LNNA). With respect to this construct and its indicators, it is interesting to note that while many studies have included a consideration of size, often little attention is paid to defining this dimension in a clear or consistent fashion. Frequently, size has been defined in terms of the number of full time, or full time equivalent, members of the organization, either the actual number or some transformation such as a logarithm of the number. However, as Aldrich (1972) points out, there are several ways of measuring size. He suggests that theorists often mean by size the magnitude of an organization's output (such as sales volume or volume of product) or magnitude of assets. Aldrich further criticizes the use of employment as a causal variable on theoretical grounds. He argues that decisions regarding technology and scale of operations are made prior to increases in size of the workforce.

Jackson and Morgan (1978) suggest that the measure of size selected should depend upon the subject of the investigation. If, for example, one is concerned with the effects of increasing numbers of employees on organizational structure, then employment is a reasonable measure. However, if one is investigating structure and technology or the effect of the environment, for example, then size measures should include measures of sales and assets. Given the nature of the issues under investigation in the present research, the assumption is made that indicators of size in terms of sales volume and net assets provide more relevant information for the questions of interest.

### Performance

The indicators of performance are selected in the attempt to capture the bases for judging "fitness for future action" by internal and external constituencies. As noted in the review of the literature, survival among profit-seeking organizations is heavily dependent upon economic performance, albeit in a relative sense. Thompson (1967, p. 88) suggested that both organizational decision makers and "significant others" will be making judgments regarding "readiness for the future". It is suggested here that those judgments will be reflected in somewhat different, although related, information.

Internally Assessed Performance. This construct is represented by three indicators. These include risk adjusted measures of average (1) return on assets (XROA), (2) return on equity (XROE), and (3) return on investment (XROI) over the five year period following each of the two model years (1967; 1974). Values for these indicators will be obtained from COMPUSTAT tapes.

These indicators represent a basis for "fitness" assessment by internal constituents in terms of returns adjusted for firm risk. These particular measures were selected in order to test a commonly held assumption that they are all equally valid measures of performance, such as suggested by Bettis (1981, p. 384). Risk is included in the interest of addressing issues related to portfolio theory (Markowitz, 1959).

Portfolio theory suggests that diversification reduces total risk, or variability in earnings of one's investment. The concept of corporate strategy (Andrews, 1980) has implicitly and explicitly assumed that both risks and returns can be managed, and the process of diversification is often presumed to serve a similar purpose for corporate earnings as it does for personal portfolio management. Recent research by Bettis (1981) has injected some doubt regarding such assumptions. His findings suggest that "increasing the level of diversification does not result in a reduction of the fluctuations of return on assets" (Bettis, 1981, p. 390).

Externally Assessed Performance. This construct is represented by two indicators, market value and capital market performance. Market value (MKTVAL) is calculated as

$$(GMR_i - RFR_k)/Beta \quad (1)$$

where $GMR_i$ = geometric mean annual stock return, firm i,

$RFR_k$ = geometric mean annual riskless rate, and

Beta = measure of systematic risk.

Capital market performance (SROR) is $GMR_i$ alone, and is calculated as the combined rate of return on common stock for a given period, considering all dividends as being reinvested in the stock of the firm throughout the period of interest.

These indicators are selected to reflect assessment by external constituents. The market value provides an indication of return given a consideration of market risk. Performance in the capital market (McEachern, 1975) assesses a firm's performance through valuations in the capital market. In McEachern's study, they varied considerably with variations in share price appreciation during the period 1963-1972.

## The Sample

Values for the observable variables are collected on firms in Rumelt's (1978) strategy and structure databank. Most of the firms in this databank formed the original sample for his dissertation (Rumelt, 1974). The later version was extended in time, increased in size, and showed annual data (1949-1974) rather than simply point data at ten-year intervals. For these reasons, any discrepencies between the information in the databank and that in the dissertation constitute corrections (Rumelt, 1982a).

The firms selected for analysis are those in the databank that meet the following criteria:

1. Not an object of acquisition or merger in the time frame of the study.

2. Identified by 2-digit SIC code between 20 and 39 (manufacturers).

3. All necessary data are available.

4. No shift in major industry group or major product group classification between 1974 and 1982.

Of the 262 firms in the databank, 193 meet the first two criteria. Incomplete data and/or inability to meet the fourth criterion further reduced the number of usable firms to 110, the number used in this study.

## Summary

This chapter has presented the operationalizations, data sources and the composition of the sample. The next chapter will describe the procedures of analysis used to submit the ESPI model to empirical test.

# CHAPTER V

# ANALYSIS

The method used in the process of submitting the ESPI model to empirical test is generally referred to as causal modeling and is based on the general linear model. Through the work of Jöreskog (Jöreskog and van Thillo, 1972), Bentler (1980), Bagozzi (Bagozzi, 1980; Bagozzi and Phillips, 1982) and others, researchers in a number of disciplines have become aware of the usefulness of systems of linear structural equations in the analysis of general cause and effect relationships.

This chapter presents a discussion of the use of a causal modeling approach. This is followed by a discussion of the issues of specification and identification of the model. Next, the process of hypothesis testing and theory development is presented. The last section deals with some of the assumptions and general strengths and weaknesses of the general linear model.

## Causal Modeling

It is unfortunate that in most organizational research, there exist few formal mechanisms for integrating statements of theory with empirical tests of theory. Typically, theory is formulated in abstract terms, but its predictions are tested using only concrete observations, leaving the link between theoretical constructs and their measurement either unspecified or unverifiable (Bagozzi and Phillips, 1982).

This problem is of particular importance in organizational research, since many of the phenomena of interest both receive and exert influence in systems of complex relationships, in both sequential and simultaneous fashion, rather than in independent bivariate relationships.

## A Structural Equations Model

The general linear model provides a comprehensive scheme for representing all of the elements and relationships of a theory in a single structure. The foundation for such an approach is the construction of a theoretical model of the relationships of interest, that is, a causal model. To clarify the use of this term, it is important to note that, in the construction of "causal" models, one is not necessarily attempting to identify strict cause and effect relationships. As Bentler (1980) notes:

> It is not necessary to take a stand on the meaning of "cause" to see why the modeling process is colloquially called causal modeling. The word "cause" is meant to provide no philosophical meaning beyond a shorthand designation for a hypothesized unobserved process, so that phrases such as "process" or "system" modeling would be viable substitute labels for causal modeling (p. 420).

Thus, the use of the word "causal" is a colloquialiam. In fact, the model provides statistical analyses based on assumptions of cause and effect derived from theory.

The model represents relationships among theoretical and derived constructs (unobserved, latent, or unmeasured variables), and the empirical concepts selected as indicators of the unobserved constructs. Relationships between unobserved constructs and measured variables are then specified in mathematical form to obtain a model designed to explain the statistical properties of the measured variables in terms of the latent ones. It is often assumed in experimental design and analysis that the independent variables are measured without error, and that a causal relationship, if present, is between measured variables. In a structural equations model, one might say there are really two "theories". The first is the theory providing causal links between the theoretical constructs. The second defines the rules of correspondence between the theoretical constructs and their indicators (Wheaton, Nuthen, Alwin and Summers, 1977; Aaker and Bagozzi, 1979).

The approach is not unlike that of confirmatory factor analysis. Whereas in pure exploratory factor analysis the researcher collects a set of variables and subjects them to factor analysis with no knowledge of what to expect, in confirmatory factor analysis the factors are conceptualized and interpreted, and the variables which measure each factor are identified prior to the estimation of the parameters. It is not difficult to extend confirmatory factor analysis to structural equations with unobservable constructs. In the latter case, the factors are considered to be causally related instead of correlated, and terms reflecting errors in equations are added (Aaker and Bagozzi, 1979).

The term "structural equations" refers to a system of linear regression equations in the context of a causal model. The parameters in the model are referred to as structural parameters. Structural parameters are presumed to represent relatively invariant parameters of a causal process. Thus, they have more theoretical meaning than ordinary predictive regression weights (Bentler, 1980).

Although the standard regression model assumes that independent variables are measured without error, there is likely to be some systematic influence present in addition to random disturbance

(Bagozzi, 1980). As mentioned above, in such situations ordinary least squares (OLS) estimates of parameters will be both biased and inconsistent. This is particularly important in the analysis of a model containing reciprocal causation or feedback loops (simultaneity).

Econometricians developed the two-stage least squares (2SLS) method to arrive at consistent estimators under such circumstances. However, although a 2SLS estimator may be consistent, it will not be asymptotically efficient because it does not take into account the correlation of the structural disturbances across equations (Kmenta, 1971).

Efficient estimators are of interest because they generate greater levels of confidence. This is due to the fact that the sampling distribution of the estimates has a relatively small degree of variance. Thus, the individual estimates from each sample tend to cluster closely around the true parameter value. An efficient estimate in an over-identified model (to be discussed below) is a weighted average of the individual estimates. To achieve efficiency, these weights should reflect the variability of the original estimates. When a simple average is taken, however, one is implicitly assigning equal weights to all of the estimates even though each of them probably had different variability. The result is an unbiased but inefficient estimate (Hauser and Goldberger, 1971).

The deficiency of the 2SLS method can be overcome by estimating all equations of the system simultaneously, such as with the full information, maximum likelihood (FIML) method (Morrison, 1976). The maximum likelihood estimation procedure may be described intuitively as follows: Assume a model is specified and values assigned to each parameter. Starting with these as the knowns, it is possible to derive the correlations that would result from these estimates. Maximum likelihood programs use an iterative technique that basically readjusts the values of the parameters until the correlations generated approach the observed correlations as closely as possible. Single estimates thus result for each of the parameters of the model and the procedure guarantees them to be efficient. The technique also yields standard error estimates for each of the parameters and a chi square test for the overall goodness of fit of the model.

This approach is general enough to handle both measurement error and simultaneity in one system of equations. Furthermore, the estimators can be shown to be not only asymptotically efficient but robust over nonnormality (Thiel, 1971).

A practical maximum likelihood estimation program (LISREL) has been developed by Jöreskog. This program can handle the most general structural equation problem, including both errors in equations and errors in variables (Jöreskog, 1969, 1970, 1973; Jöreskog and van Thillo, 1972). It will be used in the analysis of the model proposed in the present research.

## Specification of the Model

According to Bagozzi (1980), the first step in constructing structural equation models is to propose relevant theoretical constructs, their indicators, and the structure or pattern of relationships (causal ordering). This process is referred to as specification of the model.

The model hypothesized in the present research was presented in a conceptual fashion in Chapter III. The empirical concepts (measured variables) selected as indicators were presented in Chapter IV. The complete model is represented in Figure 3, which now includes all indicators as well as the theoretical constructs. The following notational conventions have been observed (Jöreskog and van Thillo, 1972; Bagozzi, 1977, 1980):

1. Theoretical constructs (unobserved variables) are represented by circles, while

2. Squares indicate operationalizations (measured or observed variables)

3. Exogenous variables measured with error are shown as $\xi$'s, their operationalizations by x's, and errors in variables for the x's by $\delta$'s

4. Endogenous variables measured with error are shown as $\eta$'s, their operationalizations by u's and errors in variables for the y's by $\varepsilon$'s

5. Errors in equations are shown as $\zeta$'s

6. Relationships between:

    a. Exogenous and endogenous variables are shown by $\gamma$

    b. Endogenous variables are shown as $\beta$

    c. Exogenous variables and their operationalizations are shown by $\lambda_x$

    d. Endogenous variables and their operationalizations are shown by $\lambda_y$

7. Correlations among exogenous constructs are drawn as curved line segments and are represented as $\phi$'s.

The general model for representing this system of simultaneous linear structural relations may be written as follows:

$$\eta = \beta\eta + \Gamma\xi + \zeta \qquad (2)$$

Recalling the notational conventions cited above, this model may be interpreted as follows (Bagozzi, 1980, p. 92): "The m true dependent

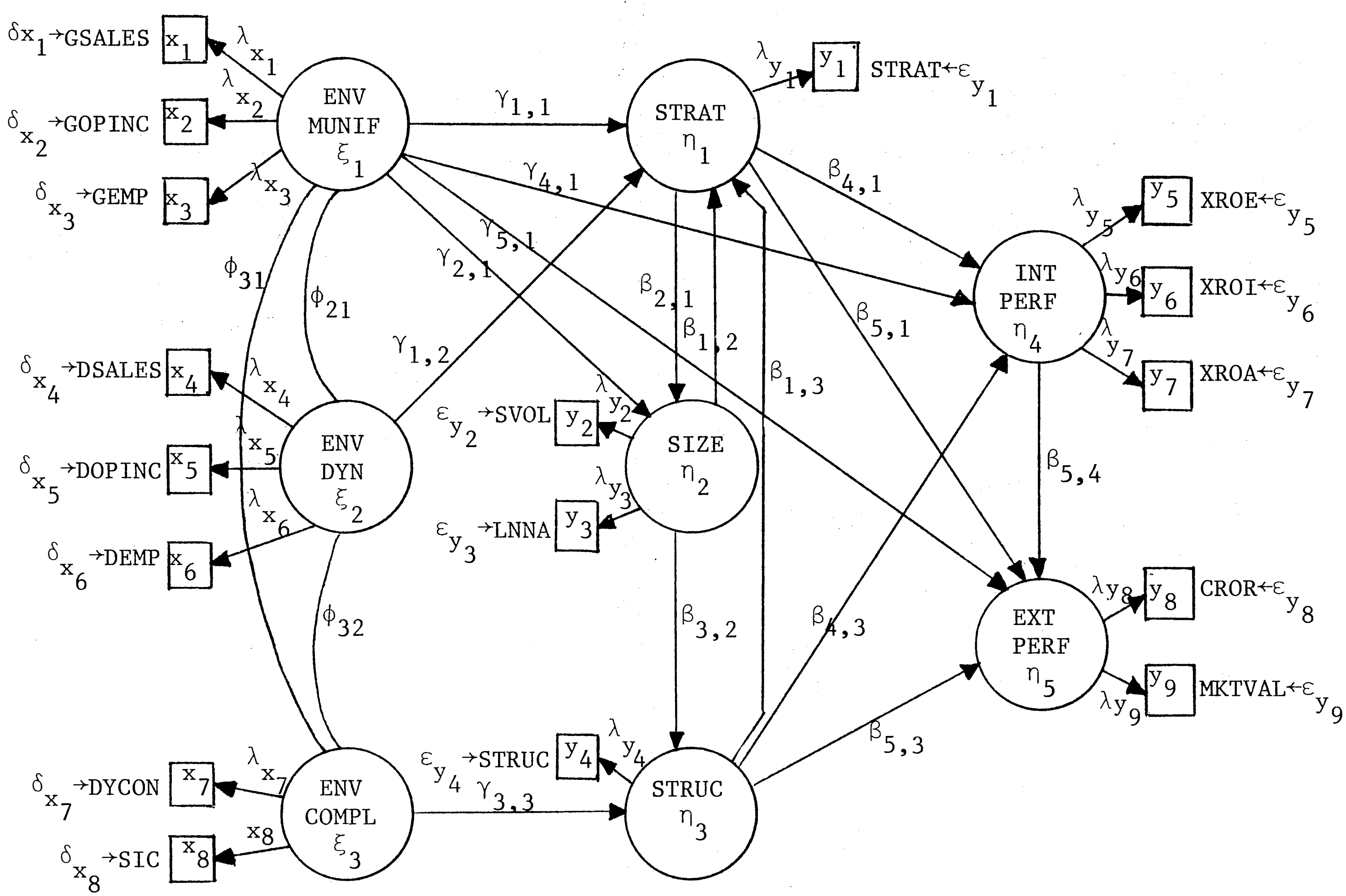



Figure 3. The Relationships Among Constructs and Their Indicators in the ESPI Model

variables $\eta$ are related among themselves through the parameters in $\beta$ and are related to the n true independent variables $\xi$ through the parameters in $\Gamma$." Thus, causal relationships are modeled as connections between theoretical constructs, and the parameters in $\beta$ and $\Gamma$ represent linear relationships to be estimated. The disturbance term $\zeta$ represents random error in the system of equations. The measured variables are related to their respective constructs through the following measurement equations:

$$Y = \Lambda_y \eta + \varepsilon \tag{3}$$

and

$$X = \Lambda_x \xi + \delta \tag{4}$$

The specification of the model is dependent upon prior theoretical knowledge, logical criteria, empirical evidence, and so on, since certain possible paths (parameters) will be hypothesized to be absent, some will be hypothesized to be equal to others, with the remainder to be estimated. The model may be misspecified if, for example, important independent or dependent variables are omitted or extraneous ones included, or if relevant causal paths are omitted or irrelevant ones hypothesized. One constraint on being able to test for these things is whether the model is identified or not.

## The Issue of Identification

Once the model has been specified, one must address the important problem of whether or not it will be possible to obtain unique solutions for the parameters. In its simplest form, the issue of identification refers to the relationship between the number of structural parameters to be estimated and the amount of information provided to solve for those values. In the case of underidentification (more parameters to be estimated than pieces of information available), it is not possible to derive consistent estimators of the structural coefficients. (The coefficients of an underidentified structural equation can be estimated by the OLS method, but the resulting estimates are inefficient.)

In general, a necessary condition for identification of the model is

$$s \leq (\tfrac{1}{2})(p+q)(p+q+1) \tag{5}$$

where s is the number of parameters to be estimated, p and q represent the measured variables (the number of correlations or sources of information) (Kmenta, 1971; Jöreskog and Sörbom, 1977; Bagozzi, 1980). The problem of sufficient conditions for identification of the general linear model has not been solved, although some authors have treated the problem for special cases (Fisher, 1966; Geraci, 1974).

Until the most general criteria are derived, then, one must demonstrate identification for each model tested on an individual basis. Thus, a first step of analysis is to determine if a structural model is identified. The model hypothesized in the present research was tested using artificial data and the LISREL program under the criteria suggested by Kmenta (1971, p. 543). It was found that all parameters could be estimated.

## Hypothesis Testing and Theory Development

Under ideal conditions, theory would lead one to a unique model, and the function of a program such as LISREL would be to develop its parameter estimates. However, it is far more likely that the researcher will propose a tentative model as an hypothesis to be tested, refined and tested again. It is also likely that other structural equation models provide rival hypotheses. It would be of great interest to the researcher, then, to know which, if any, of the models are supported by the data and which are not.

As mentioned above, the maximum likelihood procedure provides an overall chi square goodness of fit test of any structural equation model. The test is whether the hypothesized model fits the data. The LISREL program generates estimates of the model. It recreates a correlation matrix based on the specification of the model and compares it to the sample correlation matrix. The degree to which they are different is an indication of the degree to which the model is a misrepresentation. This process can only be accomplished when the model is overidentified. If the number of parameters exactly equal the number of variables, the program will arrive at a unique solution that exactly recreates the correlation matrix. To help overcome this problem, in the modeling process some relationships are set at zero, which in effect overidentifies the model. Each restriction implies a degree of freedom.

To the extent that the model is overidentified, we can obtain multiple estimates. The FIML estimation procedure generates a matrix that will vary as a chi square distribution. The LISREL program provides the probability _p_ for the chi square test. This probability refers to the probability of obtaining a chi square value larger than that actually obtained, given that the hypothesized model holds. Hence, the higher the value of _p_, the better the fit (Aaker and Bagozzi, 1979;

Bagozzi, 1980). It has been suggested that adequate fits may be obtained when the value of $\chi^2$ is below the 10 percent level, that is, when $p > 0.10$ (Bagozzi, 1980).

This approach is the reverse of the standard hypothesis testing procedure, where the theory is supported if the null hypothesis is rejected. Here, the testing is organized so that the researcher expects that the null hypothesis will not be rejected. The attainment of a non-significant chi square value would indicate that the correlation matrix estimated from the specified model does not differ significantly from the correlation matrix generated from the obtained data, thus supporting the model (Fornell and Larker, 1981; Burnkrant and Page, 1982).

The test statistic has some limitations. As with most hypothesis tests, it is sensitive to sample size. Lawley and Maxwell (1971) suggest that sample size exceed the number of observable variables by about 50. Furthermore, if the model does not fit the data, it does not provide any indication why, nor does it suggest which other models might also fit the data.

## General Strengths and Weaknesses of the Model

The general linear model provides a comprehensive scheme for representing all of the elements and relationships of a theory in a single structure. It further provides direct assessment of measurement error, and convergent, discriminant and predictive validity. Since the approach is a maximum likelihood procedure, parameter estimates are independent of scales of measurement for the variables in the model (Bagozzi, 1980). The program LISREL provides a test statistic for one's entire model, and maximum likelihood estimates that are optimally efficient over variable sample sizes and robust over nonnormality (Burt, 1973).

On the other hand, the general linear model assumes interval scaled data. It may be noted that two of the 18 variables (diversification and divisionalization) are measured on what is technically an ordinal scale (although not binary). However, these variables provide desirable information, as described in the previous chapter. Furthermore, as used in the present study, they do not present as serious a deviation from the interval assumption as it might appear.

The two major distinctions between an ordinal and interval scale are the existence of a zero point (however arbitrary) and equality of distance between any two points. In the present case, the lowest score on both of these variables represents "none", that is, no diversification or no divisionalization. Furthermore, the scoring system of assigning linearly equidistant numbers to the categories imposes equality of distance (Labovitz, 1970). The result is not unlike a Likert scale, which has been treated frequently in such analyses.

In general, the greater the number of categories, the less critical is the interval requirement (Asher, 1976). Thus, one should avoid, for example, collapsing categories into a smaller number such as a dichotomy.

By carefully constructing the scoring system and its meaning, then, one has a reasonable basis for treating ordinal variables as if they are interval. Both Asher (1976) and Labovitz (1970), among others, argue that so long as one knows and reports the actual scales of the actual scales of the data, there is ample Monte Carlo work to suggest that in many instances, the violation of the interval assumption is not very consequential.

## Summary

This chapter has presented the analytical methodology by which the hypothesized model is submitted to empirical testing. The following chapter will present the results of this process.

## CHAPTER VI

## RESULTS

This chapter will present first the results of the estimation of the original hypothesized model, and second, a description of the iterative sequence through which the model was refined. Such an approach is similar to grounded theory development (Glaser and Strauss, 1967; Bailey, 1978; Burgelman, 1983). That is, a classical approach is used to test and possibly reject the adequacy of the hypothesized model. Then those modifications that are indicated by the data and grounded in theory are admitted to the model, which is then reestimated.

### Analysis of the Original Model

Seventeen measured variables representing five unobserved endogenous constructs and three unobserved exogenous constructs were obtained for the sample of 110 firms. The definitions of these constructs and variables were discussed in the previous chapters. The preparation of the data for maximum likelihood (ML) estimation procedures using LISREL involved the construction of the 17x17 matrix of correlations. This served as the input data to the LISREL program. The correlation matrix as used by LISREL is presented in Table VII.

The LISREL program requires the specification of parameters for up to eight matrices. The following matrices were specified for the ESPI model (the notation is consistent with that used in the previous

## TABLE VII

## THE INPUT CORRELATION MATRIX

CORRELATION MATRIX TO BE ANALYZED

| | STRAT | SVOL | NA | STRUC | XROE | XROI | XROA | CROR | MKTVAL | GSALES |
|---|---|---|---|---|---|---|---|---|---|---|
| STRAT | 1.000 | | | | | | | | | |
| SVOL | -0.203 | 1.000 | | | | | | | | |
| NA | -0.032 | 0.763 | 1.000 | | | | | | | |
| STRUC | 0.525 | -0.090 | 0.097 | 1.000 | | | | | | |
| XROE | 0.296 | -0.130 | -0.011 | 0.224 | 1.000 | | | | | |
| XROI | 0.272 | -0.144 | -0.015 | 0.210 | 0.829 | 1.000 | | | | |
| XROA | 0.276 | -0.111 | -0.014 | 0.185 | 0.854 | 0.834 | 1.000 | | | |
| CROR | 0.156 | -0.143 | -0.332 | 0.155 | -0.227 | -0.235 | -0.202 | 1.000 | | |
| MKTVAL | 0.171 | -0.066 | -0.203 | 0.110 | -0.141 | -0.143 | -0.145 | 0.707 | 1.000 | |
| GSALES | -0.042 | 0.234 | 0.261 | 0.065 | 0.164 | 0.194 | 0.120 | -0.135 | -0.026 | 1.000 |
| GOPINC | -0.066 | 0.321 | 0.300 | 0.022 | 0.010 | 0.053 | -0.013 | -0.058 | 0.001 | 0.695 |
| GEMP | 0.374 | -0.150 | -0.204 | 0.187 | 0.059 | 0.104 | 0.069 | -0.007 | 0.032 | 0.115 |
| DSALES | -0.235 | 0.088 | 0.018 | -0.088 | -0.467 | -0.357 | -0.400 | 0.274 | 0.229 | -0.031 |
| DOPINC | -0.430 | 0.086 | -0.026 | -0.224 | -0.527 | -0.425 | -0.453 | 0.215 | 0.123 | -0.010 |
| DEMP | 0.170 | -0.128 | -0.229 | 0.060 | -0.104 | -0.066 | -0.093 | 0.062 | 0.039 | -0.220 |
| DYCON | -0.001 | 0.066 | 0.089 | -0.035 | -0.076 | -0.119 | -0.097 | -0.011 | -0.093 | -0.343 |
| SIC | -0.016 | 0.153 | 0.002 | -0.063 | -0.125 | -0.083 | -0.014 | 0.155 | 0.219 | 0.175 |

CORRELATION MATRIX TO BE ANALYZED

| | GOPINC | GEMP | DSALES | DOPINC | DEMP | DYCON | SIC |
|---|---|---|---|---|---|---|---|
| GOPINC | 1.000 | | | | | | |
| GEMP | 0.240 | 1.000 | | | | | |
| DSALES | 0.138 | -0.096 | 1.000 | | | | |
| DOPINC | 0.119 | -0.236 | 0.809 | 1.000 | | | |
| DEMP | 0.067 | 0.810 | 0.087 | 0.019 | 1.000 | | |
| DYCON | -0.333 | -0.073 | -0.081 | -0.188 | 0.023 | 1.000 | |
| SIC | 0.072 | 0.179 | 0.250 | 0.061 | 0.077 | 0.078 | 1.000 |

DETERMINANT = 0.224287D-04

chapter): ($\Lambda_y$) and ($\Lambda_x$), which relate measured variables to their respective constructs; ($\theta_\varepsilon$) and ($\theta_\delta$), the errors in measurement matrices; ($\beta$), which specifies the hypothesized direct causal relationships among endogenous constructs; and ($\Gamma$) which specifies the hypothesized direct causal relationships between exogenous and endogenous constructs. The remaining matrices describe the intercorrelations among the exogenous constructs ($\phi$) and the errors in equations ($\zeta$).

The specification of the $\beta$ and $\Gamma$ matrices involves a combination of fixed and free parameters such that where a direct influence from a column construct to a row construct is hypothesized to exist, that cell is allowed to be free, or estimated. Where no direct influence is hypothesized, the cell (parameter) is fixed at zero (note that effects are read from column to row).

Tables VIII and IX present the ML solution of the originally hypothesized ESPI model, which is graphically depicted in Figure 4. Parameters with t-values greater than 2.0 are indicated by an asterisk. The t-value for a parameter is defined as the parameter divided by its standard error. This can be used to test whether the true parameter is zero. Parameters whose t-values are equal to or greater than 2.0 in absolute magnitude may be considered significantly different from zero (Jöreskog and Sörbom, 1981). Given the exploratory nature of the present study, it was felt that a conservative approach was indicated. Furthermore, given the nature of the modeling process as described below, some parameters are likely to be admitted to a model that were not hypothesized originally, while some may be deleted. For these reasons, and to be consistent across all parameters, all are confined to a "2-tailed" test of significance.

TABLE VIII

BETA MATRIX OF ML SOLUTION OF ORIGINALLY HYPOTHESIZED ESPI MODEL

| BETA | STRAT | SIZE | STRUC | IP | EP |
|---|---|---|---|---|---|
| STRAT | 0.0 | 0.001 | 0.499* | 0.0 | 0.0 |
| SIZE | -0.204 | 0.0 | 0.0 | 0.0 | 0.0 |
| STRUC | 0.0 | 0.065 | 0.0 | 0.0 | 0.0 |
| IP | 0.238* | 0.0 | 0.085 | 0.0 | 0.0 |
| EP | 0.201 | 0.0 | 0.118 | -0.350* | 0.0 |

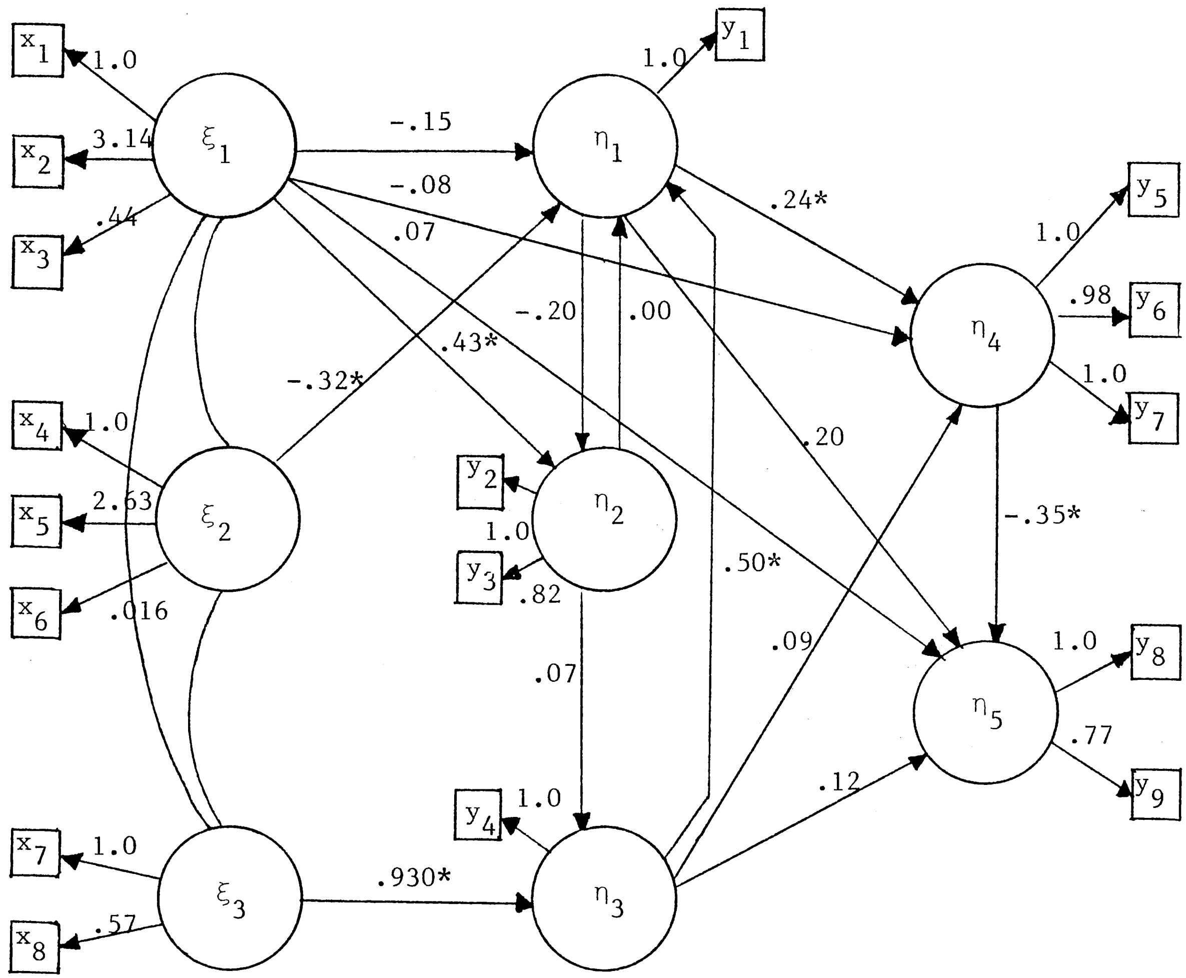
*t-value greater than or equal to 2.0.

TABLE IX

GAMMA MATRIX OF ML SOLUTION OF ORIGINALLY HYPOTHESIZED ESPI MODEL

| GAMMA | MUN | DYN | COMP |
|---|---|---|---|
| STRAT | -0.150 | -0.322* | 0.0 |
| SIZE | 0.432* | 0.0 | 0.0 |
| STRUC | 0.0 | 0.0 | 0.930* |
| IP | -0.077 | 0.0 | 0.0 |
| EP | 0.066 | 0.0 | 0.0 |

*t-value greater than or equal to 2.0.




*t-values greater than or equal to 2.0.

Figure 4. ML Solution of Originally Hypothesized ESPI Model

Although several of the relationships demonstrate t-values greater than 2.0, the information presented in Table X indicates that, overall, a poor fit of model to data was obtained. The coefficient of determination for structural equations indicates how well the observed variables serve jointly as measurement instruments for the unobserved constructs. The range of this coefficient is between zero and one, with large values being associated with good models.

TABLE X

GOODNESS OF FIT INDICES FOR THE ORIGINALLY HYPOTHESIZED ESPI MODEL

Total coefficient of determination for structural equations is 0.064

Measures of goodness of fit for the whole model:

Chi-Square with 103 degrees of freedom is 390.15 (prob. level = 0.000)

Goodness of fit index is 0.777

Adjusted goodness of fit index is 0.669

Root mean square residual is 0.149

The next four pieces of information assess the overall fit of the model to the data. The chi square may be regarded as a goodness of fit measure in the sense that large values correspond to bad fit, small values to good fit. The degrees of freedom for chi square are given by

$$df = k/2\ (k+1) - t \qquad (6)$$

where k is the number of observed variables analyzed and t is the total number of independent parameters estimated. As indicated in previous discussion, the interpretation of the probability value is the reverse of standard hypothesis testing in that larger values are desirable. This is because goodness of fit is indicated by "no difference" between the theoretical model and the model generated by the data.

The goodness of fit index (GFI) is a measure of the relative amount of variance and covariance jointly accounted for by the model (the adjusted value is calculated using mean squares rather than total sums of squares). This index is independent of the sample size and relatively robust over departures from normality. However, its statistical distribution is unknown, leaving one with no real standard of comparison (Jöreskog and Sörbom, 1981).

Finally, the root mean square residual (RMR) is a measure of the average of the residual variances and covariances. It is useful in the comparison of two different models for the same data.

Taken collectively, these indices suggest a poor fit of the model to the data.

## Refinement of the Model--Phase One

An analysis of residuals indicated first that the simple two-digit SIC indicator was a poor measure of its construct. Furthermore, despite frequent use of the natural log of net assets as a size measure in organizational research, the program rejected the combination of sales volume and ln(net assets) as measurements of the same construct in the same form. When ln(net assets) was replaced with net assets (NA), the relationship improved considerably.

In addition, the analysis suggested that perhaps the employment variables were not representing their constructs well. To examine this possibility, a confirmatory factor analysis was conducted for the munificence and dynamism constructs. The results of this two stage process are presented in Tables XI and XII.

TABLE XI

GOODNESS OF FIT INDICES FOR FACTOR ANALYSIS OF MUNIFICENCE AND DYNAMISM CONSTRUCTS (1)

| |
|---|
| Measures of goodness of fit for the whole model: |
| Chi-Square with 8 degrees of freedom is 192.04 (prob. level = 0.000) |
| Goodness of fit index is 0.780 |
| Adjusted goodness of fit index is 0.422 |
| Root mean square residual is 0.195 |

TABLE XII

GOODNESS OF FIT INDICES FOR FACTOR ANALYSIS OF MUNIFICENCE AND DYNAMISM CONSTRUCTS (2)

| |
|---|
| Measures of goodness of fit for the whole model: |
| Chi-Square with 1 degree of freedom is 0.06 (prob. level = 0.803) |
| Goodness of fit index is 1.000 |
| Adjusted goodness of fit index is 0.997 |
| Root mean square residual is 0.006 |

The first stage used all three measures of each construct, with the results presented in Table XI. The second stage used only the sales and operating income measures. These results are the contents of Table XII. A comparison of these two tables suggested that the deletion of the employment variables produced substantial improvement in the measurement of the two constructs. The decision was made, then, to use two measures each for the munificence and dynamism constructs (GSALES, GPIONC and DSALES, DOPINC, respectively) and one for the complexity construct (DYCON), and to replace ln(net assets) with net assets (NA) in further refinement of the model. As a beginning step, the original model (i.e., the originally hypothesized parameters) was reestimated using the new formulation. The resulting indices of fit are presented in Table XIII. These values suggested that further refinement of the model was necessary. Thus, the process was continued.

TABLE XIII

GOODNESS OF FIT INDICES FOR ORIGINALLY HYPOTHESIZED
ESPI MODEL--REVISED FORMULATION

| |
|---|
| Total coefficient of determination for structural equations is 0.175 |
| Measures of goodness of fit for the whole model: |
| Chi-Square with 62 degrees of freedom is 111.92 (prob. level = 0.000) |
| Goodness of fit index is 0.880 |
| Adjusted goodness of fit index is 0.797 |
| Root mean square residual is 0.125 |

## Refinement of the Model--Phase Two

The process of refining the model incorporates a number of procedures designed to provide for both addition of statistically significant parameters and deletion of nonsignificant parameters. Caution must be exercised in both directions, however, because paths should not be added or deleted without some theoretical or logical basis. (Note: whenever parameters are referred to as "significant" in the remaining text, it implies statistical significance. That is, a t-value equal to or greater than 2.0 is associated with that parameter.)

The procedures following in the iterative process of refinement were those suggested by Jöreskog and Sörbom (1981). They involved examination of t-values, already discussed, normalized residuals (each is approximately a standard normal variable), and modification indices. These are important because the mere indication of inadequate fit does not suggest how the model should be changed. Although the presence of substantive theory may provide such information, in the case of exploratory research, the extant body of theory may not be sufficiently robust.

In such cases, the values mentioned above provide useful information on how to modify the model. The t-values suggest which paths are or are not significant. However, they can be misleading, particularly in the early stages. It is possible for a parameter to have a significant t-value in an early formulation, but fall below significance when an additional parameter involving a construct that influences both constructs on that path is allowed to be estimated.

The value of the normalized residual in a given cell (i,j) suggests whether or not the model accounts for s(i,j) sufficiently well.

The normalized residual is $(s_{ij} - \hat{\sigma}_{ij})$ divided by the square root of its asymptotic variance. For further discussion, see Jöreskog and Sörbom (1981). Normalized residual values greater than 2.0 were considered indicative of a cell for which s(i,j) is not adequately accounted (Jöreskog and Sörbom, 1981).

The modification index for a given cell (i,j) reflects the expected decrease in chi square if a single constraint is relaxed and all estimated parameters are held fixed at their estimated values. Thus, modification indices may be examined in relation to a chi square distribution with one degree of freedom. The procedure involves finding the largest modification index, and, if greater than five, setting that parameter free and reestimating the model. The decrease in chi square will be at least equal to the modification index, and often much greater. Two basic rules should be followed in this process, however. First, one should not relax more than one parameter at a time, and second, the freed parameter should have some grounding in theory.

These procedures were followed in an iterative fashion until (1) no normalized residual had a value greater than two, (2) no modification index has a value greater than five (criteria suggested by Jöreskog and Sörbom, 1981), and (3) the solution was within the admissable parameter space. It should be noted that what follows may be considered a post hoc type of analysis. It will take further study to ascertain the stability of the relationships observed given some other data set.

The $\beta$ and $\Gamma$ matrices for the model that resulted from the procedures described above are presented in Tables XIV and XV. As before, paths with t-values equal to or greater than 2.0 are indicated by an asterisk.

TABLE XIV

BETA MATRIX OF ML SOLUTION OF REVISED ESPI MODEL

| BETA | STRAT | SIZE | STRUC | IP | EP |
|---|---|---|---|---|---|
| STRAT | 0.0 | 0.0 | 0.455* | 0.0 | 0.0 |
| SIZE | -0.151 | 0.0 | 0.0 | 0.0 | 0.0 |
| STRUC | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| IP | 0.094 | 0.0 | 0.066 | 0.0 | 0.0 |
| EP | 0.233* | 0.0 | 0.135 | -0.255* | 0.0 |

*t-value greater than or equal to 2.0.

TABLE XV

GAMMA MATRIX OF ML SOLUTION OF REVISED ESPI MODEL

| GAMMA | MUN | DYN | COMP |
|---|---|---|---|
| STRAT | -0.072 | -0.417* | 0.0 |
| SIZE | 0.526* | 0.0 | 0.256* |
| STRUC | 0.0 | -0.323* | -0.085 |
| IP | 0.153 | -0.515* | 0.0 |
| EP | -0.131 | 0.266* | 0.0 |

*t-value greater than or equal to 2.0.

The goodness of fit indices are presented in Table XVI. The model itself is depicted in Figure 5.

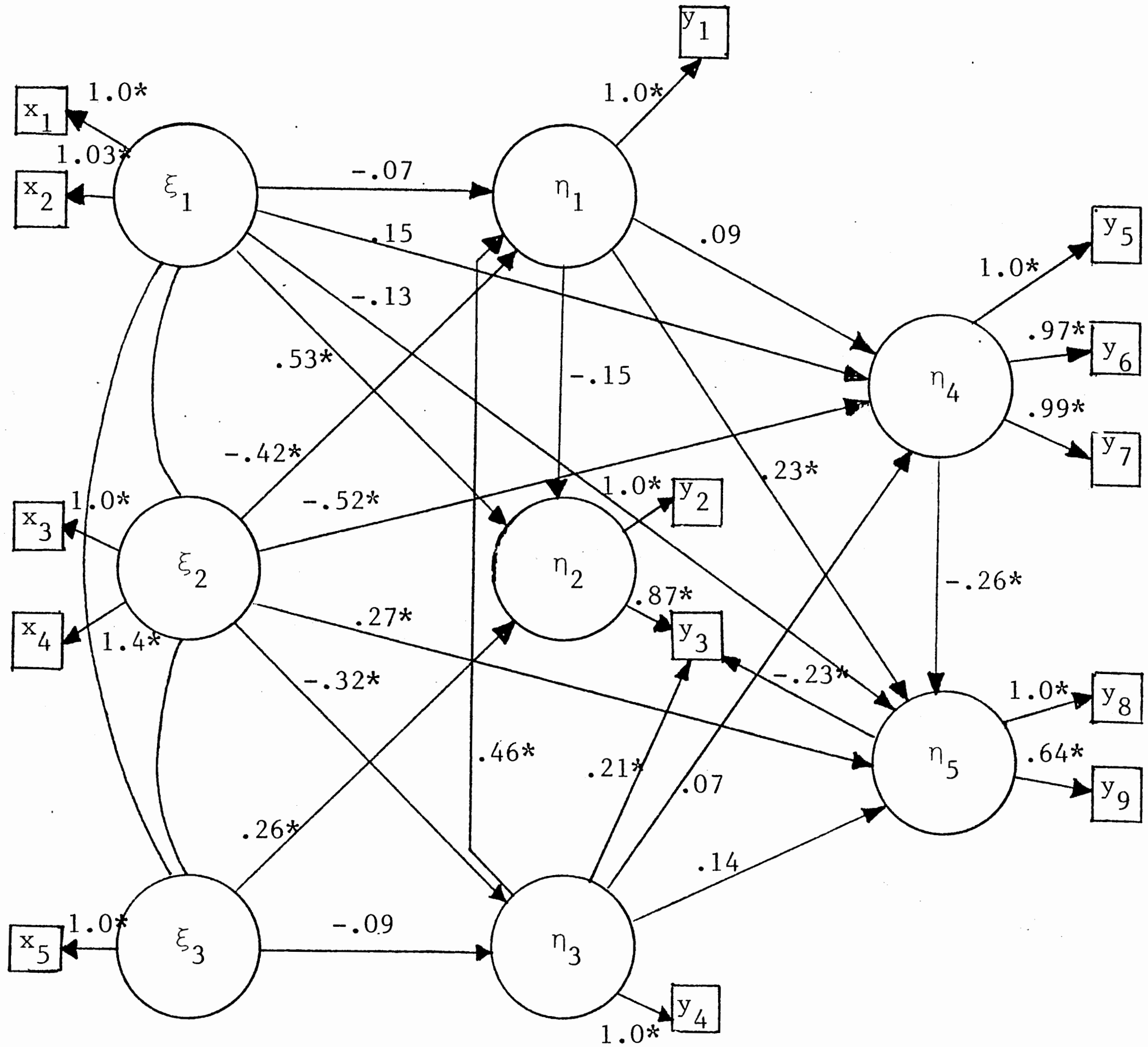
TABLE XVI

GOODNESS OF FIT INDICES FOR REVISED ESPI MODEL

| |
|---|
| Total coefficient of determination for structural equations is 0.481 |
| Measures of goodness of fit for the whole model: |
| Chi-Square with 58 degrees of freedom is 47.45 (prob. level = 0.837) |
| Goodness of fit index is 0.942 |
| Adjusted goodness of fit index is 0.894 |
| Root mean square residual is 0.058 |

## Analysis of the Revised Model

It may be recalled from Chapter III that for purposes of submitting the model to empirical test, the hypothesized relationships took the form of the alternative hypothesis "the parameter will be different from zero." The results of the revised formulation with respect to those 11 hypotheses are summarized in Table XVII. Once the significance of the parameters is observed, the next issue is the directionality of the relationships. In two cases (the relationship between dynamism and structure, and that between dynamism and strategy) the directionality of the relationship was the opposite of that suggested by the population ecology model.




*t-values greater than or equal to 2.0.

Figure 5. ML Solution of Revised ESPI Model

TABLE XVII

SUMMARY OF RESULTS WITH RESPECT TO HYPOTHESES
(STATED IN CHAPTER III)

| Parameter Significantly Different from Zero | Parameter Not Statistically Significant |
|---|---|
| Hypothesis 2 | Hypothesis 1 |
| Hypothesis 3 | Hypothesis 4 |
| Hypothesis 10 | Hypotheses 5-9 |
| Hypothesis 13 | Hypotheses 11, 12 |
| | Hypothesis 14 |

In general, then, the relationships hypothesized based on a deterministic model of selection and adaptation received little support in the present study. The following sections will present the results of the analysis with respect to the various interrelationships in the model.

## The Effects of Dynamism

The results with respect to the data set used in present study suggest that the dynamism construct is a far more powerful construct than previously realized. It demonstrated significant relationships with four endogenous constructs, as follows: (1) a negative relationship with diversification; (2) a negative relationship with "internal" performance; (3) a positive relationships with "external" performance; and (4) a negative relationship with divisionalization.

Dynamism, Diversification and Performance. Previous research has suggested a direct, and typically negative relationship between diversification and measures of performance. Such research has considered these variables in the context of firm specific variables only, or within the context of the relationship between certain industry-related characteristics for a given firm (e.g., market share) and firm characteristics. In the latter cases, the industry characteristic measures tended to be taken at a single point in time, as opposed to the dynamic approach used in the present study, and did not reflect the notion of volatility.

Early formulations of the ESPI model indicated support for a direct (although positive) relationship between diversification and "internal" performance. However, once the path from dynamism to "internal" performance was admitted to the model, the former path dropped well below any significant level, with a t-value of 0.92. This finding suggests that a substantial portion of the observed influence of diversification strategy on performance may have been related to the effects of an exogenous construct on both. On the other hand, the diversification to "external" performance path remained significant, despite the path from dynamism.

## Strategy and Structure

At no time during the process of refinement and reestimation of the model was there a significant parameter indicating a causal path from strategy to structure, even one mediated by size. On the other hand, the path from structure to strategy was consistently significant. However, it should be noted that due to the specification of the model to examine environmental influences on both strategy and structure at a given time, measures of both strategy and structure were obtained for a concurrent time period. This will be discussed in the following chapter.

## The Performance Dimensions

The analysis of residuals and ML estimates with respect to the two performance constructs indicates that they are capturing different information. The residual variance and covariance matrix indicated no overlap between any members of the two sets of indicators. Furthermore, while no significant path was obtained between environmental munificence and either performance construct, dynamism significantly affected both, but in opposite directions. That is, a negative relationship was observed between dynamism and "internal" performance, while a positive relationship was observed between dynamism and "external" performance. Curiously, neither diversification nor divisionalization demonstrated a significant influence on the "internal" performance dimension. However, diversification exhibited a significant positive relationship with the "external" performance dimension.

## Environmental Constructs and Size

Significant parameters were observed between (1) environmental munificence and firm size (positive), and (2) environmental complexity and firm size (negative). These relationships suggest that organizations grow larger in the face of greater munificence and less complexity.

Net Assets

Two very strong relationships in the model raise some intriguing measurement issues for researchers. Significant parameters were obtained in the measurement model between divisionalization and net assets, and between "external" performance and net assets. Such relationships appearing in the measurement model suggest that net assets, a commonly employed measure of size, may be reflecting a number of constructs. That is, it is not unidimensional.

Measures of "Internal" Performance

The indicators of "interal" performance were five-year (post model year) average ROE, ROI and ROA, adjusted for firm risk. Analysis of the measurement parameter estimates, t-values, normalized residuals and modification indices all suggested that all three measures demonstrated strong and significant relationships with the construct and with one another.

These results are encouraging in the sense that such measures are often used interchangeably as single indicators of "performance". However, it is suggested that researchers recognize that this construct represents one dimension of performance, and that other dimensions may be more relevant to the questions of interest.

## Summary

This chapter has presented the results obtained upon submitting the ESPI model to empirical test, and has pointed out parameters of particular interest. The following chapter discusses some implications of these results, conclusions drawn from them, and suggestions for future research.

## CHAPTER VII

## DISCUSSION AND CONCLUSIONS

As noted in the previous chapters, the present study represents a piece of exploratory research. It constitutes a first attempt to place a complex array of environmental and organizational variables into a holistic system of equations for the purposes of causal modeling. The present chapter will begin with some discussion of the results reported in the preceeding chapter. It will then present some conclusions based on those results, discuss limitations of the study, and outline some implications for future research.

### The Population Ecology Model

As mentioned in the previous chapter, the results of the present study provided little support for the hypothesized relationships derived from the population ecology model. However, it may be seen from the revised model (Figure 5) that each of the three environmental constructs demonstrated a significant relationship with at least one organizational construct. The following discussion will explore in some detail the relationships that emerged from the "grounded theory" approach employed in the present research.

### Munificence and Complexity

The results with respect to the munificence dimension run counter to both the population ecology model and the paradigm of traditional IO economics in that significant linkages between munificence and "internal" performance, even mediated by "conduct" (strategy), were not observed. The measure of dynamic changes in monopoly power in the industry (complexity) might be said to reflect certain aspects of the environment considered as industry structure by IO. However, at no time did the analysis of residuals or modification indices suggest that a complexity to diversification or complexity to "internal" performance path be admitted to the model. Rather, the primary impact of both munificence and complexity was on organizational size, in a positive and negative relationship, respectively. These results suggest that organizations tend to be larger in more munificent and less complex environments. Notions of effects of increasing demand for products would support these findings.

Such evidence may also lend support to the notion that management self-interest is often in the direction of "bigger is better" (Chamberlain, 1968). As Chamberlain and others have argued, given that certain basic economic criteria are met, a primary force in management decision making is increasing size, wherein lies power. Mueller (1969) suggests that compared to stockholder welfare maximizers, growth maximizing managers are willing to sacrifice some earnings for growth.

While Mueller indicated that this will probably occur through diversifying acquisitions, the results of the present study do not provide support for that relationship. However, under conditions of munificence and increasing monopoly power, the pursuit of growth for growth's sake (and for such reasons as those cited above), would be more easily accomplished.

## Dynamism, Strategy and Structure

Some of the strongest effects observed in the present study involved the dynamism construct. Only one direct path involving dynamism was originally hypothesized (a positive relationship with diversification). However, the results indicated not only a significant negative relationship between dynamism and diversification, but also significant direct effects on four other constructs in the model. One of the most interesting groups of relationships in the model involved the dynamism to structure, dynamism to strategy, and structure to strategy parameters.

Policy research generally has tended to support Chandler's (1962) original thesis regarding the causal linkage between strategy and structure ("structure follows strategy") defined in terms of diversification and divisionalization, respectively (Wrigley, 1970; Rumelt, 1974). Furthermore, as discussed in previous chapters, the population ecology model would suggest that increasing volatility in the environment would compel organizations to expand their domains in the quest to control critical resources.

However, the results of this admittedly exploratory study suggest that, in the context of the holistic array of relationships under investigation, the principal relationships among these constructs are (1) a negative path from dynamism to both diversification and divisionalization, and (2) a positive path from divisionalization to diversification, with no true mediating effects of size.

It may be recalled that the model was specified to examine the separate effects of environmental dimensions on organizational characteristics. Thus, strategy and structure are measured at a single time (the model year). The findings should be interpreted in that context. That is, there is strong evidence of a causal influence from structure to strategy at a given time period. The necessary fine tuning of this relationship would involve the specification of the constructs to capture more richly the temporal effects involved. Despite these problems, the results suggest an interesting scenario from a policy perspective.

## Dynamism and Structure

A number of researchers have argued that the most effective firms will use organic structures in turbulent, dynamic environments, and mechanistic structures in more stable, predictable circumstances (Burns and Stalker, 1961; Lawrence and Lorsch, 1967; Perrow, 1967; Thompson, 1967; Woodward, 1965). However, as noted by Bourgeois (1978), research on organizational stress might suggest that environmental turbulence may cause uncertainty or stress which leads to attempts to decrease that uncertainty by "pulling in the reins" to gain a sense of control over the situation (Hall and Mansfield, 1971).

Results reported by Bourgeois (1978) indicated that (1) stable environments would yield more organic structures, (2) turbulent environments would yield more mechanistic structures, (3) stable-to-turbulent environmental shifts would yield a shift from organic to mechanistic styles, with no "loosening up" in the face of a reverse shift. The author suggested a number of points regarding these results. Among them, he indicated that contingency theorists should recognize the role of (possibly nonrational) managerial choice in not seeking what theorists prescribe as a "goodness of fit" between organization and environment.

The results obtained in the present study provide some support for those reported by Bourgeois (1978). Increasing divisionalization (as defined by Rumelt with characteristic decentralization of authority and increased autonomy of organizational components) may represent a more "organic" structure, with the reverse (i.e., the greater centralization accompanying a more functionally structured organization) more "mechanistic" (more tightly controlled from the top). If so, the results are quite consistent with his. The relationships among dynamism, divisionalization and performance suggest that managers will respond to turbulence (or volatility) in terms of more centralized structure, not because of its impact on performance, but because it provides a greater sense of control. This suggestion is also consistent with Child's (1972) argument that managerial perceptions and actions have a strong influence on organizational responses to the environment.

Dynamism and Strategy

With respect to the dynamism to diversification path, based on the premises of the population ecology model, it was hypothesized that greater levels of dynamism would be associated with greater levels of diversification, as volatility would favor the generalist. However, the results obtained in the present study further support the managerial choice point of view. It appears that in turbulent times, managers prefer to reduce, or limit, the number of different environments in which the organization will participate.

Such reasoning is quite consistent with the arguments offered with respect to structure. That is, turbulence, rather than encouraging decentralization and diversification (and despite theoretical prescriptions) seems to foster a felt need to "pull in the reins", perhaps because such action provides a greater sense of control. The lack of significant relationships between diversification/divisionalization and "internal" performance suggest that this action is not due to the improvement in that dimension of performance that will result.

It should be noted that turbulence was measured as a characteristic of the external environment, not as the perceptions of that environment by organizational decision makers. Thus, the measures of turbulence used here may or may not be equivalent to PEU.

## Stragey and Structure

The significant positive parameter from structure to strategy lends some support to the notion that organizational structure, as a reflection of management philosophy and value systems, influences participants' perceptions, decision premises and so on (Chamberlain, 1968; Child, 1972; Perrow, 1972; Bobbitt and Ford, 1980; Brief and Downey, 1983). Greater decentralization and autonomy of organizational divisions permits the gathering and processing of information on many different fronts. It also provides an environment more suitable for the pursuit of lower management self interest.

Chamberlain (1968) suggests that organizational structure, as a reflection of corporate culture, provides a "policy set". That is, the organizational structure provides a "cultural" framework that influences participants' perceptions of information salience, sets premises for decision making and for formulation of objectives. Pitts (1980) provides extensive arguments supporting these notions. He suggests that in more divisionalized firms, the type of information gathered, perceptions of opportunities, threats and so on, will vary among the divisions and be much more diverse than in a more centrally organized firm.

His study suggests that under such conditions, diversification is more likely to be undertaken by divisionalized firms. Furthermore, those with the greatest divisionalization (divisional autonomy) are likely to engage in more unrelated types of diversification. Finally, he suggests that the path to diversification (internal vs. acquisition) will be strongly influenced by structure.

A provocative article by Brief and Downey (1983), provides a more general treatment of this notion that organizational structure is a reflection of management value systems and philosophy, and in turn provides a framework that sets the premises for participant decision making. In their discussion of implicit theories of organizing they suggest that such implicit theories serve as mediators of organizational structure. That is, managers attempt to operationalize (enact) their implicit theories of organizing in terms of organizational structure. Furthermore, implicit theories represent the means by which members interpret structure, the nature of their organization and their role in that organization (cognitive mechanisms that translate structure into behavior). Finally, implicit theories serve as organizational myths, providing a rich cultural system which, like myths in any social system, are not affected by their correctness. These organizational myths will be reflected in choices of domain and methods of behaving in those domains.

In general, these studies and the present research suggest that perhaps strategy should be studied as an enactment process, derived in large part from the philosophy, values, and choices of organizational decision makers.

## The Performance Constructs

Another interesting group of relationships is that involving the performance constructs. The results indicated the following significant paths: (1) a negative path from dynamism to "internal" performance; (2) a positive path from dynamism to "external" performance; (3) a positive path from diversification to "external" performance; and (4) a negative path from internal to external performance.

These results indicate that of the constructs studied in this model, the principal source of influence on the "internal" performance dimension was dynamism, and the relationship was negative. This result was particularly intriguing since the path from strategy to "internal" performance was statistically significant prior to the process of model revision (albeit in a positive direction). Prior research had indicated a significant relationship between the two (Rumelt, 1973), although Montgomery's (1979) work did not reproduce that finding.

Perhaps earlier findings of a significant systematic relationship were due to the inability of the methodologies to reveal the effects of some exogenous construct on the constructs of strategy and performance. This is suggested because, when the dynamism to "internal" performance parameter was admitted to the model, the path from diversification to "internal" performance dropped to near zero.

The positive relationship between strategy and "external" performance suggest that investors perceive greater future value in diversified firms and/or firms operating in more volatile environments. Since the exogenous construct "dynamism" demonstrated significant relationships with both diversification and "external" performance but in opposite directions, this latter finding suggests that perhaps the "external" performance construct is multidimensional, and these two relationships are tapping two different dimensions.

The negative relationship between "internal" and "external" performance was a somewhat surprising outcome. Intuitively, one might argue that evaluations by investors will certainly involve direct positive effects of current performance. However, it may be recalled that the measures of "internal" performance were adjusted for firm risk, and one measure of "external" performance was adjusted for market risk. Given the statements above regarding the dimensionality of "external" performance, it is possible that the present relationship reflects conclusions presented by Levy and Sarnat (1970). They suggested that the notion of risk reduction through firm diversification may not be beneficial to stockholders, since they may achieve, on their own, the desired level of risk through portfolio diversification of securities in a perfect capital market.

That the results reported here might reflect such conclusions is highly speculative. Furthermore, it should be noted that the notion of a perfect capital market implies perfect information. In the case of stock investments, the degree of perfection of information may vary widely among various classes of investors.

## The Complexity of Net Assets

The results reported in the previous chapter suggested that the measurement of organizational size by net assets may pose some serious problems. Its statistically significant presence in the measurement model for three separate constructs (size, structure and "external" performance) suggests that it is not a unidimensional variable. It is often treated as such in the selection of a measure of firm size. Its behavior in the present study suggests that its use, in one form or another, as a single, unidimensional indicator of firm size, should be undertaken with great care, if at all.

While the parameters in question were admitted to the model primarily to demonstrate these problems, some theoretical support exists for at least some of the measurement links. In the work of Meyer (1972) and Hall (1972), "size" was considered, explicitly or implicitly, to be one of several structural properties of an organization. However, for the moment, the parameter involving "external" performance remains something of an enigma.

## Limitations of the Study

The results of the present study reflect a first attempt at holistic modeling of complex organizational relationships. The study is presented as exploratory research, with all the problems inherent in such efforts. Its overall purpose was to place certain variables that have received a good deal of attention in the literature into the context of a holistic, causally ordered system. For these reasons, certain paths which do not exhibit significant t-values were retained in the model. They have varying degrees of support in the literature, and one hesitates to engage in actions that might constitute "throwing the baby out with the bathwater" without further study.

On the other hand, the results do suggest that certain relationships may be the result of complex interactions and indirect effects. Thus, they serve the important function of raising a caution flag regarding the manner in which these variables are studied.

It should be noted that the "grounded theory" approach to the process of modeling was based on a single data set. Thus, the results are reflecting a model that represents a best fit to that data set. Future research will reveal whether the structure of relationships obtained in the present study is stable.

It should also be noted that the present study attempted to study environmental and organizational characteristics at the corporate level of analysis. There is certainly some degree of disagreement in the literature regarding the ability to address such issues at that level. If this study had been conducted at the business level, for example among firms in a single industry, the results might have been different. If nothing else, a good deal of variability would have been controlled.

Finally, it should be recalled that the research was based on some assumptions regarding the ability to capture information about the corporate level task environment. This is also an area requiring further study.

## Conclusions and Implications for Future Research

A number of conclusions may be drawn from the present study, with several implications for policy research. First, the predictions derived from the deterministic models, such as the population ecology model or the traditional IO paradigm, do not seem to hold in the context of a holistic, causally ordered system. The environment did exert some powerful influences in the present study, but not in the sense that such models would suggest.

Dynamism, as an external characteristic, was particularly strong. However, as mentioned previously, the method of study does not reveal how that dynamism was perceived by organizational decision makers.

The results do suggest that environmental contingencies are not the immutable forces suggested by the deterministic models, but that their influences are filtered through managerial perceptions, value systems, implicit theories and so on, and their effects are mediated by the resulting managerial choice.

For example, the relationships among dynamism, structure, strategy and performance suggest that with respect to the study of strategy formulation and implementation, consideration should be given to the concept of strategic choice. Such an approach would emphasize that organizations have the ability not only to respond to environmental contingencies, but to exercise considerable influence on the environment. It would further suggest that the concept of "performance" as used by researchers may be only marginally relevant to understanding behavior involving the concepts investigated in the present study.

The indicators of "internal" performance used in the present study are used frequently as measures of performance. Perhaps this is so because they are "objective", easily quantified, and managers often report that they are important.

While managers may look at measures of return for a number of reasons, there are indications in the present research that they are not the most appropriate outcome variables for the constructs studied.

An extensive discussion of ideas relating to this suggestion may be found in the first chapter of Miles and Cameron (1982). The authors suggest, among other things, that "strategic managers may actually choose less than maximally efficient structures in order to satisfy their own needs or those of internal interest groups on whom their survival depends" (p. 17). The organization, then, may choose to ignore some "misalignments" with its environment. They may choose to operate at levels of efficiency criteria that minimally satisfy critical constituencies, and address other issues in their own interpretation of "organizational performance".

Such conclusions are at variance with rational-analytical approaches to strategy formulation and implementation that accept the "structure follows strategy" thesis as a truism, and assert that the primary considerations are those of a portfolio approach based on measures of market share and return. However, they may provide some basis for the disenchantment with such approaches expressed by practitioners in recent years (Kiechel, 1982).

## Suggestions for Future Research

The findings and conclusions reported in the present study suggest further study in a number of areas. A few are listed here:

1. Validation of the stability of the structure of the model on another data set.

2. A "fine tuning" of the relationships involving strategy and structure, to evaluate further their causal structure. That is, placing them in a time ordered specification.

3. Further development of the definition and measurement of that complex array of influences collectively referred to as the environment.

4. A continuation of the model to test notions of "enacted environments". That is, extend the formulation such that the endogenous constructs of the present model become the exogenous constructs, and vice versa.

5. Attempts to define and capture performance criteria relevant to the constructs of interest.

6. Development of richer measures of strategy and structure at the corporate level.

7. Enrichment of the model through the incorporation of constructs relating specifically to issues of managerial perceptions, value systems and choice.

8. Following from (7), development of constructs designed to capture the influences of institutional factors on strategic decision making (the "industry culture" and "corporate culture" as sources of influence).

9. Pursuit of a pragmatic approach to implementation research. That is, with improved understanding of the complexities involved, development of suggestions for (a) strategy formulation in the context of the factors discussed above, and (b) translation of that strategy formulation into activity that will fit the organization.

10. Enrichment of the modeling process to explore the potential existence of any systematic relationships between strategy or structure and economic performance.

## Summary

The study of policy/strategy is, by definition, dependent upon the understanding of an eclectic array of influences. The present study represents an exploratory approach to the use of holistic causal modeling as a means of capturing some of the complex systems of relationships involved in understanding these influences. Is is hoped that the study will at least serve as a basis for reflection, and a stimulus to research designed to further enhance our knowledge of complex organizational systems.

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APPENDIXES

## APPENDIX A

## DEFINITIONS OF ENVIRONMENTAL DIMENSIONS

I. Selected definitions used in the Dess and Beard (1982) study:

A. Munificence

1. Industry growth in total sales: value of shipments, defined as net selling values f.o.b. plant after discounts and allowances, and excluding freight charges and excise taxes; regression slope coefficient divided by mean value, 1968-1977.

2. Industry growth in value added by manufacture: value added, as defined by value of shipments minus total cost of materials (materials, supplies, fuel, electric energy, cost of resales, misc. receipts), with final amount adjusted by net change in finished products and WIP inventories between beginning and end of year (no stipulation on valuation method); regression slope coefficient divided by mean value, 1968-1977.

3. Industry growth in total employment: total employment; regression slope coefficient divided by mean value, 1968-1977.

B. Dynamism

Standard errors of the regression slope coefficients of the munificence measures described above.

C. Complexity

Industry geographical concentration in total sales, value added and employment, as calculated by the following formula:

$$C_i = \sum_j^m X_{ij}^2 \;/\; (\sum_j^m X_{ij})^2$$

where $C_i$ = concentration index,

$X$ = sales, value added, or total employment (separate index for each),

$i = 1, 2, \ldots, n$,

$j = 1, 2, \ldots, m$,

$m$ = number of census divisions = 9, and

$n$ = number of industries in sample = 52

II. Definitions used in the present research

A. Munificence: growth in each of the following, treated as described in the body of the text.

1. Net sales: net sales as reported in the financial statements for the particular accounting period.

2. Operating income (before depreciation): this item represents sales less cost of goods sold and Selling, General and Administrative expense.

3. Total employment.

B. Dynamism: the instability of the above variables, as described in the body of the text.

C. Complexity: defined in the body of the text.

# APPENDIX B

## DEFINITIONS OF MEASURES OF RETURN

I. Return on Equity (ROE): After tax return on common equity

$$= A / B$$

II. Return on Investment (ROI): After tax return on invested capital (after Rumelt, 1974, ROC):

$$= A + C + D / E$$

III. Return on Assets (ROA): After tax return on gross assets

$$= A / (F + G - H)$$

where A = after tax income before extraordinary items and discontinued operations,

B = common equity,

C = interest expense,

D = minority interest (portions of income applicable to minority stockholders)

E = invested capital (LT debt + preferred stock + common equity + minority interest),

F = total assets,

G = gross plant, and

H = net plant.

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