A Dynamic Perspective of Strategic Groups and Performance:

A Longitudinal Study of the U.S. Computer Equipment Industry,

1975-1989

by

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(ABSTRACT)

Recent developments in industrial organization and strategic management have conceptualized an industry as being composed of finer groups of firms. The cluster of firms with similar strategic behavior is called the "strategic groups". This concept has important implications for strategy researchers because it offers a systematic way to study the relationships between strategy and performance. A review of the literature on strategic groups reveals that the dynamics and performance implications of strategic groups have not been systematically studied. Thus, the major focus of this study was to examine the dynamic characteristics of strategic groups and performance implications over time, and to understand the nature and pattern of competition.

To guide this study theoretically, the concepts of strategy, strategic groups, strategic group movement, and mobility barriers are defined explicitly. Under the guidance of research questions and the theory of strategic groups, three hypotheses on the strategic group dynamics were provided based on the inter-temporal stability of firm members, firm movement pathways, and contextual factors motivating changes in group membership. In addition, three hypotheses on the performance implications of strategic groups were derived from between and within-group analysis and the consequences of mobility dynamics.

In order to test these hypotheses, constructs were operationalized in a multidimensional manner. Strategy was operationalized in terms of three dimensions (scope, differentiation, efficiency) each of which were found to be significant in previous research. Performance was operationalized to include the financial and growth dimensions. The data used to perform the empirical tests was obtained from COMPUSTAT II and other objective, secondary sources (e.g., annual reports and 10-K, the Annual Survey of Manufacturers). The U.S. computer equipment industry for the period 1975-1989 served as the setting for this study.

Analysis results suggest that strategic groups are a relative part of the competitive structure in an industry. The mobility rate between relatively similar groups is higher than that between less similar groups. Firms that change group membership have different contextual factors than firms that do not change membership. Moreover, no significant performance difference was found among strategic groups over time. Instead, individual firm effects contribute more to explaining the performance differences. The primary contribution of this study is the integration of strategic management, industrial organization, and organization theory to provide a cohesive platform from which to understand the role and value of strategic groups in competitive strategy.

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The completion of this dissertation marks the end of the most challenging journey of my life to date. The voyage has been marked by periods of exciting and seeming impossible challenge followed by tremendous feelings of personal growth and accomplishment. While there have been periods of failure and loneliness, the memories that I will carry with me are joyful and rewarding ones.

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The end of this dissertation marks the beginning of a new challenging journey to an unknown destination. However, the lessons that I have learned and the training I have received at Virginia Polytechnic Institute and State University gives me the confidence to face this challenge.

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Chapter I: Introduction

This research effort examined two major issues of the strategic group study: (1) the dynamic characteristics of strategic groups, and (2) the performance implications of strategic groups. The discussion outlines the research questions and the theoretical concepts employed to answer those questions. This chapter highlights both the purpose and importance of the study and ends with a review of subsequent chapters.

Importance of Strategic Groups

The field of study concerned with the analysis and applications of the concept of strategy, is called the strategic management discipline. In general terms, strategic management is the set of activities involving the analysis of environmental opportunities and threats, and the development of organizational capabilities and distinctive competences which lead to sustained competitive advantages and improved organizational performance.

In the study of strategic management, an analytical distinction can be made between "corporate strategy" and "business strategy" (Hofer & Schendel, 1978). Corporate strategy deals with the question of the businesses with which a firm should be involved; business strategy addresses the question of how to compete in each business in which a firm participates (Bourgeois, 1980; Hofer & Schendel, 1978; Porter, 1980). This study is concerned with business-level strategy and the primary focus is to examine how firms choose to compete in an industry and whether different business (or competitive) strategies exhibit varying degrees of performance.

In the last three decades, the nature of competitive strategy has been recognized by both practitioners and academicians to be an important element in business success. Competitive strategy " . . . involves positioning a business to maximize the value of the capabilities that distinguish it from its competitors" (Porter, 1980: 47). Based on this definition, a firm must contend with at least two strategic issues:

1. Which companies are direct competitors?
2. How does a company position itself relative to its competitors?

In industrial organization economics, an industry is often used to define competitive boundaries. Two criteria normally define the boundaries of the industry: markets and technologies. The *market* criterion (e.g., Caves, 1982) includes, within a specific industry, those firms that have products sufficiently similar so as to be close substitutes. This similarity is tested by the cross-elasticity of demand. The *technological* criterion (e.g., Andrews, 1951) focuses upon the classification of firms according to the similarity of their production processes. In the United States, the basic system for

classifying industries is called the Standard Industrial Classification (SIC). It follows the market criterion by defining industries in product terms.

It is difficult to satisfy both market and technology criteria, due to increasing industrial complexity since World War II, diversification of products/services, participation in several industries, and multinational activity. Consequently, the definition of the set of competitors for a given firm (i.e., the industry environment) has become increasingly imprecise. Thus, the problem of defining the firm's competitors is an increasingly difficult issue in formulating the competitive strategy.

In his doctoral dissertation on competitive processes in the home appliance industry, Hunt (1972) coined the concept "strategic groups" to distinguish more precisely the direct competitors in an industry. He observed that different firms in the industry adopted different strategies in order to achieve their organizational goals. Firms similar in their strategic behavior were clustered into a strategic group.

The strategic group concept was developed in the first half of the 1970s by researchers from Harvard University (Hunt, 1972; Newman, 1973; Porter, 1973) and Purdue University (Hatten, 1974; Patton, 1976). Although both groups of researchers pursued different research objectives, as will be discussed later in this study, they both grouped firms in a certain way to improve the understanding of competition and performance from a strategic perspective. Porter provides the accepted definition of a strategic group in terms of the similarity of strategic behavior:

> A strategic group is the group of firms in an industry following the same or a similar strategy along the strategic dimensions . . . . Usually, however, there are a small number of strategic groups which capture the essential strategic differences among firms in the industry. (1980: 129)

The concept of strategic groups allows firms to better understand competition when analyzing complex industries (McGee & Thomas, 1986; Thomas & Venkatraman, 1988), and when defining firms' competitors and the competitive positions available within an industry. Based on the concept of strategic groups, Caves and Porter (1977) generalized the theory of entry barriers (Bain, 1956; Scherer, 1980; Vernon, 1972) and devised the term "mobility barriers". The theory of mobility barriers argues that barriers not only protect firms in a strategic group from entry by firms outside the industry, but they also protect firms within the industry from shifting their strategy positions from one strategic group to another.

Based on the concepts of strategic groups and mobility barriers, Porter (1979) developed a theory that explains inter-firm performance differences. According to his theory, the structure of strategic groups (e.g., the magnitude of mobility barriers) affects the process of rivalry within the industry and, therefore, both industry profitability and the dispersion of firms' profits. In addition, mobility barriers enable some strategic groups to keep persistent performance advantages over other strategic groups. Thus, the concept of strategic groups provides an important framework for analyzing competitive strategies.

Beginning with the promising research results mentioned above, strategic group research received increasing attention in the strategic management and the industrial organization economics literature.[1] Attempts have been made to determine the incidence of strategic groups in a large number of industries,[2] and attention has been given to the performance implications of strategic group membership.[3] This paradigm argues that strategic groups exhibit different levels of performance.[4] The application of this paradigm to many different industry settings has illustrated that the strategic group concept has the potential to provide insights into the nature of both strategy and performance relationships, and into the analysis of competition in general.

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[1] In the period since the introduction of the concept of strategic groups by Hunt in 1972, there have been over 50 empirical papers published on the topic, with more than half of them in the last five years. See Herriott and DeArmond (1990), McGee and Thomas (1986), and Venkatraman and Thomas (1988) for the comprehensive literature review.

[2] Extant studies show that different strategic groups have been identified in the various studies (McGee & Thomas, 1986; Venkatraman & Thomas, 1988). Further, many industries have been studied. They range from consumer goods industries (e.g., Oster, 1982; Porter, 1979) and producer goods industries (e.g., Newman, 1978), to the pharmaceutical industry (e.g., Cool, 1985), the insurance industry (e.g., Fiegenbaum, 1987), the retailing industry (e.g., Harrigan, 1985; Lewis & Thomas, 1990), the oil-drilling industry (e.g., Mascarenhas, 1989) and the home appliance industry (e.g., Hunt, 1972).

[3] Based on a fundamental contention that some strategic groups have higher levels of performance than other strategic groups (Caves & Porter, 1977; Newman, 1978; Oster, 1982; Porter, 1979), many researchers have examined the relationship between strategic group membership and performance (e.g., Cool & Schendel, 1987; Dess & Davis, 1984; Fiegenbaum & Thomas, 1990; Frazier & Howell, 1983; Hawes & Crittenden, 1984; Lewis & Thomas, 1990; Oster, 1982; Porter, 1979).

[4] From a theoretical viewpoint, the main contributions to the explanation of intra-industry performance differences are found in the work of Caves and Porter (1977) and Porter (1979, 1980). They argue that performance may differ systematically among strategic groups in an industry, and they offer explanations ranging from mobility barriers and market factors to firm-specific factors in order to explain such differences.

Framework of the Study

Problem Statement

Careful study of the literature on strategic groups reveals that there are still many ambiguities surrounding the "strategic groups" concept (Cool & Schendel, 1987; McGee & Thomas, 1986; Thomas & Venkatraman, 1988). The main issue pertains to the definition of the concept itself. Different researchers have used different measures to describe the strategy for identifying strategic groups. These range from one variable (e.g., firm size) to many (e.g., scope and resource deployment).[5] These discrepancies seriously hamper the comparability of the study results.

Moreover, there is no strong empirical evidence to support the argument that strategic groups observed do exhibit different levels of performance. The existing empirical research indicates that evidence of a relationship between strategic group membership and performance is mixed. For example, Dess and Davis (1984), Fiegenbaum and Thomas (1990), Hawes and Crittenden (1984), Oster (1982), and Porter (1979) have generally found performance differences between strategic groups. On the other hand, Cool and Schendel (1987), Frazier and Howell (1983), and Lewis and Thomas (1990) found no consistent performance difference between groups. Except for Cool and Schendel (1987), Fiegenbaum and Thomas (1990), and Oster (1982), however,

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[5] For example, Porter (1979) and Primeaux (1985) used firm size as a surrogate of strategy to identify strategic groups. Cool and Schendel (1987, 1988), Fiegenbaum and Thomas (1990), and Lewis and Thomas (1990), on the other hand, used strategy variables reflecting scope and resource commitment to classify firms into strategic groups.

most studies conducted were cross-sectional. Therefore, more empirical studies are called for concerning inter-temporal performance consequences of strategic groups.

In addition, most of the studies have treated the strategic group phenomenon from a static perspective: the study of strategic groups has been restricted to only one point in time; assuming implicitly that these relationships are unchanging (Cool & Schendel, 1987). This static perspective does not permit either observations or conclusions about strategic groups, how they form or shift, whether such groups are only random phenomena, or whether observed performance differences are merely transitory.

According to Mintzberg, strategy is "a pattern in a stream of decisions" (1978: 934), that is, the behavior of a firm's actions over time is an aspect not considered in most studies. In their study of the brewing industry, Hatten and Schendel concluded that "attention to homogeneity over time, as across sections, is likely to be worthwhile" (1977: 110). Indeed, in later studies, Cool and Schendel (1987), Fiegenbaum and Thomas (1990), and Mascarenhas (1989) found that both group membership and the strategic relationships clearly changed over time. Cool and Schendel (1987, 1988) and Fiegenbaum and Thomas (1990) argued for more research focused on the dynamics of strategic groups. Since a firm's environment and its expectations and objectives are not stable over time, it is reasonable to expect that the structure of strategic groups may also change over time.

The Purpose of the Study

The purpose of this study is as follows:

1. This study will extend the theoretical foundations of the strategic group concept and will examine the formation of strategic groups within an industry over time. Moreover, this study will examine the dynamic characteristics of strategic groups and will explore the performance consequences of strategic group membership over time.

2. This study will lay a foundation for further investigation of the nature of strategy - performance relationships and the nature and pattern of competition in general.

3. This study shall provide insights for management involved in the positioning of a firm in an industry based on industry structure characteristics and alternative competitive positions.

Research Questions

In view of such issues, it was decided to study strategic groups centered around the following research questions:

1. What are the dynamic characteristics of strategic groups over time?

Are strategic groups a stable or transitory phenomenon? When a longitudinal perspective is viewed, how stable is an industry's strategic group structure[6]? To examine these questions, time periods with stable strategic behavior[7] were identified before strategic groups were identified. The stability of firm members in the same strategic group over time then was tested to examine the strategic group concept as a stable element of market structure and the existence of mobility barriers in an industry (Caves & Porter, 1977).

Although the mobility of firms across strategic groups in an industry may be low, it cannot be implied that firms never move. Several strategic group researchers (e.g., Caves & Porter, 1977; Mascarenhas, 1989; Oster, 1982) recognized the possibilities of firm shifts across strategic groups. Thus, it is crucial for theory development to examine the dynamic characteristics of strategic groups. Questions related to firm movement pathways were tested.

Confronted by an increasingly turbulent and complex environment, top managers have become more interested in understanding the contextual factors that enable or disable successful changes in strategy. However, none of the strategic group studies provided managers with a set of well-tested theories about changes in group

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[6] Strategic group structure can be defined as the configuration of strategic groups within an industry. The structure of strategic groups consists of five elements: the number of strategic groups, the number of members in strategic groups, the complexity of strategic groups (e.g., the number of significant strategy variables which determine a strategic group), the tightness of strategic groups (within-group variance, the relative homogeneity within the group), and the distance between strategic groups (between-group variance, or the relative heights of mobility barriers) (Harrigan, 1985; Hergert, 1983; Porter, 1979).

[7] In this study, a time period with stable strategic behavior is defined as a distinct time period in which firms' behaviors along the strategic dimensions and the interrelationships among the strategic dimensions do not change significantly at the industry level.

membership. To address this gap, we explored the contextual factors that motivate changes in group membership. An empirical understanding of this relationship will help clarify the role of adaptation and population ecology perspectives of organization as well as provide one more step toward the development of the dynamic theory of strategic groups.

2. What are the performance implications of strategic groups?

Do different strategic groups have different performance consequences? Are these differences transitory or are they observable at any point in time? According to Porter, firms in different strategic groups have different performance profiles. The theory of strategic groups, "provides an explanation . . . for persistent intra-industry profit differences" (Porter, 1979: 214). Nelson and Winter's (1982) tacit knowledge embodied in the repertoire of routines and Lippman and Rumelt's (1982) concept of "uncertain imitability"[8] also indicate performance differences between strategic groups. These theories were tested among strategic groups over time.

Strategic group researchers have argued the importance of strategic groups as major determinants on competitive strategy and firm performance. They generally assume that a strategic group is the appropriate unit of analysis for competitive strategy research. However, this argument deserves careful scrutiny as a theory to explain and predict the variance of firms' performance. In fact, Cool and Schendel (1988) provide evidence that firm-specific factors may be more important than strategic group factors

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[8] Lippman and Rumelt (1982) argue that the imitation of the strategy and performance of profitability leaders by incumbents or new entrants is significantly impeded by the existence of ambiguity about what factors are responsible for superior performance. Uncertainty in the creation of new cost functions, related to management actions and results, explains the origin of efficiency differences. They contend that this uncertainty applies to all imitation and entry attempts, and explains the persistence of profitability differences despite free entry and perfect competition.

in explaining the variance of firms' performance. Surprisingly, the question of the relative importance of strategic groups in explaining persistent differences in performance was not directly addressed, with one noted exception (Cool & Schendel, 1988). Thus, we examined the relative importance of strategic groups as compared with firm-specific factors as sources of variance in firms' performance.

Given that firm members may shift across strategic groups over time, mobility dynamics of group membership and performance consequences can be explored. First, we examined the performance differences for the same firms, from the organizational adaptation perspective, before and after group membership changes. Next, we tested Friesen and Miller's (1986) argument that alignment between the magnitude of change in strategy and the environment increases firm performance (Ginsberg, 1988).

Study Setting

To permit a detailed examination of these two basic research questions, it was decided to limit the analysis to one industry; the U.S. computer equipment industry (SIC 3573) from 1975 to 1989. A single industry was selected because the determination of strategy and strategic groups over a long period of time for several industries was judged to be infeasible given the scope of this research. This growing industry exhibits a good mix of different competitive strategies. Due to the industry's high rate of innovation and technological obsolescence, new niches are constantly being carved, while firms unable to adapt decline and go into bankruptcy. Thus, it was expected that different strategies and varying levels of performance in the computer equipment industry would be found, providing an ideal setting for this study.

Data for this study was obtained from multiple secondary sources such as COMPUSTAT II, annual reports and 10-K, and the Annual Survey of Manufacturers. Each construct was operationalized using multiple objective measures.

Importance of the Study

Guided by the conceptual work in industrial organization economics, organization theory, and strategic management framework, this study inquired into a dynamic perspective of strategic groups and performance implications in a longitudinal study. In this effort, several aspects merit attention. This study linked the work in industrial organization economics, organization theory and strategic management to provide a theoretical framework for this research. In substantive terms, this study provided a close look at some major interrelationships between strategy and performance and aimed to obtain a better understanding of the nature and pattern of competition. By identifying the relative efficacy of various schools of thought in competitive strategy, with respect to the strategic groups, this study should make an important contribution to the competitive strategy literature.

Definitions of Terms

The five major constructs in this study are: business strategy, strategic groups, mobility barriers, strategic group movement, and performance. This section briefly introduces these constructs. Details with theoretical justification are provided in chapter II.

Business strategy

In order to provide a theoretical framework for this study, key characteristics of firm strategy are identified based on the major theoretical writings on the relevant topics. These characteristics include: the scope of strategy (e.g., means), the domain of strategy (e.g., holistic), the hierarchical level of strategy (e.g., business level), the realized strategy (Mintzberg, 1978), and three strategy dimensions. Following Hambrick (1983c), Miller (1986, 1987), and Porter (1980) we identified three strategic dimensions: scope, differentiation, and efficiency. The *scope dimension* refers to the range of activities of a business within its industry. The *differentiation dimension* reflects the degree of strategic behavior needed to create products/services that are perceived as uniquely attractive and/or to differentiate by coming out with new products and new technologies. The *efficiency dimension* includes the extent of strategic behaviors through which the firm emphasizes cost reductions and efficiency seeking methods.

For the purpose of this study, a business strategy is defined as the realized pattern of emphasis upon the alternative strategy dimensions (scope, differentiation, efficiency) which permit an organization to attain sustainable competitive advantages and to achieve its objectives.

Strategic groups

A strategic group is a group of firms competing and responding on the basis of a similar combination of strategic dimensions in an industry at any point in time (Porter, 1979, 1980).

Mobility barriers

Mobility barriers are those structural factors which make up group-specific barriers

which cannot readily be negotiated by firms outside the group, as well as barriers which cannot readily be moved to other groups, without significant cost, substantial lead time or uncertainty about the outcome of the strategic decision (Harrigan, 1985; Hatten & Hatten, 1987; Mascarenhas & Aaker, 1989; McGee & Thomas, 1986).

Strategic group movement

A strategic group movement is a relocation of a firm from one existing strategic group to another, a relocation of a firm to a newly formed strategic group, or a relocation of a strategic group in the same industry following a change in the firm's unique combination of strategic dimensions (Mascarenhas, 1989; Porter, 1979).

Performance

Since performance is a multidimensional concept, and since performance indicators may display various patterns, different measures of performance need to be considered in order to obtain a qualified insight into the performance consequences of strategic groups. Thus, both internal (profitability) and external (growth) measures of performance were utilized to capture this construct.

Outline of the Study

This chapter provides an introduction of the basic issues this study proposes to investigate. The discussion outlines the research questions and identifies the purposes and significance of the study. Chapter II begins with a literature review intended to focus on the issues surrounding the strategic group theory. The chapter then develops and discusses the research questions proposed. Next, the hypotheses to be tested in this study are presented. Chapter III gives a detailed explanation of both the research design and the methodology adopted in this study, as well as defensible reasons for the methodological decisions made at each stage. Chapter IV presents the data collection and analysis procedures and the results of the hypothesis tests. Finally, chapter V discusses the conclusions and implications of the study and provides suggestions for future research.

Chapter II: Literature Review

Introduction

This chapter begins with both a discussion of the structure-conduct-performance paradigm developed in industrial organization economics and an examination of the theoretical foundations of the strategic group study. In the second part of this chapter, the constructs advanced in this study are discussed. The concepts of strategy, strategic groups, strategic group movement, and mobility barriers as the major constructs in this study, are presented. In the third part of this chapter, studies on the dynamic analysis and performance implications of strategic groups are reviewed and the important issues as well as the implications for present research work are presented. This chapter concludes with a list of testable hypotheses.

Structure-Conduct-Performance Paradigm

Industrial organization economics studies the rivalry of firms within industries and the implications of this observed rivalry on industry performance (Scherer, 1980: 1). The framework that has been widely used in the study of industry rivalry and performance is the *structure-conduct-performance* (SCP) paradigm. Generally, this paradigm suggests that the way an industry is structured in terms of competitors influences the conduct of firms within the industry. This conduct, then, is said to shape the performance of the industry (Bain, 1956; Mason, 1939).

Before further discussion on the SCP paradigm, an explanation of each term in the SCP paradigm is provided.

Structure

Structure refers to the "relatively stable features of the industry environment that influence the nature of rivalry among buyers and sellers operating in it" (Caves, 1982: 14). The main elements of industry structure are: seller concentration, product differentiation, barriers to entry, buyer concentration, and barriers to exit.

Seller concentration indicates the size and number distribution of firms within an industry. The more concentrated an industry, the easier it becomes for sellers to coordinate their conduct and, in general, to achieve greater market power.

Product differentiation refers to the degrees to which buyers distinguish between various products on the basis of non-price attributes. To the extent that an

industry's product displays commodity-like characteristics, competition on non-price attributes such as quality, packaging, services, etc. will be less likely.

Barriers to entry are industry-specific structural conditions which result in cost advantages for incumbents over potential entrants to the industry. The most common entry barriers are scale economies, absolute cost barriers, and product differentiation. For example, scale economy barriers arise when firms do not achieve the lowest possible cost until they have grown to occupy a large portion of the market. Failure to achieve this threshold level of market share results in cost disadvantages.

Buyer concentration refers to the number and size distribution of buyers within the industry. To the extent that high buyer concentration prevails, the bargaining power of buyers may increase and reduce the excess profits of sellers.

Barriers to exit are conditions which impede firms from exiting an industry. The most common one is high fixed costs. High fixed costs can rapidly turn profits into losses in the case of falling demand or falling prices and/or increases in supply created by new entrants. To avoid these risks, firms may enter into tacit (or overt) collusive agreements to keep prices up or to deter new entrants to the industry.

Conduct

Conduct consists of a firm's policies toward both the structural elements and the strategic behaviors made by rivals within the industry. Conduct is usually described as a firm's pricing behavior, product strategy and advertising, research and development, and coercion and entry deterrence (Scherer, 1980).

Performance

Performance is defined as the "appraisal of how far the results of an industry's behavior deviate from the best possible contribution it could make to achieve society's performance goals" (Caves, 1982: 67). The major performance goals are allocative efficiency, technical efficiency, innovativeness, contribution to macroeconomic stability, and equity. Efficiency refers to the degree to which resources are optimally allocated among industries in the economy (allocative efficiency), and the degree to which resources are optimally employed within each industry (technical efficiency).

The traditional structure-conduct-performance paradigm argues that industry performance and conduct are thought to depend primarily upon market structure (Bain, 1956; Mason, 1939). The logic of this paradigm is that market structure influences a firm's conduct, which in turn determines performance. The "structuralists" argue that the intermediate structure-conduct and conduct-performance relationships need not be studied to evaluate overall industry performance. It is sufficient, in this traditional view, to relate structural elements to measures of performance to assess the nature of competition and to establish how well society is served by the industry. The crucial assumption of this paradigm is that firms are profit maximizers and under constraints of market structure, they will tend to behave in the same way. The homogeneity assumption is the reason that firm conduct elements are ignored in the structure-conduct-performance paradigm. A number of empirical studies (e.g., Bass, Cattin, & Wittink, 1978; Hall & Weiss, 1967; Gale, 1972; Shepherd, 1972) have confirmed that firms' profits in an industry can be partially explained by market structure elements.

This structural view, which has dominated industrial organization research post World War II, has become the subject of much criticism, particularly in the early 1970s.

The so-called "behaviorists" claim that firm conduct is not merely a superfluous intermediate variable because an individual's firm conduct can influence industry structure. Thus, behaviorists argue explicitly that conduct needs to be taken into account when analyzing industry performance because firm strategic behavior has the potential to affect both structure and performance, and because the intermediate structure-conduct and conduct-performance relations merit individual research attention. This view has been articulated by Scherer (1980) and is the basic foundation for industrial organization research on strategic groups. Early industrial organization economics research subscribing to this behaviorist approach came from Hunt (1972), Newman (1973), and Porter (1973).

The above overview of the industrial organization economics analysis provides a framework for understanding the theory of strategic groups. In the next section, a summary of extant theory on strategic groups is presented.

Fundamentals of Strategic Group Theory

In the early 1970s, the strategic group concept developed from two separate viewpoints; one stemmed from industrial organization economics, the other from the strategic management discipline.

Industrial Organization Economics Research Stream

Hunt (1972) departed from the *structuralist* perspective to explain the intense rivalry observed in the highly concentrated, but nevertheless highly competitive, U.S. home appliance industry in the 1960s. Investigating the strategic patterns in the industry, he observed conduct differences such as product diversification policies and distribution arrangements, and noted that observed strategies of rivals fell into distinct patterns of behavior common to a subset of firms in the industry. He suggested that these strategy differences prevented the development of an industry-wide oligopolistic consensus as prior industrial organization economics research would predict. Instead of observing collusive agreement and higher profits, he found strong rivalry among firms. Thus, Hunt coined the term "strategic groups" to refer to firms displaying similar conduct along these key strategic dimensions. He implied that an industry is more likely to be composed of several strategic groups. According to Hunt, the "strategic groups" is defined as:

> A group of firms within the industry that are highly symmetric . . . with respect to cost structure, degree of product differentiation, degree of vertical integration, and the degree of product diversification. (1972: 8)

Based on his findings, Hunt argued that the occurrence of asymmetric strategies decreased the ability of firms in concentrated industries to coordinate their strategic actions and thus achieve higher profits. His work was the major impetus, in the industrial organization economics field, for a continuation of strategic group research.

Newman (1973, 1978) extended the strategic group theory in his study of 34 four-digit chemical process industries. Defining strategic groups by their degree of vertical integration within the market in question, he demonstrated that the existence

of strategic groups impairs *tacit collusion* among firms, which reduces the explanatory power of the structuralist model of industrial organization theory. He noted that:

> If corporate strategies can differ persistently among *direct* market rivals, we can speak of strategic groups - each group consisting of firms highly symmetric in their corporate strategies - *as a stable element of market structures.* (1978: 417)

Although Hunt and Newman laid the groundwork for the industrial organization study of strategic groups, Porter is most closely associated with this stream of research.

Based on the strategic group theory, Caves and Porter (1977) developed the concept of "mobility barriers", a modification of entry barriers (Bain, 1956). The theory of entry barriers argues that existing firms within an industry are protected from new entrants by such elements as economies of scale, absolute cost barriers, and product differentiation. However, if firms pursue different strategies, then the degree of protection provided by specific entry barriers can vary among firms within an industry. Entry barriers should not be viewed as a collective good shared equally by all members of an industry, but rather as mobility barriers which are expected to vary systematically with group structure. Thus, the mobility barriers theory argues that mobility barriers impede not only newcomers but also firms in the same industry in other strategic groups who wish to improve their relative strategic positioning by moving into yet another strategic group. Further, since the strategic behavior of firms can affect the condition of mobility barriers, in Caves and Porter's view mobility barriers are considered partly structural and partly endogenous factors.

Porter (1979) provided a theory of inter-firm performance differences based on the concepts of strategic groups and mobility barriers. He argued that profitability may differ systematically between strategic groups in an industry due to mobility barriers, market factors, and firm-specific asset profiles. He also confirmed the performance

differences between strategic groups by analyzing the patterns of profitability for leaders versus followers[9] in 42 consumer goods industries. In essence, he attempted to verify whether the elements of industry structure have a differential impact on the profitability of firms belonging to different strategic groups. To determine group membership, relative firm size was chosen as a proxy, by assuming that firm size is a summary measure of the strategies employed by firms. Across all industries, leader firms were observed to have a higher average profitability than follower firms. This suggests that it is inappropriate to view all firms within a market as identical except for size.

This concludes the overview of the strategic group theory from an industrial organization economics perspective.

Strategic Management Research Stream

About the same time that the strategic group studies were conducted at Harvard University, two dissertations were completed at Purdue University in which similar issues were addressed. In the first study, Hatten (1974) examined whether some firms adopted more similar strategies than others while they competed within the U.S. brewing industry during the years 1952 to 1971. It was postulated that similarity in strategy could be gauged by assessing whether firms had similar profitability relationships. The strategy-performance model was proposed as testable propositions that were related to the structure-conduct-performance paradigm in the work of Hatten and Schendel (1977)

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[9] Porter defined industry leaders by ranking companies according to sales and including the largest firms which cumulatively supplied 30 percent of industry output. All other firms were defined as followers.

and Hatten, Schendel and Cooper (1978). In this brewing industry setting, firm performance was postulated to be influenced by strategic conduct and industry structure:

$$\text{Firm performance} = f(\text{strategic conduct, industry structure})$$

Tests of strategic conduct homogeneity in the brewing industry led to an examination of statistically homogeneous clusters of firms. These clusters were later related to the concept of strategic groups. It was demonstrated that the estimated profitability relationship for each group differed significantly from the profitability relationship for the industry as a whole. The study showed that firm-level strategic conduct variables contribute to the explanatory power of the structure-conduct-performance paradigm. One of Hatten's major conclusions was that, within the same industry, strategic conducts are associated with different performance consequences for firms belonging to different groupings.

Patton (1976) replicated Hatten's (1974) research on heterogeneity in firm profitability relationships using multiple performance measures. For his study, he also selected the U.S. brewing industry. Based upon differences in firm size and geographic scope, three "firm-groups" were hypothesized to exist: national brewers, large regional brewers, and small regional brewers. As in Hatten's (1974) study, it was found that each group has different estimated relationships and that industry-level estimates differed significantly from the group-level estimates using simultaneous regression analysis (Schendel & Patton, 1978).

This concludes the summary of the fundamentals of strategic group theory. To further our understanding of the strategic groups phenomenon, a set of constructs which allow better identification of strategic groups and an improvement of the analysis of

research questions related to strategic groups is needed. The development of the concepts of strategy, strategic groups and mobility barriers is the subject of the following section.

The Concept of Strategy

To date, there exists general consensus among strategic management researchers that the function of strategy is to provide a mechanism for relating the organization to its environment. Substantial differences, however, remain concerning what strategy really is and how it can be defined.

In the last three decades, various concepts of strategy have been proposed by different researchers. Several of these well-known concepts include those of Andrew (1971), Ansoff (1965), Chandler (1962), Hofer and Schendel (1978), Miles and Snow (1978), Mintzberg (1978), and Porter (1980). Although some of these concepts are quite different, all of them are considered equally relevant to various aspects of strategy-related phenomena. That is, these definitions are complementary to one another; differences among them only reflect their proposer's academic and practical training as well as personal research interests. Since strategy represents a different concept to different researchers, it remains necessary to define terms before embarking on a new strategic management study.

Toward an Operational Definition of Strategy

In trying to conceptualize the strategy construct, a major task is the specification of its boundaries (Venkatraman, 1989). The conceptual domain of the proposed construct is circumscribed with the following four theoretical boundaries:

1. It is important, as noted by Mintzberg (1978), to distinguish between *intended* and *realized* strategies. Intended strategy is an ex-ante concept whereas realized strategy is an ex-post result. By viewing *realized* strategy as "a pattern in a stream of decisions" (Mintzberg, 1978: 934), strategies become consistencies in the behavior of organizations (Mintzberg & Waters, 1982). This view also stresses the longitudinal nature of the strategy concept.

2. It is important to relate strategy to a particular organizational level. Following Hofer and Schendel (1978), we define the strategy construct at the *business* level for this study. Since the primary focus is to examine how firms choose to compete in an industry and whether different competitive strategies exhibit varying degrees of performance, the business-level strategy appears to be relevant to the present study.

3. Considering that the strategy construct is a multi-dimensional concept (Venkatraman & Grant, 1986), a *holistic* perspective of strategy is adopted (Hambrick, 1980) for this study to reflect the strategic orientation of a firm.

4. Following Hofer and Schendel (1978), MacCrimmon (1988), Mintzberg and Waters (1982), and Schendel and Hofer (1979), our focus in describing the essence of strategy is on the *means* adopted to achieve the desired goals within a particular

setting. This provides a restricted construct in which the measures of strategy can be used to examine the relationship between strategies and performance in a particular context.

By borrowing terms and ideas from the earlier strategy concepts, along with the specific views adopted in relation to the above four boundaries of the strategy construct, we define the concept of strategy for this study as:

A business strategy is the realized pattern of the various means employed that permits an organization to achieve its objectives while responding to the perceived opportunities or threats in an industry environment.

Business strategy has been defined as the pattern of goal-directed activity prioritized by the top management of a business. Given limited resources, top management must decide the relative emphasis to be placed on the alternative competitive attributes that define the competitive posture of the business (Bourgeois, 1980). The strategic behavior of a business is therefore established by the pattern of emphasis among the competitive attributes.

This view of strategy, the *pattern of emphasis placed on alternative competitive attributes*, is considered "state-of-the-art" by some strategic management researchers (Miller, 1988; Robinson & Pearce, 1988). It allows a rich operationalization of the strategy construct, since strategy is often thought of as a complex and multifaceted construct (Ginsberg, 1984; Hambrick, 1980). It does not constrain a business to classify itself into predefined strategy types, but rather permits each business to convey its own unique strategic emphasis (Miller, 1981; Miller & Friesen, 1984). While the particular patterns of emphasis among the competitive attributes of a business may be unique to that business, there are "a limited number of strategic archetypes that capture the essence of most business units' competitive postures" (Hambrick, 1983c: 688).

Based on the strategy archetypes of Dess and Davis (1984), Hambrick (1983a, 1983c), Henderson (1979), Hofer and Schendel (1978), Miles and Snow (1978), and Porter (1980), Miller (1987) identified four strategy dimensions that are consistently stressed in the literature: complex innovation, marketing differentiation, breadth, and conservative cost control. Similarly, Hambrick, in testing Porter's (1980) generic strategies in mature capital goods industries, argued that Porter's generic strategies represent "a theorized confluence on three dimensions" (1983c: 689): efficiency, differentiation, and scale/scope dimensions. Following Hambrick (1983c), Miller (1986, 1987), and Porter (1980) we also identified three strategic dimensions: *scope, differentiation*, and *efficiency*.

A brief description of the strategic dimension follows.

Scope Dimension

Scope dimension refers to the relative size and range of activities of a business within its industry (Abell, 1980; Hambrick, 1983c; Hofer & Schendel, 1978). It reflects the directional choices in view of environmental opportunities and threats, that are made to achieve organizational objectives (Ansoff, 1965). This dimension also captures the scope of the market to which businesses cater: the variety of customers, their geographic range and the number of products. Many researchers on strategic management have discussed this dimension (e.g., Abell, 1980; Ansoff, 1965; Chandler, 1962; Hofer & Schendel, 1978; Porter, 1980; Rumelt, 1974).

Differentiation Dimension

Differentiation dimension reflects the degree of proactive strategic behavior needed to create products/services that are perceived as uniquely attractive and/or to

differentiate by coming out with new products and new technologies (Miles & Snow, 1978; Porter, 1980). It emphasizes strong marketing abilities, creative, well-designed products, a reputation for quality, a good corporate image, and strong cooperation from marketing channels. There is also strong emphasis on product R & D and the development of new products. Differentiation dimension also reflects Miles and Cameron's (1982) domain offense strategy which is based on product innovation and/or market segmentation, Miles and Snow's (1978) prospectors, and Porter's (1980) differentiation strategy.

Efficiency Dimension

Efficiency dimension captures the extent of defensive strategic behavior to which the firm emphasizes cost reduction and efficiency-seeking methods (Porter, 1980). It stresses efficient scale facilities, process R & D, the pursuit of cost reductions in manufacturing, the minimization of expenses of product R & D, services, selling and advertising. This dimension also tries to supply a standard, high-volume product at the most competitive price. Efficiency dimension is the strategy of Buzzell, Gale and Sultan (1975), Henderson (1979), Miles and Cameron's (1982) domain defense strategy, Porter's (1980) cost leadership strategy, and, to a lesser degree, Miles and Snow's (1978) defenders.

These three strategic dimensions are broad aspects of strategy and have been suggested as particularly appropriate for studies of an essentially exploratory nature (Miller, 1987). Each strategy dimension results from a business's emphasis on a specific set of competitive attributes that enact the dimension. Each attribute can be pursued to a greater or lesser extent. It may be argued that aspects of each dimension can lead to a successful strategy. A business strategy is based, then, on the relative importance

placed on each dimension. The strategy dimensions and related competitive attributes are outlined and briefly described in Table 1.

The previous definition of strategy can now be defined in more specific terms:

A business strategy is the realized pattern of emphasis upon the alternative strategy dimensions (scope, differentiation, efficiency) that permits an organization to attain sustainable competitive advantages and to achieve its objectives.

This definition is the basis for our discussion of the concepts of strategic groups and mobility barriers.

The Concepts of Strategic Groups and Mobility Barriers

As mentioned earlier, the concept of strategic groups was coined by Hunt (1972) in his study of competition in the U.S. home appliance industry. Later studies invariably adopted the same term to refer to the observed heterogeneity in firm strategy within industries. However, the term has a different connotation to different researchers (McGee & Thomas, 1986; Venkatraman & Thomas, 1988). This lack of consensus is especially visible when the empirical definitions of the concept are compared. If the strategic group concept is to have any real value to strategic management, research will have to be concerned with this definition.

To begin, we may ask: "What is the concept of strategic groups?" If observed grouping really stems from differences in firm strategy, then the concept of strategy should provide the basis for revealing the differences in strategy between firms in any given industry. As stated earlier, strategy is minimally composed of three facets: scope,

Table 1. Strategic Dimensions and Competitive Attributes

Strategy Dimension	Competitive Attributes	Supporting Studies
Scope Dimension		
The relative size	Variety of customers	Ansoff, 1965
and range of activities	Geographical scope	Hofer & Schendel, 1978
of the business	Product line breadth	Abell, 1980
within its industry	Relative firm size	Porter, 1980
Differentiation Dimension		
The degree to which the	Control distribution	Miles & Snow, 1978
products/services	Aggressive/innovative	Porter, 1980
are perceived as	marketing	Miller & Friesen, 1984
unique	Customer service	
	Advertising and promotion	
	Premium pricing	
The degree to which	Product innovation	Miles & Snow, 1978
the business introduces	Product R & D	Porter, 1980
major new products or	Track market opportunities	Hambrick, 1983c
services	Unique product development	Miller & Friesen, 1984
Efficiency Dimension		
The degree to which	Control overhead	Miles & Snow, 1978
inputs per unit of	Emphasize low cost	Henderson, 1979
output are low	Efficient manufacturing	Porter, 1980
	High capacity utilization	Hambrick, 1983c
	Low pricing	
	Process innovation	

differentiation and efficiency dimensions. Given these three definitions, it can be argued that it would be natural to look at strategic differences between firms in those terms.

Another way to analyze whether scope, differentiation, and efficiency dimensions are complementary is to examine what strategic decisions create sustainable competitive advantages. To take competitive advantages, a firm has to develop and apply distinctive competences, that is, capabilities that competitors do not have. For example, some firms are particularly effective in product or market development, while others display strength in cost or production efficiency. Among various options, Hofer and Schendel (1978) considered distinctive competences to be the outcome of a firm's consistent pattern of deploying its skills and resources that determines the external competitive weapons (Porter, 1980). These skills and resources reflect the pattern of past and present investments resulting from strategic decisions. In addition, scope decisions also provide the basis for pursuing lasting competitive advantages over competitors (Abell, 1980; Hofer & Schendel, 1978). Snow and Hrebiniak's (1980) results also indicated that distinctive competences were critical to strategic orientation at the business level. Thus, scope, differentiation, and efficiency strategic decisions need to exist to create distinctive competences. Distinctive competences then result in competitive advantages for a firm.

The above three dimensions of the strategy concept need to be captured in a theoretical and empirical definition of strategic groups. Therefore, the following definition of strategic groups is employed in this study:

A strategic group is a group of firms competing and responding on the basis of a similar combination of strategic dimensions in an industry at any point in time.

This definition implies that strategic group members vie for defendable strategic positions on the basis of the same sources of competitive advantage, and that the concept of strategic groups has three major characteristics (Porter, 1979). First, a

strategic group is composed of firms that follow similar strategic dimensions. Second, firms within a strategic group resemble one another more closely than firms outside the group. Third, firms within a strategic group are likely to respond similarly to environmental opportunities or threats.

Building on the previous discussion, a definition of strategic group membership changes, also called "strategic group movement", can now be provided:

> **A strategic group movement is a relocation of a firm from one existing strategic group to another, a relocation of a firm to a newly formed strategic group, or a relocation of a strategic group in the same industry following a change in the firm's unique combination of strategic dimensions.**

Mascarenhas (1989) developed a framework for analyzing strategic group movement. A change in strategy by some firms in a strategic group can result in three different outcomes: a change in the number of groups, a change in group strategy, or a change in group membership. Some firms in a strategic group may change their strategy. If the change in strategy does not result in a strategy that coincides with the strategy of another existing strategic group, and if not all members in the group match the strategy change, an additional strategic group will be formed. If all other members of the group match the change in strategy, the result will be a change in group strategy. Finally, if a strategic change parallels the strategy of another strategic group and if all the other members in the group do not follow, changes in group membership occur. The notion of strategic group movement is a necessary element for the dynamic analysis of the strategic group phenomenon.

In the next section, the concept of mobility barriers, the theoretical core of the strategic group concept (Porter, 1979: 216), is discussed.

As mentioned previously, the concept of mobility barriers was introduced by Caves and Porter (1977) to explain the persistence of strategy differences among firms operating in the same industry. They argued that the cost factors involved in strategic change may keep firms in a particular strategic group from adopting strategies of firms in other more successful strategic groups. Mobility barriers may be defined as "group-specific entry barriers" that "not only insulate firms from entrants new to the industry, but they also insulate firms in a strategic group from entry by members of another group (intergroup mobility)" (Porter, 1979: 216).

In their review of the strategic group literature, McGee and Thomas (1986) examined mobility barriers. Briefly, they stated that mobility barriers arise from strategic decisions:

> A firm within a group makes strategic decisions which cannot be readily imitated by firms outside the group without substantial costs, significant elapsed time, or uncertainty about the outcome of the decisions. These barriers to casual imitation by firms outside the group are called *mobility barriers (or group-specific entry barriers)* . . . it is natural to envisage the key strategic variables as those which affect the height of mobility barriers. (1986: 150)

McGee and Thomas then proceeded to formalize these key strategic decisions into a taxonomy of mobility barriers. Three major types of strategic dissimilarities between groups are distinguished in this taxonomy: market related strategies, industry supply characteristics, and characteristics of the firm. The common denominator of the listed mobility barriers is that they are all strategic variables. McGee and Thomas indicated that "mobility barriers reflect the decisions of firms and a way of defining the set of key strategies available to a firm" (1986: 153). In this respect, their argument can be seen as an extension of Caves and Porter's (1977) concept of mobility barriers. Harrigan also argued that the heights of mobility barriers are determined by "the types of competitive investments its firms have made in the past, . . . (and) firms' differences in brand

identification, product quality, technological leadership, asset specificity, extent of service offerings, degrees of financial leverage, . . . " (1985: 57).

Following Harrigan (1985) and McGee and Thomas (1986) mobility barriers are seen in this study as endogenous factors for an industry. They result from firms' unique strategic behaviors to certain sets of strategy attributes. Although over time certain scope, differentiation, and efficiency attributes become more stable than others, and in the short then run do not change, mobility barriers essentially represent a firm's strategic behavior and therefore are changeable in the long run.

As with the entry barrier notion, the mobility barriers concept has been employed to explain performance differences between firms. The general view is that firms in strategic groups with higher mobility barriers will have greater profit potential than those in groups with lower barriers (Caves & Porter, 1977; Harrigan, 1985; Hatten & Hatten, 1987; Oster, 1982; Porter, 1979, 1980). The concept of mobility barriers explains why some firms in an industry persistently earn higher profits than others, and why firms adopt different strategies even though not all strategies are equally successful. Without mobility barriers, firms with successful strategies would quickly be imitated by others. Firms' profits would also tend to become equal except for the relatively transient differences in firms' abilities to execute their strategies. The existence of mobility barriers means that some firms can enjoy systematic advantages over others which can only be overcome by strategic breakthroughs that lead to structural change in the industry, and not merely through better execution.

If some profile of scope, differentiation, and efficiency attributes is potentially associated with performance differences, one may wonder what prevents group outsiders from entering the group, or from imitating these three attributes. Although potentially

scope, differentiation, and efficiency attributes can be imitated, some factors (e.g., uncertain imitability) inherent in these choices limit the possibilities for copying them. Specifically, since scope, differentiation, and efficiency strategic decisions involve long lead times, and because they are subject to substantial uncertainty about the outcomes once the resource and time commitments have been made, these decisions can be said to be generally characterized by barriers to imitation (McGee & Thomas, 1986). Therefore, movement in and out of investment opportunities is significantly impeded by the difficulty of successfully imitating new scope, differentiation, and efficiency attributes and by the attending sunk costs.

Building on the previous discussion, the following definition of the mobility barriers concept is adopted in this study:

> **Mobility barriers are those structural factors which make up group-specific barriers which cannot readily be negotiated by the firms outside the group, as well as barriers which cannot readily be moved to other groups, without significant cost, substantial lead time, or uncertainty about the outcome of the strategic decision.**

This concludes the discussion of constructs advanced for theory building and hypotheses in this study. In the next section, a discussion of the research questions addressed in this study, and the hypotheses tested, is undertaken.

Dynamic Analysis of Strategic Groups

Stability of Strategic Group Membership

The theory of strategic groups argues that firms within an industry can be clustered into groups in terms of strategic similarity. Once strategic groups are identified, firms within a strategic group resemble one another closely. Firms in the same strategic group are likely to respond in the same way to environmental change, and to be able to anticipate each other's reactions quite accurately (Caves & Porter, 1977; Porter, 1979). Therefore, it is likely that firm members will adhere to the strategies of the strategic group over time (Oster, 1982).

Several explanations can be offered to support this viewpoint. First, firms in the same strategic group make similar assumptions about the future potential of the industry (Porter, 1980). Second, strategic group members have similar goals and the skills that are required to achieve these goals. If there is an environmental change in the industry, strategic group members are expected to react in a similar way (Caves & Porter, 1977; Porter, 1979). This argument is consistent with the organizational adaptation perspective, which is concerned with the development of a viable match between environmental opportunities and threats and the organization's capabilities and resources for exploiting those opportunities and threats (Chaffee, 1985). Moreover, taking the adaptation perspective one step further, firms within the same strategic group have similar mechanisms for strategic adaptation, and these adaptation mechanisms differ across strategic groups. Even if a firm is dissatisfied with its current strategy, it is not easy to move to a more successful strategic group. Finally, impediments such as

mobility barriers (Caves & Porter, 1977; McGee & Thomas, 1986), execution ability (Porter, 1979), uncertain imitability (Lippman & Rumelt, 1982), and structural inertia[10] (Hannan & Freeman, 1977, 1984) may induce firms to remain in the same strategic group.

Organization theory also provides support for the existence of resistance to change. Miller and Friesen (1984: 207) summarize this perspective as follows: First, as noted by Carter (1971), Cyert and March (1963), and Pfeffer and Salancik (1978), there are adaptive rigidities caused by the avoidance of uncertainty and the fragmentation of political coalitions and goals. Second, March and Simon (1958) show that slack resources may reduce the need to response rapidly. Third, Wildavsky (1972) and Wilensky (1967) emphasize that the information processing system in organizations may tend to perpetuate narrow models of reality so that there is a lack of awareness of the need to adapt. Fourth, the studies of Clark (1972) and Mitroff and Kilmann (1976) suggest that organizational ideologies cause resistance to change. Finally, Miller and Friesen (1980) emphasize the role of emotional, cognitive, and power factors that inhibit organizational responsiveness. Thus, it can reasonably be assumed that firms in the same strategic group follow strategies similar to other group members over time.

Until recently, the majority of previous strategic group studies have employed static analysis and have implicitly assumed that strategic groups are a stable element of market

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[10] From the view of the population ecology perspective, Hannan and Freeman (1977, 1984) asserted that organizations are not primarily adaptive, but largely inertial. They display inertia to the extent that variables describing some of their strategic and structural features change at relatively slow rates. Managers face a wide variety of constraints which often limit their ability to make changes of various kinds. Changes in strategy involve overcoming such inertial constraints. This is not to say that organizational ecology assumes that managers do not matter, or that strategy is never modified. Rather, such changes occur as relatively abrupt modifications in the organization's mode of operating. These changes are likely to be abrupt because strategy, structure, and patterns of human participation are linked so that changing one requires changes in the others. Therefore, resistance to piecemeal tinkering is likely.

structure (e.g., Dess & Davis, 1984; Fombrun & Zajac, 1987; Frazier & Howell, 1983; Harrigan, 1985; Hawes & Crittenden, 1984; Lawless, 1989; Newman, 1978; Porter, 1979; Zahra, 1987). With static analysis, however, research cannot examine whether strategic group structure and membership are stable over time, or investigate fundamental questions about strategic group formation, evolution, and types of change of strategic group structure.

Despite the strategic group literature's conceptual emphasis on the stability of group membership, the strategic choice view suggests that strategic decision makers may enact or interpret different environments (Starbuck, 1982; Weick, 1979). Managers are likely to have discretion in strategic options or the ability to influence their environment (Bourgeois, 1984; Child, 1972; March, 1981). Further, a central tenet of strategic management is that organizations must maintain an alignment with their environment. A underlying premise is that organizations can manage their dependency on their environment for resources, by developing and maintaining strategies (Aldrich, 1979; Hofer & Schendel, 1978; Pfeffer & Salancik, 1978; Thompson, 1967). Consequently, as environments change so should an organization's strategy (Thompson, 1967). Many studies have examined the different strategies that organizations can use in order to cope with their various environments (e.g., Hambrick, 1983c; Miller & Friesen, 1978; Mintzberg, 1973). Therefore, the assumption of stability of strategic group structure and membership becomes a hypothesis that needs to be tested. Since strategy refers to a dynamic reality (Mintzberg, 1978), whether or not strategic group structure and membership change over time as firms alter their strategies for competing in an industry, must be assessed.

A dynamic extension of strategic group research consists of studies that examine the stability of strategic group structure and membership over time. One motivation for

this work has been to verify the existence of strategic groups, defined as a set of firms exhibiting stable patterns of strategy over time (e.g., Baird, Sudharshan, & Thomas, 1988; Cool & Schendel, 1987; Fiegenbaum & Thomas, 1990; Hatten, Schendel, & Cooper, 1978; Mascarenhas, 1989; Oster, 1982; Ryans & Wittink, 1985). Representative empirical studies of the stability testing of strategic group structure and membership over time are listed in Table 2.

In general, researchers found relatively stable strategic group structure and membership over time. For example, Oster (1982) studied the incidence of strategic changes of firms, measured year to year, in the 19 consumer goods industries for the period 1971 to 1977. She used an advertising to sales ratio to cluster firms into high and low advertisers. She found that the incidence of firm movement between high and low advertiser groups was quite low in all industries.

In another study, Cool and Schendel (1987) examined the stability of strategic group structure during from 1963 to 1982. Their sample consisted of 22 firms in the U.S. pharmaceutical industry. Using scope and resource commitment variables for grouping, they found a stable strategic group structure across four distinct time periods during the 20-year period. Based on these results, they concluded that strategic groups are a relatively stable phenomenon.

Using a sample of firms in the international off-shore drilling industry from 1966 to 1984, Mascarenhas (1989) found stable strategic group structure and membership over periods of economic stability, growth, and decline. During most of the period, three strategic groups were observed and firm movement rates across strategic groups, measured by the ratio of actual to possible membership changes, were quite low (ranges from 0.05 to 0.10).

Table 2. Empirical Studies on Stability of Strategic Groups Over Time

Study	Industries Studied	Strategy Measures	Analysis Method	Major Findings
Hatten & Schendel (1977) (with Cooper, 1978)	Brewing industry	Manufacturing and marketing strategy variables	Statistical pooling tests	Fairly high degree of time-related membership stability was found.
Oster (1982)	19 consumer goods industries	Product strategy; Advertising to sales ratio	Year-to-year variations testing	Low levels of movement in group membership were observed.
Ryans & Wittink (1985)	Airline industry	Security price movements	Rule-of-thumb by calendar quarter	Stable structure exists over time.
Cool & Schendel (1987, 1988)	Pharmaceutical industry	Scope and resource deployment variables	Equality of variance/covariance testing	Stable structure over time was found.
Baird, Sudharshan & Thomas (1988)	Office equipment and electronic computing industry	Financial strategy variables	Three-mode factor analysis	Stable patterns in group structure were found over time.
Mascarenhas (1989)	Oil-drilling industry	Variables reflecting strategy dimensions and mobility barriers	Identifying economic periods (stability, growth, decline) by industry capacity change and utilization	Group structure persisted over time. Low levels of changes in group strategy, changes in membership, and changes in number of groups were found.
Mascarenhas & Aaker (1989)	Oil-drilling industry	Three dimensions of mobility barriers (depth, offshore, international)	Identifying economic periods by industry capacity change and utilization	Stable group membership over time were found.
Fiegenbaum & Thomas (1990)	Insurance industry	Scope & resource deployment variables	Equality of mean and variance/covariance testing	Stable group structure over time were found. Low level of changes in group membership was observed.
Fiegenbaum, Sudharshan, & Thomas (1990)	Drug industry	Scope & resource deployment variables	Equality of mean and variance/covariance testing	Stable group structure over time was observed.

The extant empirical studies, therefore, offer additional support for the theoretical arguments of economic and organizational researchers on the stability of strategic group structure and membership over time.

Though previous studies have examined the temporal stability of strategic group structure and membership, most extant studies are descriptive in nature. Thus, little empirical work has provided strong empirical evidence that firms in the same strategic group are stable over time. Porter (1979) proposed three major characteristics of strategic groups: (1) each strategic group is composed of firms that follow similar strategies; (2) firms within a strategic group resemble one another more closely than any other firm outside the group; and (3) firms within a strategic group are likely to respond similarly to environmental opportunities or threats. Support for the first two characteristics may be provided through clustering analysis, but the third characteristic, which reflects an important theoretical issue, has not been examined in previous studies.

Without any strong evidence of inter-temporal stability of group membership, the concept of strategic groups may reflect nothing more than statistical homogeneity. Thus, it is necessary to examine the stability of group membership over time before undertaking the dynamic analysis of strategic groups. In addition, as Rumelt (1984) argued, the strategic group may act as a reference point for the individual firm in formulating its strategy in a competitive environment. Therefore, the stability in strategy of firms in the same strategic group is a necessary element for predicting future strategic behavior in strategic groups. Since theory and research point strongly toward the assumption that firms in the same strategic group react in a similar way to environmental opportunities and threats, it can be hypothesized that:

H1. **Firms will remain in the same strategic group over time.**

Mobility Dynamics of Strategic Groups

Another aspect of strategic group dynamics relates to the pattern of strategic group membership movement over time. Although the probability of firm movement across strategic groups may be low, this does not imply that firms never move. In fact, Caves and Porter (1977) and Porter (1979) suggested that mobility barriers do not create an entirely deterministic group structure in an industry. They also recognized the possibility of firm shifts across strategic groups as well as new firms' sequential movement when attempting to enter the industry. Their argument is stated as follows:

> The presence of groups also raises the possibility of entry paths. Conventional entry theory has the unsatisfying property of positing that the firm chooses to enter at some scale x in the industry, and that this choice is independent of its future plans. If the firm will, in general, alter position within its industry after entry, and if it is not completely ignorant of this possibility when it makes its entry choice, then the initial entry plan will rationally include some provision for expected future moves. An outsider entering a group-segmented industry may proceed by a sequence of moves, as may a going firm's intergroup shift. (1977: 255)

As Caves and Porter (1977) indicated, mobility barriers not only give differential protection against new firms coming into the industry, but they also keep the members of one group from entering into another group. Consequently, entry into some strategic groups may be easier than entry into others because of differences in the mobility barriers. Thus, mobility dynamics can be modeled to examine firm movement pathways.

Strategy is a dynamic process (Mintzberg, 1978) in which firms are concerned with the development of a viable match between the external environment and the organization's capabilities and resources which may change over time (e.g., Porter, 1980). In order to identify the match between external and internal forces, firms make either major strategic changes or strategic adjustments (Ginsberg & Venkatraman, 1985;

Snow & Hambrick, 1980). The firm's change or adjustment behavior may result in new positioning for strategic group members. Organization theories also argue that, typically, the organization's environment is unstable (e.g., Dess & Beard, 1984), and firms consistently attempt to adapt their strategic behavior to environmental change (e.g., Aldrich, 1979; Chaffee, 1985; Hofer & Schendel, 1978; Miller & Friesen, 1980). Thus, the outcome may be a relocation of a firm from one existing strategic group to another, a relocation to a newly formed group, or a relocation of a strategic group in an industry over time.

Recently, Mascarenhas (1989) and Oster (1982) have investigated strategic group membership movement over time. Although they found relatively stable strategic group membership, they did recognize the incidence of firm shifts across strategic groups. Thus, they provided empirical evidence about the extent of movement in strategic group membership over time. In general, they found that entry into some strategic groups is easier than entry into others because of the height of the mobility barriers.

In her study of 19 consumer goods industries, Oster (1982) observed that strategic group membership shifts were asymmetrical between two strategic groups because of mobility barrier differences. In another study, Mascarenhas (1989) examined the dynamics of strategic groups in the international oil-drilling industry. He found that the mobility rate between relatively similar groups was higher than that between less similar groups also because of differences in mobility barriers.

These studies demonstrate asymmetric membership shifts between strategic groups. This aspect of mobility dynamics captures important characteristics of the dynamic nature of group membership movement pathways, and provides valuable insights about

industry evolution. Thus, further empirical investigation of the mobility dynamics of strategic groups is encouraged.

The heights of each strategic group's mobility barriers are determined by the types of group-specific competitive investments its firms have made in the past (Harrigan, 1985). Additionally, strategic group asymmetry refers to inter-group differences in strategic configurations which are defined by the overall strategic attributes that firms follow, and the distances between strategic groups that are indicated, in part, by dissimilar mobility barriers heights (Harrigan, 1985; Porter, 1980). Harrigan mentioned that "the distances between strategic groups suggest the relative heights of mobility barriers separating groups from emulation by potential entrants" (1985: 67).

Inter-group differences in strategic configurations determine whether firms' strategic attributes can be imitated easily. If their competitive advantages arise from strategic attributes that firms outside the group could imitate easily, strategic groups might be more vulnerable to copying by outsiders. Thus, the low mobility barriers would offer little protection for member firms from group entrance by firms outside the group. On the other hand, high mobility barriers may prevent movement out of as well as into a group. If movement into strategic groups with lower mobility barriers is easier, mobility rate should be higher among groups with similar strategic configurations (Harrigan, 1985; Mascarenhas, 1989; Oster, 1982). This movement pathway may occur partly because firms are more likely to engage in incremental change, involving movement into similar strategic groups, than in major or quantum change, involving movement into dissimilar groups.

Using Miles and Snow's (1978) strategic typology, Zajac and Shortell (1989) investigated the effects of an environmental shift (the Medicare Prospective Payment

System introduced by the government in 1983) on strategic changes in the health care industry. They found that changes between similar strategies were more frequent than those between dissimilar strategies. Among 275 strategic changes, 198 firms changed their strategies between adjacent strategy types (e.g., prospectors-analyzers and defenders-analyzers). Only 17 firms (6 percent of the total strategic shifts) changed their strategies between remote strategy types (e.g., defenders-prospectors).

In another study, Smith and Grimm (1987) examined the impact of deregulation on strategic changes among 27 railroad firms. They observed that only three out of 15 firms with strategic shifts dramatically changed their strategies from an unfocused follower strategy to an innovation strategy. Even though they found that the most profitable kind of strategic change was from an unfocused follower strategy to an innovation strategy, the strategic shift direction was rare. Therefore, these studies provide additional evidence of asymmetric firm shifts among strategic groups facing abrupt environmental change. These considerations lead to the following hypothesis:

***H2.* The level of firm movement will be higher between strategic groups with similar strategic configurations than between groups with dissimilar strategic configurations.**

Contextual Factors Influencing Change in Group Membership

Another important issue in the dynamic analysis of strategic group study is: what contextual factors influence changes in strategic group membership? Strategic management is fundamentally concerned with environmental changes and organizational adaptation (Ansoff, 1979; Hofer & Schendel, 1978). Accordingly, researchers describe organizational strategies as patterns of resource allocations that are inherently involved

with change (Mintzberg & Waters, 1982), and strategic managers as "change-seekers" who "must not only be adaptable to change, but must also convince other people in the organization of the inevitability of change" (King & Cleland, 1978: 36). Like other kinds of organizational changes, shifts in strategy occur when contextual factors creating pressure for change overcome factors creating resistance to change (Lundberg, 1984). How often firms tend to undergo changes in strategy is a central debate in organizational theory with regard to the relative influence of inertia factors, adaptive factors, and strategic choice on activity patterns over time (Astley & Van de Ven, 1983; Romanelli & Tushman, 1986).

Population ecology theorists view organizations as complex systems severely constrained by external contextual factors that create and institutionalize strong webs of commitment (Aldrich, 1979; Stinchcombe, 1965). Hannan and Freeman (1984: 153) argued that formal organizations have two important advantages over other collective actors: their ability to perform reliably and to account rationally for their actions. Organizational reliability and accountability require organizational structures that are reproducible or stable over time. Formalizing goals and standardizing patterns of activity stabilize organizational structure (Hannan & Freeman, 1984; Nelson & Winter, 1982).

On the other hand, institutionalization and standardization generate strong resistance to change because organization members tend to maintain the status quo that protects their interests (Hannan & Freeman, 1984). Thus, the characteristics that give an organization stability also generate resistance to change. Hannan and Freeman (1984) contended that constraints on change in the core features of organization are very strong. However, they did not suggest that organizations never change. Instead, Hannan and Freeman defined inertia relative to environmental changes: "structures of

organizations have high inertia when the speed of reorganization is much lower than the rate at which environmental conditions change" (1984: 151). This view would suggest that the probability of change in group membership in response to environmental changes may be low.

In contrast, organization adaptation theorists view organizations as actors able to make prescient decisions that lead to survival-enhancing shifts (Pfeffer & Salancik, 1978). From the perspective of organizational adaptation, organizations change easily and speedily in response to environmental changes (Ansoff, 1965). Changes in the firm's external or internal environment may increase both pressures for, and resistance to, changes in strategy. Changes in the external or internal environment may lead to pressure for change by providing feedback that a firm is misaligned with its environment. This misalignment, in turn, may decrease the effectiveness of continuing the current strategy (Porter, 1980), and may precipitate strategic changes intended to improve alignment (Friesen & Miller, 1986). The adaptation perspective suggests that environmental shifts drive strategic changes that may result in changes in group membership.

Theories of strategic management increasingly focus on modeling and measuring changes in strategy (Ginsberg, 1988). Empirical research, however, appears to have become preoccupied with a particular aspect of the causes of strategic changes. For example, Smith and Grimm (1987), Tushman and Anderson (1986), and Zajac and Shortell (1989) examined the influence of external environmental changes on strategic changes. Other studies (e.g., Oster, 1982) examined the influence of poor or declining performance on changes in strategy. On the other hand, Kelly and Amburgey (1991) and Singh, Tucker, and Meinhard (1988) studied strategic changes from the population ecology perspective. Arguing that neither population ecology nor organization

adaptation models adequately explain the occurrence of changes in strategy, we examine the above two models to identify what contextual factors motivate changes in group membership.

Inertial factors

As mentioned earlier, population ecology theorists contend that organizations are subject to strong inertial factors that tend to slow responsiveness to environmental changes, especially when responses involve changing the core features of organizations (e.g., goals, core technology). This does not imply that organizations never change, but rather that inertia plays a key role in predicting organization responsiveness to environmental changes (Hannan & Freeman, 1984). According to the inertia theory, structural inertia varies with organizational size and age.

Organizational size: Large firms are more likely to be formalized and bureaucratic than small firms (Scott, 1987). Because large organizations must organize the efforts of many members, they develop formal policies and procedures to coordinate the work flow. Once formal policies and procedures are in place, strong effort is required to dislodge them. However, increased formalization can lessen responsiveness to environmental change (Lawrence & Dyer, 1983). Organizations that are highly formalized make decisions regularly and are less inclined to alter formal policies and procedures than are less formalized organizations. Empirical research has supported the relationship between size, formalization, and bureaucracy (Blau & Schoenherr, 1971).

Large firms tend to have complex structures (Scott, 1987) that can constrain adaptability (Galbraith, 1973). If a myriad of details regarding the daily concerns of

management consumes managers, they are less able to scan the environment and notice when it is necessary to reorganize or to change strategies. Even if the necessity for a change is apparent, managers may find it difficult to implement core changes because of the complex processes involved in adjusting information and resource flows (Hannan & Freeman, 1984). They may also be embodied in the role of top managers' belief systems in the cognitive and behavioral attributes of strategy (Ginsberg, 1990). Because small firms are more flexible than large firms, they can adapt more quickly to changing environmental demands (Aldrich & Auster, 1986).

Organizational age: Organizational age is also associated with resistance to change (Hannan & Freeman, 1984). As organizations grow older, their members learn to cooperate with each other to work out new routines (Stinchcombe, 1965). Once they have survived their early years, organizations are more willing to invest in existing routines than to create new ones (Nelson & Winter, 1982). As organizational habits form with age, organizations become increasingly bureaucratized, and traditional ways of doing things become firmly established (Inkson, Pugh, & Hickson, 1970). Thus, change is more disruptive to an older organization with standardized ways of conducting business than it is to an organization that is young and still in a state of flux. Kelly and Amburgey (1991) found that old organizations are less likely than young ones to experience changes in their core features.

In older organizations, power relationships become fixed (Pfeffer & Salancik, 1978). The tendency of managers to repeatedly hire people similar to themselves results in a homogeneous group of decision makers (Kanter, 1977). Consequently, the managers develop a rich network of formal relationships with other institutional actors in their environment and get entangled in resource dependent relationships, which in turn makes

them less flexible (Singh, Tucker, & Meinhard, 1988). Since processes of institutionalization take time, young organizations may not have yet institutionalized organizational norms and thus are less likely to resist pressures to change.

Adaptive factors

In contrast to the population ecology perspective, the organization adaptation perspective emphasizes that organizations change in response to environmental opportunities and threats (Chakravarthy, 1982). This does not imply that inertial properties do not exist, but rather that organizations can and do undergo changes in response to contextual factors that render their current positions ineffective (Tushman & Romanelli, 1985).

Proponents of the adaptation perspective have taken varied approaches to explain the contextual characteristics of organizational changes. Contingency theory focuses on misfit between internal and external characteristics (Miller & Friesen, 1984). Resource dependence theory focuses on organizational inability to control critical resources (Pfeffer & Salancik, 1978) and strategic choice theory focuses on the gap between organizational aspirations and capabilities and environmental threats and opportunities (Andrews, 1980).

According to these approaches, the appropriate nature of change can be decided in reference to a particular set of internal and external environment variables that characterize the contextual factors that shape disequilibrium. Examples of external environmental variables influencing disequilibrium include the availability of resources (environmental scarcity or munificence) (Aldrich, 1979) and competitors' actions (MacMillan, McCaffery, & Van Wijk, 1985). Examples of internal environmental

variables influencing disequilibrium are the feedback effects of prior performance (Oster, 1982), and organizational slack (Bourgeois, 1981).

Environmental scarcity: Environmental scarcity, or munificence, reflects the amount of slack available in an organization's environment (Aldrich, 1979; Starbuck, 1976). Munificence is therefore a measure of the opportunities that an environment presents to an organization. Previous research has frequently hypothesized that environmental scarcity affects organizational behavior (March & Simon, 1958; Pfeffer & Salancik, 1978). An environment with scarce resources increases the uncertainty facing a firm (Pfeffer & Salancik, 1978), and managers will take action to reduce that uncertainty (March & Simon, 1958).

Environmental conditions may also affect group membership shifts. Although entry may be easier in a munificent environment when existing firms are not exploiting sales opportunities rapidly enough (Duetsch, 1975), existing firms have no compelling need to search for a new domain under conditions of growth (Hofer, 1975). Consequently, firms tend to remain in the same strategic group. Scarce resource environment, however, may motivate survival search, which may result in changes in domains and in group membership.

Performance feedback: Performance outcomes may influence changes by providing feedback that indicates whether or not the current strategy is effective or efficient. Alternately, they may provide feedback regarding the firm's willingness or capacity to change to a new strategy. High levels of performance should increase resistance to change.

The effect of poor performance, on the other hand, may create positive pressure for change in group membership. The likelihood that an organization will change strategies depends not only on the pressures that come from performance outcomes, but also on those that come from aspiration levels (Cyert & March, 1963). Such pressures may come from aspirations of external stakeholders. Performance may increase pressure for change and this may result in pressure for change in group membership.

Organizational slack: Organizational slack may be defined as the excess that remains once a firm has paid its various internal and external constituencies to maintain the coalition. Bourgeois wrote that slack resources allows an organization "to initiate changes in strategy with respect to the external environment" (1981: 30). Although organizational slack makes it easier to implement change, it lowers the motivation to undertake it (Hedberg, 1981). Organizations with slack resources are cushioned from the effects of change (Thompson, 1967). An abundance of slack resources can breed contentment and limit the range of problematic search (Cyert & March, 1963), and excessive slack tends to dull an organization's sensitivity to environmental variances and discontinuities and to strengthen its resistance to change (Thompson, 1967).

In contrast, a lack of organizational slack will lead to efforts to find additional resources or to cut costs. However, firms with little slack have fewer strategic choices available, and their lack of slack resources has a negative impact on their willingness to change strategy. Since levels of slack resources may increase resistance to change if they are either exceedingly high or exceedingly low, it is likely that they will create the greatest pressure for change in group membership when they are at intermediate levels.

Based on the above discussions, the following hypothesis can be made:

H3. **Firms that change strategic group membership will have different contextual characteristics (i.e., size, age, environment, prior performance, and organizational slack) than firms that do not change group membership.**

In the next section, studies that consider the performance implications of strategic groups are reviewed. Subsequently, the literature is integrated and hypotheses that advance this stream of literature are set forth.

Performance Implications of Strategic Groups

Between and Within-Group Performance Analysis

The concept of mobility barriers has been employed theoretically to explain performance differences between strategic groups. Strategic group theory argues that firms in strategic groups with higher mobility barriers will have greater profit potential than those in groups with lower mobility barriers (Caves & Porter, 1977; Harrigan, 1985; Hatten & Hatten, 1987; Mascarenhas & Aaker, 1989; Oster, 1982; Porter, 1979). Mobility barriers impede firms from repositioning in the more successful strategic groups (Caves & Porter, 1977). When the mobility barriers between the strategic groups are high, the likelihood of preserving firms' competitive advantages over other strategic groups is higher. Porter (1979, 1980) also presents a theory of the determinants of firm performance based on strategic group structure within an industry. Considering strategic groups and mobility barriers, Porter contends that the configuration of strategic groups (e.g., the number of groups, the size distribution of groups, and the strategic

distance between groups) and the ability of the firm to implement its strategy, may affect its performance.

Lippman and Rumelt (1982) and Nelson and Winter (1982) also provide an additional perspective on the study of inter-firm differences in conduct and performance. In Nelson and Winter's (1982) framework, a firm is viewed as consisting of a bundle of economic capabilities of relatively narrow scope. The information required for the functioning of the enterprise is stored in "routines", in which most of the underlying knowledge is tacit, not consciously known or articulatable by anyone in particular. The set of routines known to the individual actors and the resources tied to the organization define the firm's capabilities. There is neither a "shelf" of technologies external to the firm nor a "book of blueprints" which can be followed in case strategic changes are desired or mandated by events internal or external to the organization. A firm's capabilities are very much defined by where it has been in the past, and what it has done. History therefore becomes important, as the firm's performance is a function of routines - deeply ingrained repertoires.

Nelson and Winter's view implies that a firm's strategic flexibility is limited by its range of routines. If a firm has only a limited range of repertoires, its scope of strategic choices is correspondingly limited. However, if its distinctive skills are not readily imitable, since they are embodied in a complex set of routines where a great deal of knowledge is tacit, they can be an almost unassailable source of economic rents.

Lippman and Rumelt (1982) were able to demonstrate that stable intra-industry differences in profitability can exist even when conditions of free entry and perfect competition are assumed. The key concept in their argument is "uncertain imitability". Similar to Nelson and Winter, they posit that the imitation of the conduct and

performance of profitability leaders, by incumbents or new entrants, is significantly impeded by the existence of ambiguity as to what factors are responsible for superior performance. Uncertainty in the creation of new cost functions and relating management actions and results, explains the origin of efficiency differences. Lippman and Rumelt contended that the fact that this uncertainty applies to all imitation and entry attempts explains the persistence of profitability differences despite free entry. In sum, it can be argued that the existence of mobility barriers (Caves & Porter, 1977), tacit knowledge embodied in the repertoire of routines (Nelson & Winter, 1982), and uncertain imitability (Lippman & Rumelt, 1982) appear to be major contributing sources of performance differences.

As pointed out previously, current thinking on the concept of strategic groups suggests that some achieve higher levels of performance than others (Caves & Porter, 1977; Fiegenbaum & Thomas, 1990; Hatten, Schendel, & Cooper, 1978; Hawes & Crittenden, 1984; Mascarenhas & Aaker, 1989; Newman, 1978; Oster, 1982; Porter, 1979; Schendel & Patton, 1978). This finding was recently reiterated by Caves when he stated that:

> . . . the factors delineating strategic groups themselves are directly related to structural barriers to entry (i.e., mobility barriers), establishing a straightforward explanation why some strategies prove persistently more profitable than others in the same market. (1984: 129)

Although this view is fundamental to the theory of strategic groups, the extant empirical research indicates that evidence of group membership-performance relations is mixed and the level of support varies across studies. Porter (1979) found that leaders outperform followers in 38 consumer goods industries, but the difference in profitability was not statistically significant. Frazier and Howell (1983) also did not find a difference in profitability among strategic groups in the medical supply and equipment industry.

Oster (1982), on the other hand, found that high advertisers outperformed low advertisers. Hawes and Crittenden (1984) found statistically significant differences in Likert-scale measures of relative success among strategic groups in the supermarket chains industry. Empirical studies that examine performance differences between strategic groups using a single performance measure (e.g., profitability) are shown in Table 3.

Given that performance measurement is a thorny issue in strategic management (Venkatraman & Ramanujam, 1986), it needs to be recognized that strong support for the performance difference hypothesis of strategic groups will only be established by using multiple measures of performance. Thus, performance differences can be examined across several different measures and key trade-off issues can be evaluated. Recently, more strategic group studies have used multiple performance measures (e.g., Dess & Davis, 1984; Lewis & Thomas, 1990) as well as risk-adjusted measures (e.g., Cool & Schendel, 1987, 1988; Fiegenbaum & Thomas, 1990), as reported in Table 4.

Dess and Davis (1984) collected both primary and secondary data from 22 firms in the paints and allied products industry. Using return on assets (ROA) and annual sale growth as measures of performance, they observed that generic strategic groups differed on annual sales growth measures but not on return on assets. In another study, Lewis and Thomas (1990) found that no performance difference existed when return on capital employed and price/earnings ratio were used as measures of performance. Their sample consisted of 16 firms in the U.K. retail grocery industry. While these studies provide valuable results in this area, conclusions drawn from them have limited generalizability due to the nature of the cross-sectional study and their small sample size. Further, it is an exaggeration to conclude from the cross-sectional study, that performance differences between strategic groups are either transitory or stable over time.

Table 3. Studies of Performance Differences Using a Single Measure

Study	Industries Studied	Strategy Measures	Performance Measures	Analysis Method	Major Findings
Hatten & Schendel (1977) (with Cooper, 1978)	Brewing industry	Manufacturing and marketing variables	Return on common equity	Regression analysis	The relationship between profitability and strategic variables is different for different strategic groups.
Newman (1978)	34 producer goods industries	Degree of vertical integration	Price-cost margin	Regression analysis	Performance differences exist across groups.
Porter (1979)	38 consumer goods industries	Relative firm size	Return on equity	Regression analysis	Performance differences exist across groups.
Oster (1982)	19 consumer goods industries	Advertising to sales ratio	Return on equity	Regression analysis	Profit variability across groups.
Frazier & Howell (1983)	Medical supply and equipment industry	Abell's (1980) three dimensions	ROA, Return on net worth, Leverage ratio	Multivariate analysis of variance	No performance differences.
Hergert (1983, 1988)	50 manufacturing industries	Five strategy variables	Return on sales	Regression analysis	Performance differences - equivocal.
Hawes & Crittenden (1984)	Retailing; supermarket chains	Marketing strategy variables	Three success measures	Multivariate analysis of variance	Performance differences across groups.
Primeaux (1985)	Petroleum industry	Firm size	Net investment	Regression analysis	Performance differences observed.
Lawless (1989)	Four manufacturing industries	Strategy and technology variables	Six accounting indicators	Analysis of variance	No performance differences across groups.
Lawless, Bergh, & Wilsted (1989)	Four manufacturing industries	Differentiation, efficiency, and R&D variables	Return on sales, Return on equity, Return on assets	Analysis of variance	Performance differences between and within group.
Mascarenhas & Aaker (1989)	Oil-drilling industry	Mobility barriers	Return on drilling assets	Analysis of variance	Performance differences between groups.

Table 4. Studies of Performance Differences Using Multiple Measures

Study	Industries Studied	Strategy Measures	Performance Measures	Analysis Method	Major Findings
Schendel & Patton (1978)	Brewing industry	Firm size & geographical scope	Return on equity, Market share, Efficiency	Simultaneous regression analysis	Performance differences among different groups.
Dess & Davis (1984)	Paint and allied industry	21 competitive strategy variables	Annual sales growth, Return on assets	Analysis of variance, Scheffe tests	Performance differences in sales growth.
Cool & Schendel (1987, 1988)	Brewing industry	Scope & resource deployment variables	Market share, WSS[a],AROS[b], Risk-adjusted	Analysis of variance	No performance differences between groups. Performance differences among group members.
Fiegenbaum & Thomas (1990)	Insurance industry	Scope & resource deployment variables	Economic (COM[c], Market share, WMS[d]), Risk-adjusted	Analysis of variance, Multivariate analysis of variance	Performance differences between groups.
Lewis & Thomas (1990)	U.K. retail grocery industry	Scope & resource deployment variables	Return on sales, ROCE[e], PER[f]	Analysis of variance, Scheffe tests	Performance differences exist across groups in terms of ROS, but not ROCE or PER.

[a] WSS: weighted segment share
[b] AROS: inflation-adjusted return on sales
[c] COM: combined ratio
[d] WMS: weighted market share
[e] ROCE: return on capital employed
[f] PER: weighted index of growth in the price/earnings ratio

Using multiple measures of performance two longitudinal studies by Cool and Schendel (1987) and Fiegenbaum and Thomas (1990), have examined performance differences between strategic groups. Both studies also included risk-adjusted performance measures and used the same statistical techniques, including analysis of variance. Using a sample of 22 firms in the pharmaceutical industry from 1963 to 1982, Cool and Schendel (1987) found no differences in the set of performance measures, except for the market share, which is significantly different. Fiegenbaum and Thomas (1990), on the other hand, found a significant difference in performance among strategic groups in terms of economic performance and risk, except for risk-adjusted performance. Their study was based on a sample of 33 corporations in the insurance industry from 1970 to 1984.

These conflicting results call for additional studies to examine the performance differences between strategic groups over time. The issue of performance differences is important for strategic group research since the results challenge the theory of the strategy - performance relationship. If performance differences between strategic groups do not exist, this implies either a rejection of the hypothesis of predictive validity of strategy on performance - a central anchor in strategic management research (Ginsberg & Venkatraman, 1985) - or support for the strategy typology view of equally viable effects on performance (e.g., Miles & Snow, 1978). Therefore, it is valuable to examine the performance differences between strategic groups using multiple measures of performance in a longitudinal research design. Based on the consideration of strategic group theory, mobility barriers, uncertain imitability, and tacit knowledge embodied in the repertoire of routine on performance variations between strategic groups, it can be hypothesized that:

H4a. **The level of performance between strategic groups will be significantly different.**

Much has been made of the importance of the strategic group theory on competitive strategy, as a key structural feature within industries, and hence, their performance (Caves & Porter, 1977; Porter, 1979; Harrigan, 1985). The strategic group theory is now offered as a key strategy formulation tool, and by many researchers as the major determinant of variances in firms' performance. It is also generally assumed to be the appropriate unit of analysis for competitive strategy analysis and research (Porter, 1980, 1985; Oster, 1982; Harrigan, 1985; McGee & Thomas, 1986; Thomas & Venkatraman, 1988). However, strategic group theory deserves careful scrutiny as a means to explain and predict the distribution of firms' performance. Surprisingly, the question of the relative importance of strategic groups in explaining persistent differences in performance has not been directly addressed.

In fact, the broader issue of the focus of the main sources of differences in rates of returns has received very little attention (for two exceptions see: Schmalensee, 1985; Rumelt, 1991). In spite of the apparent centrality of this question to both the fields of industrial organization and strategic management, there still exists a strong controversy about their sources of performance differences. Disagreement exists over whether the primary sources of persistent profitability differences among firms are industry or firm-specific factors. Schmalensee (1985) offers support for the traditional view of the importance of market structure, while Rumelt (1991) provides evidence that business unit-specific factors are much more important than industry-related factors in explaining the total variance in rates of return. The question of whether firm performance is principally individually or collectively determined remains in debate.

To address this gap, we examine the relative importance of strategic groups as compared with firm-specific factors as sources of variance in firms' performance. Both Schmalensee (1985) and Rumelt (1991) used the Standard Industrial Classification (SIC)-defined industries as their definitions of markets. If the strategic group, rather than the industry, is the appropriate unit of analysis, as argued by Porter (1979, 1981), then both theses studies may have underestimated the importance of strategic groups as a source of variance in firm performance. In this study, the strategic group is adopted as the collective unit of analysis.

The strategic group theory argues that stable persistent firm performance derives from the economic structure within industries as well as from industry-wide economic properties (Caves & Porter, 1977; Porter, 1979). More specifically, the theory contends that the primary sources of stable differences in firm performance in an industry are strategic group membership and associated collective behavior [11]. Stable, long-term firm profitability is viewed principally as a collective phenomenon arising from group circumstances and activities rather than resulting from unique and idiosyncratic resources, non-imitable advantages, and the entrepreneurial activities of individual firms.

Initially, the concept of strategic grouping was posited because of observed stable differences in strategic behavior and performance among firms within an industry (Hunt, 1972; Newman, 1973; Porter, 1973). These persistent differences prevented the creation of the 'shared-fate mentality' necessary for the development of industry-wide market power which was thought to be essential, in traditional industrial organization work, to earn above-normal returns. To accommodate this empirical anomaly, competitive

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[11] Forms of collective activity may vary from strategic group to strategic group, and from situation to situation, but the intent is to earn above competitive returns. Examples may include collusion to restrict output and/or rivalry, a price leadership umbrella, coercion, and predation.

strategy analysis of industrial organization economics was moved from the industry and entry barriers to the strategic groups and mobility barriers. In fact, though in the 1970s the traditional industrial organization view was empirically challenged by an increasing number of researchers (e.g., Shepherd, 1972; Demsetz, 1973; Mancke, 1974), Porter (1979) argued that their contradictory findings are actually consistent with traditional market power arguments of industrial organization if the unit of analysis is changed from the industry to the strategic group.

While the strategic group and mobility barrier theory relaxes many of the restrictive and oversimplistic aspects of the traditional structure-conduct-performance paradigm (Porter, 1981), especially those with an emphasis on economic determinism, it continues to maintain essentially the same theory of the sources of firm profitability. That is, firm profits are "monopoly" profits that derive from the ability of firms within strategic groups to collectively attenuate the external competitive forces pressuring their strategic group, and to effectively collude internally to reduce output, raise prices, and decrease rivalry. Even though heterogeneous strategic groups are seen as evolving from such initial differences among firms as resources, skills, risk and time preferences, relationships with parent companies, and perceptions of entrepreneurial opportunities (Caves & Porter, 1977; Porter, 1979), individual firm differences are not considered a primary source of stable differences in intra-industry profitability.

Whereas in the traditional industrial organization, firm differences were typically viewed as essentially transitory or unimportant unless based on scale economies, Porter (1979) extended the traditional framework. He argued for recognition of the consequences existing between members within the same strategic groups. Differences in scale, timing of entry, initial resources and asset position, and in abilities needed to implement the strategic group's strategy could potentially allow some firms to be more

profitable than others in the same group. However, despite the fact that these differences might have performance consequences, Porter's view of the primary source of above-normal profits still counts in the strategic group theory. Based on the consideration of strategic group and mobility barrier theory, it can be hypothesized that:

***H4b.* Strategic group effects will outweigh individual firm effects within the strategic group when accounting for performance differences between strategic groups.**

Mobility Dynamics - Performance Analysis

Some firms in a strategic group may adopt strategies that do not parallel the group strategy. Consequently, group membership shifts occur. The organization adaptation perspective argues that firms need to be aligned with their environment in order to achieve higher performance (Chakravarthy, 1982; Galbraith & Schendel, 1983; Lawrence & Lorsch, 1967). With environmental changes, firms that do not change strategies may become misaligned with their environment, and as a result, their performance may suffer. Thus, despite possible shift costs (e.g., mobility barriers, resistance to change), some group members may try to change their group membership in order to match environmental changes, assuming that the benefits of changing strategies outweigh their costs. Performance also affects the type of firm's search activities, which may result in changes in their group membership. Unfavorable performance encourages firms to undertake solution-driven or survival search activities, and favorable performance encourages slack-driven searches (March, 1981).

An expectation of higher performance for firms after they change group membership, than the performance of the same firms before they change membership, is consistent with a perspective that assumes that firms that do change strategies are

generally correct in their strategic response to environmental changes. In addition, firms believe that the benefits of changing strategies outweigh their costs (e.g., mobility barriers, uncertain imitability, resistance to change). Therefore, it is reasonable to expect that firms that have changed their group membership will experience increased performance.

Although this performance issue offers additional insight into the relationship between the mobility dynamics and the performance consequences of strategic groups, little is known about how changing group membership affects performance. These arguments taken together, lead to the following hypothesis:

H5. **The performance of firms after they change group membership will be better than the performance of the same firms before they change membership.**

Contingency theorists have long been concerned with the problem of matching strategic orientation with the characteristics of the environment. Organizations change as do environments, and there is a continual need to adopt a strategy that can affect the alignment between the two at the lowest costs over time. In other words, for a dynamic context the research scope must expand to consider two costs, those of being misaligned with the environment, and those of changing to avoid the mismatch (Miller & Friesen, 1984).

Miller and Friesen (1984) suggested that organizations develop integral strategic and structural configurations or "gestalts" that have complementary elements. Change in strategy may involve the destruction of these gestalts and the building of new ones - an expensive process. This view, that changes can entail significant fixed costs, suggests the merit of undertaking quantum changes rather than piecemeal ones. Following Miller and Friesen (1984), it can be argued that a group membership change to a group with

a dissimilar strategic configuration is often required for an economical adaptive strategy - the quantum change that reduces the costs associated with the destruction of gestalts. The choices between changes to groups with similar versus dissimilar strategic configurations are related, since delaying strategic change in a changing environment tends to increase costs.

The merit of changes to groups with similar versus dissimilar strategic configurations can be decided with reference to a particular kind of environment. The alignment between the magnitude of strategic change and external environments may be critical for the prediction of success (Friesen & Miller, 1986). Yet few studies examined the effect of magnitude of change in strategy on performance outcomes.

Specifically, Friesen and Miller (1986) argued that if a firm is faced with the task of moving into an environment it knows is stable, it makes sense to move to specialize in that environment and enjoy the benefits of tight configuration and excellent fit (Miller & Friesen, 1984). Thus, a group membership change to groups with dissimilar strategic configurations should be more profitable than a change to groups with similar strategic configurations in a stable environment. This is because the costs of moving into and out of an environment and the costs of mobility barriers become relatively insignificant when the firm is entering an environment in which it may be able to capitalize on this change for a long time (Friesen & Miller, 1986). The rewards obtained by flexibility and incrementalism may easily be outweighed by the profits from a more perfect but rigid adaptation to the stable state (Hannan & Freeman, 1978).

Uncertain states of environment are sometimes of brief duration and can change in an unpredictable way. By the same token, a change to groups with similar strategic configurations should be more successful than a change to groups with dissimilar for a

firm that is entering an environment which is unpredictable, but not totally precluded. Environmental uncertainties, particularly those associated with obsolescence due to rapid technological change, discourage a quantum change in strategy. One means of coping with such change is to be flexible enough in strategy to respond to environmental opportunities and threats. A group membership change to groups with similar strategic configurations would allow the firm to continue to respond to a changing environment because of the lower fixed costs needed to overcome mobility barriers. Thus, it is expected that a group memberships change to groups with similar strategic configurations, in group membership with increased flexibility, will be more profitable in uncertain environments than a change to groups with dissimilar strategic configurations associated with decreased flexibility.

This argument is closely related to that of the population ecology perspective. According to Hannan and Freeman (1977), Freeman and Hannan (1983), and Carroll (1984, 1985), in a stable environment specialist organization which compete in a few domains, will outperform generalist organizations which compete in a number of domains simultaneously. Specialist organizations are considered to be more efficient than generalist organizations because of the lower requirements for organizational flexibility due to a tight fit with a particular domain. Based on the above discussion, it can be hypothesized that:

H6a. **Among firms that move into an uncertain environment by changing group membership, those that move into groups characterized by similar strategic configurations will be more profitable than those that move into groups characterized by dissimilar strategic configurations.**

H6b. **Among firms that move into a certain environment by changing group membership, those that move into groups characterized by dissimilar strategic configurations will be more profitable than those that move into groups characterized by similar strategic configurations.**

Summary

In summary, two research issues have been examined in this chapter: the dynamic analysis of strategic groups, and the performance implications of strategic groups. In turn, these research issues lead to a series of research hypotheses which was tested. The discussion now turns to the research design and methodology issues.

Chapter III: Research Design and Methodology

Introduction

This chapter describes the framework of the research design and methodology used to perform this study. The first part includes the research setting, data sources, and sample selection. The second part presents the measurement framework employed to test the hypotheses. In addition, a basic format for validity assessment is reviewed. The third part focuses on the methodology that is developed to address the research questions and the hypotheses derived from them.

Data

Research Setting

When choosing the research setting, several issues are taken into consideration.

1. Because this study focuses on business-level strategy, and in order to control for industry effects, the sample should be restricted to a single industry, rather than a random sample across industries (Dess, Ireland, & Hitt, 1990; Harrigan, 1983; McDaniel & Kolari, 1987).

2. To accomplish this, the sample has to be taken from a single industry as defined by a four-digit Standard Industrial Classification (SIC) code. A four-digit industry is the appropriate industrial environment within which a given firm competes (Porter, 1980: 370). The SIC four-digit level assures some comparability of technology, life cycle of the product category, general level of capital intensity, etc. within samples. Such an approach has been standard in strategic management research (Hambrick, 1983b; Porter, 1980; Rumelt, 1974; Snow & Hrebiniak, 1980).

3. In order to study strategic group dynamics the industry has to be subjected to at least a moderate amount of environmental complexity and dynamics so that managers face interesting problems of formulating and implementing strategies for competing in a challenging and dynamic environment. The uncertainties posed for managers test their willingness and ability to change strategic decisions in competitive strategy.

4. The majority of firms in the industry should be single business and should fit dominant business firms using Rumelt's (1974) categorization which stipulates that at least 70 percent of the firm's revenues be from within a particular four-digit SIC code industry.

Given the above requirements, the U.S. Computer Equipment Industry (SIC 3573) was chosen as the research setting for this study. First, the computer equipment industry was identified as experiencing both dynamic changes and complexity, in terms of technologies and markets (Baird, Sudharshan, & Thomas, 1988; Dess & Beard, 1984; Flamm, 1988). Second, the majority of firms in the computer equipment industry are relatively focused within the field of manufacture and the sales of computer equipment and peripherals. Even the larger firms that have extensive operations considerably limit their endeavors to this industry, and consequently, there are not many highly diversified companies. Thus, environmental conditions outside the industry have little effect on these firms. Finally, the computer equipment industry is highly segmented, and big firms (e.g., IBM) and niche players (e.g., Sun Microsystems Inc.), which focus on a specialized product category, coexist in the industry. Therefore, different strategies that firms in this industry pursue may be identified. Hence, the U.S. computer equipment industry provides an ideal research setting for this study.

The U.S. Computer Equipment Industry (SIC 3573)

The U.S. computer equipment industry can be categorized into four broad product classes based on the U.S. Standard Industrial Classification (SIC): electronic computers, computer storage devices, computer terminals, and other computer peripheral

equipment. The electronic computer can be further classified as: supercomputers, mainframes, minicomputers, workstations, and personal computers. For this research, we circumscribe the above four product classes and segments in the U.S. computer industry as the domain of the study.

High growth has been the norm in the computer equipment industry. In fact, we are so accustomed to explosive growth that when the computer equipment industry in 1985 and 1986 settled down to growth rates considered normal for many industries, the press and financial analysts called it the "the computer slump" (Juliussen & Juliussen, 1990). Recently, computer equipment industry growth has slowed due to its sheer size. However, compared to many other industries, the computer equipment industry moves faster - no matter how the indicator is measured - market growth rate, product life cycles, distribution channel changes, market segment evolution, or technological changes. For example, from 1975 to 1989, the average market growth rate in terms of values of shipment in the U.S. computer equipment industry was about 10 percent, adjusted for inflation, or triple the rate of the overall economy. Even though the overall computer equipment industry is now growing less than 10 percent per year, there are segments that grow 50 percent to 100 percent. For example, currently the workstation and laptop computer segments are hot growth areas. The total employment and value of shipments in the U.S. computer equipment industry (SIC 3573) from 1973 to 1989 are shown in Table 5.

During the time span of this study (1975-1989), the computer industry experienced several major trends. In 1975 Amdahl Corporation developed plug-compatible equipment, so computer manufacturers were then able to produce components that could be used in conjunction with a mainframe computer of any make (usually IBM). Thereafter, additional manufacturers (e.g., National Advanced Systems, Control Data

Table 5. Employment and Shipments in the U.S. Computer Equipment Industry

Year	Total Employment (in thousands)	Value of Shipments (in million dollars)
1989[a]	289.0	68,000.0
1988[b]	289.0	64,088.0
1987	310.7	59,195.4
1986	315.0	52,568.8
1985	355.5	55,314.7
1984	373.7	53,524.4
1983	354.4	41,977.0
1982	337.9	36,767.1
1981	320.7	32,031.8
1980	304.6	26,593.7
1979	273.9	21,466.3
1978	232.1	16,557.6
1977	192.6	12,921.8
1976	165.7	10,387.6
1975	162.5	8,559.5

[a] Estimated
[b] Estimated

Sources: Census of Manufacturers, 1977, 1982, 1987.
Annual Survey of Manufacturers, 1975-76, 1978-81, 1983-86.
Data for years 1988-89 are from the U.S. Industrial Outlook 1991.

Corporation) began to make and market computer processors that used IBM's software. In the same manner, plug-compatible storage or input-output equipment was marketed to replace compatible IBM peripheral equipment. This allowed companies to forge ahead in limited areas of technology without being concerned with the problems of designing and making central processing units. Consequently, barriers to mobility into this segment were lowered.

Second, the rise in the importance of micro processors, due to developments in chip technology, has changed the data processing business and opened up the field of personal computers, thus encouraging new entrants into the industry. The development of the personal computer segment can be divided into four periods. The first one (1975-1978) is distinguished from the others because during this period two companies (MITS and IMSAI) had great influence in the market. Both were created, became the market leaders, and went out of business during this time. In the second period (1979-1981), Apple Computer, Commodore International, and Tandy Corporation became the market leaders. They dominated the market until late 1981 when IBM made its entry and became the market leader by 1982. The third period (1982-1984) was dominated by IBM which became the market leader and caused industry hyper-growth. The final period (1985-1989) was characterized by the strong market presence of the clone computers. Although they started to enter the market during 1982, their market presence became notorious during the 1985-1989 period. The IBM-PC compatible rapidly penetrated the market and drove prices down. Technology seemed to take a back seat to the marketing of personal computers.

A third trend dealt with the increasing sophistication and availability of computer software. While the mainframe segment of the industry had become increasingly

standardized and mature during this period, software development continued to increase in importance and breadth of application.

The principal focus for competition among computer equipment manufacturers has been entry into new markets, either for new products or new types of application. The process of technological differentiation, with new competitors defining new market niches, has been central to the way in which competition has evolved. Historically, either the creation of new products targeting untapped markets, or the achievement of price and performance levels not matched by older computers, has propelled new firms into the computer industry. Some examples are: Control Data Corporation with large-scale scientific supercomputers; Digital Equipment Corporation with small high-performance scientific computers; and Apple Computer with personal computers. In contrast, economic forces in established computer markets seem to have led to increasing dominance by a few firms.

Three driving forces have shaped the nature of competition in the computer industry. First, innovation in computer technology has continued at an extraordinarily rapid pace. Second, significant economies of scale and scope exist in the use of technology, especially in the development of new products. The importance of these economies has been reinforced by the product design strategies of individual firms. Third, an innovative firm faces inherent difficulties in capturing the benefits of investment in innovation. This is an often noted problem intrinsic to research and development because without sufficient investment in R & D, technological leaps by competitors can render all other competitive advantages irrelevant. It is not always necessary, however, for a leading company to be the first to develop a product. If a solid technology base is maintained, sufficient to react quickly to the actions of potential competitors, then the leading firm can afford to let competitors take the risks of

pioneering a new product or process. If the challenger succeeds, and the leading firm can respond quickly with a similar offering, nothing is risked. The competitive advantages of the leading firm continue to hold. Conversely, the innovative failures give the leading firm considerable information about the nature of a highly uncertain market, at no cost or risk to its own fortune. These three forces (i.e., innovation, economies of scale and scope, uncertainty about the benefits of investment in innovation) have intensified competition in the development of computer systems. Consequently, an ever-finer technological market differentiation in the computer equipment industry has occurred. Bahrami and Evans view the computer industry as highly uncertain:

> High-technology firms embark on major strategic moves in the face of a unique set of challenges. Their environment is subject to a frenzied pace of change due to the confluence of technological uncertainty (affecting both product designs and manufacturing processes), market uncertainty (in relation to end-user preferences and evolving distribution channels), competitive uncertainty (due to formation of spinoffs and strategic alliances), and arena uncertainty (such as emergence of new industry standards and converging industry boundaries) . . . . (1989: 107)

Data Sources

Data extracted from the 1989 edition of the industrial files of the COMPUSTAT II tapes form the primary database was used in this study. The COMPUSTAT II tapes provide over 170 items of financial information for over 2400 companies, over a twenty-year period. The database is considered reliable and objective (Ginsberg, 1984), and has been the most popular data source in the strategic group study (e.g., Baird, Sudharshan, & Thomas, 1988; Fiegenbaum, Sudharshan, & Thomas, 1990; Harrigan, 1985; Hatten & Schendel, 1977; Oster, 1982; Primeaux, 1985). Other major secondary sources such as the *Annual Survey of Manufacturers*, and annual reports and Form 10-K reports that all public companies are legally required to file under SEC (Securities

Exchange Commission) guidelines, were used to collect and validate the information for the sample firms.

One advantage of using secondary, objective data is the ability to validate information by cross-referencing multiple sources. Since, to a large extent, individual biases are removed by standardized reporting procedures, the data can also be more reliable than primary, subjective data. In addition, since secondary sources provide information about the organization's realized rather than intended strategy, more accurate portraits of the organization's actions are possible.

The other sources for this study include:

The Computer Directory and Buyer's Guide (Berkeley Enterprises, Inc., annual)
Datamation (Cahners Publishing Company, monthly)
Dun's Electronic Marketing Directory (Dun's Marketing Services, Inc., annual)
Electronics Buyers' Guide (McGraw-Hill, annual)
Standard and Poor's Industry Surveys (Standard & Poor's Corporations, quarterly)
U.S. Industrial Outlook (U.S. Department of Commerce, annual)

These sources were used and screened in order to obtain the necessary information required for this study.

Sample Selection

To decide which firms to include in the sample for empirical analysis, a number of issues related to nature of the hypotheses tested, sampling methodology, and data availability are be taken into account.

1. The sample firms should be autonomous public entities, because of the feasibility of collecting sufficient background and financial information, from secondary sources, in order to address the research questions. It is necessary to exclude foreign firms, subsidiaries of corporations, and private firms because of a lack of reliable data on strategy and performance variables.
2. Sample firms that exist as separate legal public entities over at least two time periods of stable strategic behavior from 1975 to 1989 should be included. This criterion was adopted to ensure that changing sample composition would not bias the results. This is also necessary to study strategic group dynamics across stable time periods.
3. Consistent with the bounds established for this study, those firms with at least 70 percent of their total sales coming from within the computer equipment industry (SIC 3573) have to be included.
4. The sample firm's financial information over the study time span should be obtained from COMPUSTAT II files or from other objective, secondary sources (e.g., annual reports and 10-K reports).

Examination of the distribution of accumulated market shares revealed that both the top 50 firms in 1975 and the top 100 in 1989 cover over 90 percent of the total activities in the U.S. computer equipment industry (Datamation, 1976, 1990). Therefore, this study focused mainly on those top 50 firms in 1975 and the top 100 in 1989. This sample is clearly biased in that it ignores foreign firms, subsidiaries of other corporations, young firms, private firms, and smaller firms. This fact cannot be ignored and should be kept in mind when interpreting the results.

Measurement

This section focuses on the measurement framework employed to test the hypotheses developed in the previous chapter and addresses two related concerns: the development and validation of operational measures. A discussion of specific measures follows and a summary of the operationalization of the constructs is presented in Table 6.

Strategy

One important concern for arriving at a measurement scheme for the strategy dimensions is a set of operational indicators that adequately and reliably capture the theoretical construct of strategy. Regarding this issue, multiple indicators reflecting the conceptual definition are identified following Nunnally's (1967) *domain sampling* approach. It is important to find a set of indicators that capture the core of the construct's conceptual domain, because it is virtually impossible to cover the domain exhaustively. Accordingly, the scope dimension was measured by two indicators that collectively reflected the key characteristics in the product-market and competitive arena. Similarly, the differentiation dimension was captured through two indicators reflecting marketing and product differentiation. The efficiency dimension was captured through four indicators reflecting the assessment of the productivity and the efficiency of an organization's operations.

Table 6. Operationalization of the Constructs

Variables	Measures	Supporting Studies
Strategy		
Scope Dimension		
1. Product-line breadth	The number of product classes	Cool & Schendel, 1987
2. Geographic coverage	Sales outside the U.S./Sales	Cool & Schendel, 1987
Differentiation Dimension		
1. Marketing differentiation	Selling expenditure/Sales	Harrigan, 1985; Oster, 1982
2. Innovation differentiation	R & D expenditure/Sales	Cool & Schendel, 1987; Frazier & Howell, 1983
Efficiency Dimension		
1. Cost efficiency	Cost of goods sold/Sales	Meyer, 1982
2. Employee productivity	Sales/Employee	Harrigan, 1985
3. Capital intensity	Fixed assets/Employee	Hambrick, 1983c
4. Current assets intensity	Inventory/Employee	Fiegenbaum et al., 1990; Harrigan, 1985
Inertial Factors		
1. Organizational size	Log (Employees)	Smith et al., 1986
2. Organizational age	Years in operation	Kelly & Amburgey, 1991
Adaptive Factors		
1. Environment scarcity	Change in value added	Aldrich, 1979
2. Prior performance	Return on assets	Venkatraman & Prescott, 1990
3. Organizational slack	Quick ratio	Singh, 1986
Environment Uncertainty		
1. Uncertainty	Error of sales growth forecasts	Tushman & Anderson, 1986
Performance		
1. Return on assets	EBIT[a]/Total assets	Dess & Davis, 1984
2. Return on sales	EBIT/Sales	Cool & Schendel, 1987; Lewis & Thomas, 1990
3. Return on equity	Pre-tax income/Equity	Hatten et al., 1978; Porter, 1979
4. Sales growth	Annual change in sales	Dess & Davis, 1984

[a] EBIT = Earnings before interest and taxes

Scope dimension

Measures of scope dimension need to tap into the critical areas of the breadth of product-market scope and the extent of geographical scope. The following core measures were used for this purpose.

Product-line breadth:

Following Abell (1980) and Hofer and Schendel (1978), a measure of product-offering classes as a surrogate of product-line breadth can be derived. Within the context of the computer equipment industry, there is a fairly standardized classification of product offerings. Some examples are supercomputers and mainframe computers, minicomputers, workstations and personal computers, and computer peripheral equipment, etc. Consequently, by obtaining a numerical count of the total number of product classes that a firm offers, from both firms' annual reports and 10-K reports, the diversity of product assortment can be measured. Such an approach has been used recently by Cool and Schendel (1987) in their strategic group study of the U.S. pharmaceutical industry.

The extent of geographic coverage:

To assess the commitment to geographical expansion outside the U.S. market, the ratio of sales originating outside the U.S. to total firm sales can be taken. Data for sales originating outside the U.S. is available from firms' annual reports and 10-K reports. Sales originating outside the U.S. represent revenues from exports and direct foreign investments. This measure has also been used by Cool and Schendel (1987).

Differentiation dimension

Measures of differentiation dimension need to tap into the critical areas of marketing and product differentiation (Hambrick, 1983c; Miller, 1986, 1987; Miles & Snow, 1978; Porter, 1980). The following core measures were used for this purpose.

Marketing differentiation:

This measure represents the amount of money an organization spends on marketing its products each year. According to Miller (1987), marketing differentiation strategies try to create customer loyalty by uniquely perceiving a particular need and focusing the aggressive marketing effort in order to create a favorable image. This measure can be standardized by deriving a ratio of selling expenditures per dollar of sales. This indicator was taken from the COMPUSTAT II database and it is expected to have a higher score on this measure for differentiation-oriented strategy. This measure, or a variant (e.g., advertising to sales), has been validated by many researchers who have attempted to operationalize the differentiation strategy. In the strategic group study, for example, Cool and Schendel (1987), Harrigan (1985), Lawless, Bergh, and Wilsted (1989), Lewis and Thomas (1990), and Oster (1982) used this marketing differentiation indicator to measure a firm's products/services differentiation orientation.

Innovation differentiation:

This measure involves the degree to which the firm introduces new products or new technologies. Miles and Snow's (1978) prospectors and Porter's (1980) differentiators are the sorts of firms most given to pursuing this strategy. We expect a higher score on this ratio for differentiation-oriented strategy because of the strong emphasis on product R & D and the development of new products (Miller, 1986). As an indicator of innovation differentiation, R & D intensity based on a ratio of R & D expenditures to sales can be used. The COMPUSTAT II database was also used to provide data to measure this indicator. The R & D expenditures to sales ratio is a widely-used measure of R & D intensity in technology-based industries (e.g., Hansen & Hill, 1991).

However, a specific breakdown of R & D expenditures in terms of product and process research is difficult to obtain from secondary sources. This shortcoming is remedied by the computer equipment industry context examined. A number of studies (e.g., Fisher, McKie, & Mancke, 1983; Flamm, 1988; Juliussen & Juliussen, 1990) have reported that R & D expenditures in the computer equipment industry are mainly aimed at new product development. An analysis of the annual reports and 10-K reports of firms in the computer equipment industry confirmed this observation. Thus, it can be argued that R & D expenditures as reported by firms in the computer equipment industry are predominantly product-related. This measure has also been validated in previous studies by researchers Cool and Schendel (1987), Frazier and Howell (1983), Hergert (1983), Lawless (1989), and Lawless, Bergh, and Wilsted (1989). Further, this innovation differentiation measure has been used widely as an indicator of innovation in industrial organization economics (Scherer, 1980).

Efficiency dimension

Efficiency dimension was measured by indicators that relate to the productivity and efficiency of an organization's operations. As Miller (1986, 1987), Hambrick (1983c), and Porter (1980) observe this dimension is internally focused and relies on efficiency in operations as a means of achieving competitive advantage. The COMPUSTAT II database was used to provide data for measures of efficiency dimension. The following key measures are considered relevant.

Cost efficiency:

The cost efficiency measure is a standardized ratio of efficiency and approximates one used by Meyer (1982). Cost efficiency can be measured based on the cost of goods sold per sales. Efficiency strategy emphasizes cost reduction and efficiency-seeking methods by stressing standard products, single-core technologies and narrow product lines. We expect to have a lower score on this ratio for the efficiency-oriented strategy.

Employee productivity:

Employee productivity can be measured based on net sales per employee. This is a standardized measure of employee productivity and is one of the most critical factors in determining profitability. As mentioned previously, efficiency strategy is identifiable by its focus on cost reduction through employee productivity. Therefore, a higher score on this indicator represents an efficiency orientation. Harrigan (1985) adopted this indicator to measure an efficiency strategy.

Capital intensity:

Capital intensity is a standardized ratio that measures how efficiently an organization utilizes its total assets. Efficiency strategies are required to invest for firms a major proportion of their capital in production assets. Firms seek the efficiency position in manufacturing and distribution through investment in cost-minimizing facilities and equipment. In order to tap into this capital intensity, fixed assets per employee can be used. We expect a higher score on this ratio for the efficiency-oriented strategy. This measure has been used in past studies that have operationalized efficiency dimension (e.g., Hambrick, 1983c; Lawless, Bergh, & Wilsted, 1989; Prescott, 1986).

Current assets intensity:

Current assets intensity is a standardized measure of how effectively a firm is managing its current assets. Inventory to employees ratio can be derived to operationalize current assets intensity. The PIMS (Profit Impact of Market Strategies) study showed that this indicator is one of the most powerful determinants of output per employee (Buzzell & Gale, 1987). Thus, we expect a higher score on this indicator would represent an efficiency-oriented strategy. Fiegenbaum, Sudharshan, and Thomas (1990) and Harrigan (1985) used this indicator to measure efficiency of operations.

The four measures detailed above were derived from the empirical and theoretical literature. Thus, each is theoretically defensible and all of them have been validated in previous empirical efforts using secondary data to study the strategic group field.

Inertial Factors

Organizational size:

Organizational size was measured by the logarithm of the number of employees, information that is available on the COMPUTSTAT II database. Number of employees is one of the most common measures of organizational size (Blau & Falbe, 1976; Hall, 1987; Smith, Guthrie, & Chen, 1986; Tosi & Patt, 1967), having been used in 80 percent of the empirical studies in organization theory (Kimberly, 1976). We used the logarithm of the number of full-time employees because size is expected to have a marginally decreasing effect.

Organizational age:

Organizational age, the number of years an organization has been in operation, was taken from firms' annual reports and 10-K reports. To calculate the age of a firm, we subtract the year of its founding from the time of its change in group membership. Kelly and Amburgey (1991) used this measure as an indicator of organizational age to test Hannan and Freeman's (1984) theory of structural inertia.

Adaptive Factors

Environmental scarcity:

Following Aldrich (1979), we used the change in total value added in the computer equipment industry from one year to the next (the difference between the purchase of

raw materials, fuel, etc. and sales), adjusted for inflation, to measure scarcity or munificence. Tushman and Anderson (1986) used this measure as an indicator of munificence, and appropriate data is available in the *Annual Survey of Manufacturers.* An environment with scarce resources will exhibit little or no growth in value added since firms will attempt to operate as efficiently as possible. Although an individual firm can engage in outsourcing (buying rather than making component parts) and affect its own growth in value added, its action is not likely to affect the growth in value added of the industry as a whole significantly.

Prior performance:

Prior performance was measured by using return on assets (ROA) as an indicator of financial performance. ROA is a widely used measure of profitability (Venkatraman & Prescott, 1990), and is strongly correlated with other financial performance such as return on sales (ROS) (Buzzell & Gale, 1987). Data was obtained from the COMPUSTAT II data file. To measure prior performance the mean ROA for each time period of stable strategic behavior before changing group membership was used.

Organizational slack:

To measure organizational slack, or excess resources, we used a financially-derived measure that Bourgeois (1981) and Bourgeois and Singh (1983) advocated. We rely on Singh's (1986) concept of unabsorbed slack; previous studies have measured unabsorbed slack using quick ratios, the sum of cash, short-term marketable securities, and receivables divided by total current liabilities (Cheng & Kesner, 1988; Singh, 1986). The mean for each time period before changing membership was used to smooth short-term

variations in firm liquidity. Data for computing a firm's quick ratios is available from COMPUSTAT II database.

Environmental Uncertainty

Uncertainty:

Uncertainty is typically measured as a function of variance (Dess & Beard, 1984). Because environmental uncertainty means the extent to which future states of the environment cannot be predicted accurately, we can measure uncertainty in terms of sales growth forecasting error, i.e., the ability of industry analysts to predict industry sales growth (Tushman & Anderson, 1986). Data was collected from the *U.S. Industrial Outlook*. Published-yearly sales growth forecasts were collected and compared to actual historical results. To measure environmental uncertainty, the mean forecasting error for each time period after changing membership was compared to the mean forecasting error for the entire 15-year period. Forecasting error is defined as:

$$\frac{(|F_i - E_i|) \times 100}{E_i}$$

where F_i = forecast sales growth for year i
E_i = actual sales growth for year i

Performance

Conceptualization and measurement of performance are areas of concern in strategic management (Chakravarthy, 1986; Ginsberg, 1984; Hambrick, 1980; Venkatraman & Ramanujam, 1986, 1987). Performance is a multidimensional construct. Consequently, it is considered important to use multiple indicators of performance. The selection of specific performance indicators is further complicated given that the objectives for a business may be more related to strategic concerns than to financial returns. Thus, in an attempt to provide a comprehensive assessment of business performance, it is considered important to measure performance as a comparison of internal to external terms. To this end, both financial and growth dimensions of performance will be measured. Financial performance is concerned with the productivity and efficiency of investment decisions, and growth performance reflects the potential to generate future cash flow (Keats, 1988).

Return on assets (ROA), return on sales (ROS), and return on equity (ROE) can be used as indicators of financial performance, and sales growth (SGR) can be used as an indicator of growth dimension performance. Data was obtained from the COMPUSTAT II database. These indicators are selected for the following reasons. First, they are commonly used in strategic management research (Venkatraman & Ramanujam, 1987) and therefore provide a degree of comparability with other strategy studies. Second, ROA, ROS, ROE, and sales growth are among the most frequently used criteria in the strategic group study (e.g., Cool & Schendel, 1987; Dess & Davis, 1984; Fiegenbaum & Thomas, 1990; Hatten & Schendel, 1977; Hergert, 1983; Lawless, Bergh, & Wilsted, 1989; Lewis & Thomas, 1990; Oster, 1982; Porter, 1979).

Financial performance measures:

Return on assets (ROA) is defined as net income before interest and taxes divided by total assets. Net income before interest and taxes was used to control interest and taxes effects over time. Hence, we can obtain somewhat more meaningful results (Bernstein, 1983; Helfert, 1982). Return on assets measures the rate of return on total assets utilized in the company. Many strategic group researchers (e.g., Dess & Davis, 1984; Frazier & Howell, 1983; Lawless, Bergh, & Wilsted, 1989) adopted this indicator to measure financial performance.

Return on sales (ROS) was measured based on net income before interest and taxes per sales. In the strategic group study, Cool and Schendel (1987), Fiegenbaum and Thomas (1990), Hergert (1983), and Lewis and Thomas (1990) used this indicator to measure a firm's financial performance.

Return on equity (ROE) is another alternative measure of financial performance. This measure is calculated by dividing net income before taxes by stockholders' equity. This measure has been used in past strategic group studies that have operationalized financial performance (e.g., Hatten, Schendel, & Cooper, 1978; Lawless, Bergh, & Wilsted, 1989; Oster, 1982; Porter, 1979; Schendel & Patton, 1978).

Sales growth:

Sales growth (SGR) is a growth-based indicator appropriate for measuring the performance of firms which pursue differentiation strategy. This indicator shows annual change in sales, after adjusting for inflation. This measure also captures the effectiveness of an organization's strategy or the success of a business' products and programs in

relation to those of its competitors in the market. Dess and Davis (1984) used this indicator to measure performance.

Control Variables

Since firms from a single industry were included in the sample, the variations in industry environments and technology was controlled to the extent possible. Further, the use of ratios and standardized measures served to control for organizational size, which could potentially confound results, given the expected variance in magnitude and scale of operations between large and small firms.

Having provided a detailed articulation of the variables examined, the discussion now focuses on validity assessments.

Validity Assessment

The validity assessment was conducted via two steps (Churchill, 1979; Venkatraman, 1989); the purification of measures, and construct validity.

Purification of measures

The empirical validation of the boundaries established by constructs can be performed through a construct purification procedure (Churchill, 1979). As Nunnally (1967) noted, the most logically defensible model is the *domain sampling model*, which

holds that the purpose of any particular measurement is to estimate the score that would be obtained if all of the items in the domain are used. Such an approach assists in obtaining the true score.

Since it is not possible to use all of the items, only a sample is generally used in research settings. Hence, it becomes necessary to establish the *internal consistency* of a set of items. A measure of this internal consistency is provided by the Cronbach coefficient α (Cronbach, 1951). This coefficient is a primary indicator of the robustness of the measures (Peter, 1979). The square root of α is the estimation correlation of k-item sample of items with errorless true scores. Thus, while a low α indicates that the sample of items is a poor representation of the construct which motivated the measure, a high α is an indication that the sample of items are internally related in a manner expected.

Construct validity

Following Bagozzi (1980), Venkatraman and Grant (1986), and Venkatraman (1989), the following aspects of construct validity are considered minimally important for assessing the measures developed in this study.

1. Content validity: This depends on the extent to which an empirical measurement reflects a specific domain of content. It requires that the researchers be able to specify as accurately as possible the domain of the content that is relevant to a particular measurement context. In the case of a multidimensional concept, such as strategy, it is necessary to include items that reflect the meaning associated with each dimension. Although there is no agreeable criterion for content validation, it

is considered that the assessment by literature review satisfies the criterion for assessing content validity.

2. Internal consistency: This refers to two related but independent concepts - unidimensionality, and the reliability of operationalization (Bagozzi, 1980). *Unidimensionality* is achieved when clustered items all represent an underlying trait, and can be determined by techniques such as a factor analysis or a general linear model (Bagozzi, 1980; Hunter & Gerbing, 1982). If a trait is unidimensional, all of the clustered items measure the same trait. However, the amount of error in measurement of those items may be high or low. If the items are summed to form a composite score, errors tend to cancel each other such that there is less error in the composite score than in an individual item. It is important, however, to assess the quality of the cluster score in terms of the amount of error in measurement. The measure of this lack of error in a score is its reliability.

3. Convergent validity: This validity is the degree to which multiple attempts to measure the same concept, through maximally different methods, are in agreement. Evidence of the convergent validity is provided by the degree of correlation compared to other methods designed to measure the same construct.

4. Discriminant validity: This validity is the degree to which one concept differs from others. It is necessary to demonstrate that a measure of one construct does not correlate very highly with other measures of other construct from which it should differ theoretically. This is because scales that correlate too highly may be measuring the same, rather than different, constructs.

Generally, factor analysis is used to address the dimensionality issue and to verify the number of dimensions of a construct (Nunnally, 1967). Two-alternative data analytic schemes are available within the factor-analytic framework. One is exploratory factor analysis (i.e., the means of exploring the underlying factor structure without prior specification of the number of factors and their loadings), and the other is confirmatory factor analysis (i.e., specific expectations concerning the number of factors and their loadings).

In this study, the confirmatory factor analysis approach was adopted as implemented within the LISREL framework to assess convergent validity and discriminant validity (Joreskog & Sorbom, 1989). In comparing these two factor analysis techniques, Bagozzi noted that "in their pure forms, the exploratory factor analysis and confirmatory factor analysis approaches can be thought of as end points on a continuum. At one extreme, exploratory factor analysis represents a procedure for the discovery of structure, while at the other extreme, confirmatory factor analysis is a technique for testing hypothesized structure formed on an *a priori* basis" (1983: 134-135). Venkatraman and Ramanujam (1987) also argued that the confirmatory factor analysis approach is a better tool than other methods including exploratory factor analysis or multi-trait multi-method. In research studies which are based on a reasonable theoretical support for deriving the dimensions, confirmatory factor analysis is considered to be a more appropriate scheme (Bagozzi, 1980; Joreskog & Sorbom, 1979). Confirmatory factor analysis allows the decomposition of measurement variance into trait and random components, and thus allows us to conclude whether the measures are adequate to test the substantive hypotheses.

Hypothesis Testing

In this section, the methodology used to test the hypotheses developed in chapter two is described. First, we discuss the identification process of time periods of stable strategic behavior and the strategic groups in each time period. Second, we detail the methodology used to test the strategic group dynamics hypotheses. Finally, tests of strategic group performance implications are conducted. These hypotheses and testing methodologies are summarized in Table 7.

Comparative Static Methodology

One key issue is how the dynamic perspective is modeled. There are two basic avenues to capture intertemporal changes; the *comparative static* methodology and the *dynamic* methodology (FitzRoy, 1976; Ruefli & Wilson, 1987). A comparative static methodology postulates that change can be understood by comparing different states of the same phenomenon at different time intervals. Essentially, this approach assumes that, over time, different equilibria exist and that changes in the measured phenomenon are caused by transitory shocks. This contrasts with the dynamic analysis where the general existence of equilibria is challenged.

Clearly, each method has its advantages and disadvantages. Comparative static methodology provides a more structured approach and enables the researcher to study different states of time in more detail. However, its major disadvantage of not being capable of explaining processes of change, is well recognized. Dynamic methodology, on the other hand, precisely enables such a process view but has the drawback of making

Table 7. Hypotheses and Testing Methodologies

	Hypotheses	Testing Methodologies
	Dynamic Analysis of Strategic Groups	
H1.	Firms will remain in the same strategic group over time.	Markov probability model Chi-square test
H2.	The level of firm movement will be higher between strategic groups with similar strategic configurations than between groups with dissimilar strategic configurations.	Mahalanobis D^2 distances Chi-square test
H3.	Firms that change strategic group membership will have different contextual characteristics (i.e., size, age, environment, prior performance, and organizational slack) than firms that do not change group membership.	Two-group discriminant analysis
	Performance Implications Analysis	
H4a.	The level of performance between strategic groups will be significantly different.	Analysis of variance (ANOVA)
H4b.	Strategic group effects will outweigh individual firm effects within the strategic group when accounting for performance differences between strategic groups.	Within and between analysis (WABA)
H5.	The performance of firms after they change group membership will be better than the performance of the same firms before they change membership.	T-test Analysis of covariance
H6a.	Among firms that move into an uncertain environment by changing group membership, those that move into groups characterized by similar strategic configurations will be more profitable than those that move into groups characterized by dissimilar strategic configurations.	Kruskal-Wallis ANOVA
H6b.	Among firms that move into a certain environment by changing group membership, those that move into groups characterized by dissimilar strategic configurations will be more profitable than those that move into groups characterized by similar strategic configurations.	

a synchronic comparison of the behavior of different data units less feasible. Nevertheless, both approaches are valuable and shed light on complementary issues (Dielman, 1983).

The perspective taken for this study followed the *comparative static* methodology; strategic group structure observed at different points in time was compared to each other. Since strategic group membership composition is likely to change over time, hypothesis testing becomes less feasible. Thus, the comparative static analysis of strategic groups over time is essentially descriptive. Recently, in their PIMS (Profit Impact of Market Strategies) study, Venkatraman and Prescott (1990) used the comparative static methodology to test temporal stability across business cycles of the market share - profitability relationship.

The identification of time periods of stable strategic behavior and the identification of strategic groups in each time period are necessary to test the hypotheses. First, an overview is given of the methodology employed to divide the entire time period under study into subperiods characterized by stable strategic behavior. The technique used for this purpose was a test of the equality of multivariate variance-covariance matrices. Next, the cluster analysis methodology is reviewed. This technique was utilized for identifying the various strategic groups within each time period of stable strategic behavior.

Identification of Time Periods of Stable Strategic Behavior

It was argued earlier that the structure of strategic groups may change over time since firms modify their strategic profile in order to fit their skills and resources to the

opportunities and threats offered by the dynamic environment. In this study, the methodology used to identify time periods of stable strategic behavior closely parallel those used by Cool and Schendel (1987) and Fiegenbaum and Thomas (1990).

In the pharmaceutical industry study, Cool and Schendel (1987) examined the changing structure of strategic groups over time. They argued that it is crucial to test the stability of the variance-covariance matrix of the strategy variables in order to determine whether the differences in business strategies between firms in an industry and the inter-temporal changes in these strategies occur. The rationale for this argument is that when firms alter their commitments along the strategic variables, the covariances between these variables should reflect this strategic repositioning. Therefore, by determining at what point in time the covariance structure has changed from previous periods in a statistically significant way, it is then possible to construct distinct periods of time within which the configuration of strategic positions of firms is more stable than between periods.

The general procedure for identifying whether the period t can be considered with the previous $t-1$ periods or whether the period t is the beginning of a new period of stable strategic behavior is specified as:

$$H_0: \quad \Sigma_{12.....t-1} = \Sigma_t$$

$$H_0: \quad \Sigma_{12.....t-2} = \Sigma_{t(t-1)}$$

$$H_0: \quad \Sigma_{12.....t-3} = \Sigma_{t(t-1)(t-2)}$$

.

.

.

$$H_0: \quad \Sigma_1 \qquad = \Sigma_{t(t-1)(t-2).....32}$$

against H_1 : not all Σ are equal (for each H_0)

where Σ represents the variance-covariance matrix of data pooled over the time periods

When, for a chosen significant level, the null hypothesis is accepted (meaning that no change has occurred between the periods), the periods are pooled together. If one of the null hypotheses cannot be accepted, this indicates that the last period *t* cannot be considered to be in the same *t-1* periods representing a time period of stable strategic behavior. Therefore, the period *t* represents the beginning of a new period of stable strategic behavior and the same procedure is repeated.

Bartlett's χ^2 approximation statistic (Green, 1978: 169-171; Morrison, 1976: 252-253; Neter & Wasserman, 1974: 509-513) was used to test the equality of variance-covariance matrices.

Identification of Strategic Groups in Each Time Period

For each time period of stable strategic behavior, firms were clustered into strategic groups. The mean values for each of the strategy variables, for each firm, and for each stable period were calculated. Then, they were normalized to mean 0 and a standard deviation of 1. The normalization process gives equal weight to each variable and eliminates the problems associated with the use of different measurement scales for each of the strategic variables (Aldenderfer & Blashfield, 1984; Harrigan, 1985). The normalized values were then used as input for cluster analysis and the subsequent identification of groups.

Cluster analysis is known to be more useful than other multivariate techniques in the strategic group study (Harrigan, 1985). Cluster analysis has a variety of ad hoc methods - hierarchical, optimization-partitioning, density, and clump methods - each of which has certain advantages and disadvantages (Aldenderfer & Blashfield, 1984; Anderberg, 1973; Everitt, 1980; Miller, 1978). In this study, the criteria used for clustering firms into strategic groups minimizes the strategic distance between objects in a group and maximizes the strategic distance between groups. Ward's minimum-variance hierarchical method, using squared Euclidean distances, was used in clustering firms because it has been established that it best uncovers the "natural structure" of the data among the classes of hierarchical cluster routines (Punj & Stewart, 1983). To evaluate the stability of the results, the average linkage method and centroid method were also used.

The determination of the appropriate number of clusters is an important issue in this study since one of the major issues involves the exploration of the number of

strategic groups that can be found in each period of stable strategic behavior. Unfortunately, there are no satisfactory, clear-cut methods for determining the appropriate number of clusters for any type of cluster analysis (Aldenderfer & Blashfield, 1984). However, a commonly used rule of thumb in selecting the number of clusters involves the examination of the "tightness" (mean-squared error) of the clusters as the algorithm progressively combines groups (Hambrick, 1984; Harrigan, 1985). In this study, the decision rule for choosing meaningful clusters was based on two criteria: the overall variance explained, and the incremental change in variance as a result of adding another cluster.

To assess whether the identified clusters differ significantly from each other, we used analysis of variance and Scheffe multiple comparison tests (Aldenderfer & Blashfield, 1984; Anderberg, 1973).

A discussion of the statistical background of the hypotheses testing follows.

Dynamic Analysis of Strategic Groups

Once strategic groups have been identified, tests of hypotheses about the dynamics of strategic groups can be performed. For convenience, the hypotheses are briefly outlined in each case and the method of testing these hypotheses is described.

Stability of strategic group membership

H1. **Firms will remain in the same strategic group over time.**

In order to test hypothesis one, a Markov probability model suggested by Friesen and Miller (1986) and Winter and Nelson (1982) was performed to examine the stability of firm movement across strategic groups over time. The basic methodological premise is that the stochastic probability model can provide a useful framework to describe the dynamic characteristics of strategic groups in an industry. Treating the concept of strategic groups in a probability and dynamic manner may shed more light on the long-run viewpoint of competitive strategies. According to Winter and Nelson, two major characteristics describe the phenomenon of economic change. First, the change process is dynamic and requires knowledge of both current and past economic conditions. Second, since business behavior follows irregular and unpredictable patterns, stochastic elements need to be introduced into the determination of decisions in the evolutionary theory.

From a methodological point of view, Nelson and Winter have argued that the phenomenon of evolutionary economic change can be represented mathematically in terms of Markov stochastic processes:

> Just as some orthodox ideas seem to find their most natural mathematical expression in the calculus, the foregoing verbal account of economic evolution seems to translate naturally into a description of a *Markov process* . . . It is precisely in the characterization of the transition from one period to the next that the main theoretical commitments of evolutionary theory have direct application. However, those commitments include the idea that the process is not deterministic; search outcomes, in particular, are partly stochastic. Thus, what the industry condition of a particular period really determines is the probability distribution of its condition in the following period. (1982: 19)

Since a key methodological issue is Markov processes, we discuss the relationship between Markov processes and strategic groups. Many stochastic processes possess the Markov property, that the system has a "state space" and the probability of its moving from one state to another is not affected by the past history of the process, but by the present situation. Although the Markov probability model is a somewhat simplified

model of reality, this model has been widely applied to problems in production (Hoel, Port & Stone, 1972), finance, and marketing management (FitzRoy, 1976). In the strategic management field, Friesen and Miller (1986) used the Markov probability model to explain the adaptive behavior of organizations. However, the Markov probability model has rarely been used in strategic group research. Consequently, we first relate the concept of strategic groups to some of the properties of a Markov process, and then explain how long-run Markov properties (e.g., steady state) can give insight into the dynamics of inter-group movement.

An industry, composed of a finite number of stable strategic groups, can be viewed as a Markovian-state space where each strategic group is a state of a Markov chain. After strategic groups within an industry are identified, the following properties of a Markov process can be connected to the concept of strategic groups.

1. Transition probability: Transition probabilities (p_{ij}) represent the difficulty of moving from one strategic group i to another group j. Since this difficulty is a function of the height of mobility barriers, transition probabilities are correlated to the height of these barriers. These probabilities may be stationary over time or may vary in relation to the movement of explanatory strategic variables. In a study of cigarette brand consumption, for example, Telser (1962) assumed that the transition probabilities, associated with switching from one cigarette brand to another, depend on the relative prices of the brands and the relative advertising expenditures of the firms.

2. Absorbing states: Absorbing states are those states (strategic groups) into which firms will move and stay permanently. If such strategic groups exist, their members either cannot or do not want to leave. For example, bankruptcy represents a state

of the first type. Once a firm goes bankrupt, it cannot move to other states. The highest performance group is the other extreme. Once a firm moves into that group, it does not want to leave unless it is forced to.

3. Hitting time: Hitting time is the number of times a firm moves into a particular strategic group from other groups. Hitting times can be derived from the transition matrix.

4. Steady state: A steady state refers to a system that has reached stability. If the steady state is reached after a period of time, a stable industry structure consisting of strategic groups is established.

The steady state gives a picture of the stable elements of the structure of an industry. The key to understanding a system possessing Markov properties is the *transition probability matrix*. Given the membership of strategic groups over time, the transition probability (p_{ij}) from state i to state j is calculated as follows. The denominator of the transition probability from state i to state j is the sum of the number of firms in state i (N_{ij}) for all time periods of stable strategic behavior (periods of strategic homogeneity). That is, $N_i = \sum_i N_{ij}$. The numerator is the number of movements (n_{ij}) from state i to state j during the entire period. The process is repeated for each pair of i and j and, therefore, the transition probability (p_{ij}) is:

$$p_{ij} = \frac{n_{ij}}{N_i}$$

In order to test this hypothesis, a transition probabilities matrix was calculated, and multiple-step transition matrices were also used to examine a stable industry structure

over time. It is shown in Anderson and Goodman (1957) that p_{ij} is a maximum likelihood estimator of transition probability. A chi-square test was run to test equal probability of firm movement over time (Anderson & Goodman, 1957; Lee, Judge, & Zellner, 1970).

Mobility dynamics of strategic groups

***H2.* The level of firm movement will be higher between strategic groups with similar strategic configuration than between groups with dissimilar strategic configuration.**

One methodological issue is how to operationalize the concept of mobility barriers. In this study, following Harrigan (1985), we used the distance between strategic groups as a surrogate of the relative heights of mobility barriers separating groups from emulation by potential entrants. Inter-group differences in strategy configurations can be defined as the overall strategy attributes that firms follow, and the heights of each strategic group's mobility barriers are determined by the types of group-specific competitive investments based upon the firms' strategic configurations (Harrigan, 1985; McGee & Thomas, 1986; Porter, 1980). Oster (1982) used the difference in the ratio of advertising expenses to sales, and Mascarenhas (1989) used the differences in group-defining variables as a surrogate of mobility barriers respectively. More recently, Sudharshan, Thomas, and Fiegenbaum (1991) assessed mobility barriers in terms of the degree of differences among key strategy variables using the MOBIUS (Mobility Barriers Identification Using Strategic Grouping) procedure.

We then used the Mahalanobis D^2 distance, rather than the squared Euclidean distance, to identify both groups with similar and dissimilar strategic configurations (Aaker, 1971; Harrigan, 1985). The Mahalanobis D^2 distance is a generalized squared

Euclidean distance measure d^2, adjusting for pooled within-group covariance matrices that are not scalar matrices. Mahalanobis D^2 is defined as:

$$D_{ij}^2 = (X_i - X_j)' C_w^{-1} (X_i - X_j)$$

where X_i = the mean-corrected centroid matrix for group i
X_j = the mean-corrected centroid matrix for group j
C_w^{-1} = the inverse of the pooled within-groups covariance matrix

The testing procedure consists of the following steps:

1. Identifying sets of key strategy variables in cluster firms
2. Clustering firms for each time period of stable strategic behavior
3. Computing the Mahalanobis D^2 distance among strategic groups for each time period (the distance of the multivariate group means among strategic groups, using eight strategy variables).
4. Computing the means of the Mahalanobis D^2 distance to classify into groups with similar (below-average) and dissimilar (above-average) strategic configurations.
5. Computing the mobility ratio based upon the results of step 4 (actual firm shifts by possible firm shifts for firm movement to both groups with similar and dissimilar strategic configurations).
6. Testing the hypothesis using the chi-square statistic based upon the obtained mobility ratio (Fleiss, 1981).

The basic assumptions of this procedure are that there is a stable group structure over time in an industry, and there is a relatively clear strategic distance among groups. The procedure may be difficult to interpret when two or more groups locate around the average of the Mahalanobis D^2 distance. Despite these limitations, the above procedure

can measure objectively the distances of strategic configurations among strategic groups (as a surrogate of mobility barriers) in the case of multivariate strategy variables that use to cluster firms into strategic groups.

Contextual factors influencing change in group membership

H3. **Firms that change strategic group membership will have different contextual characteristics (i.e., size, age, environment, prior performance, and organizational slack) than firms that do not change group membership.**

Given our interest in exploring contextual factors contributing to differences between change and no-change group membership, we deemed a discriminant analysis to be an appropriate analytical approach to test these hypotheses. Use of another statistical technique, such as multiple regression analysis, may also seem appropriate because the independent variables are interval measures. However, a dichotomous criterion variable (change versus no-change), and possible multicollinearity in data, make a discriminant analysis a more appropriate statistical technique, because multicollinearity does not greatly affect interpretation of the results of discriminant analysis (Green, 1978).

To examine the relationship between the dependent variable - change in group membership - and the five independent variables discussed previously, two-group discriminant analysis was used. Discriminant analysis, in developing a linear combination of predictor variables (the discriminant function), can serve both analytical and classificatory purposes. In order to assess the contribution of independent variables (i.e., size, age, environment, prior performance, slack), we examined the group means (centroid) difference as well as the correlation between the value of the discriminant function (coefficient) and the value of the independent variables. In addition, we

compared the classification accuracy of the discriminant function with the chance model. This analysis is important for the verification of the significance of the overall results, especially in the case of unequal group analysis. Both the analytical and classificatory uses of the discriminant analysis were examined to test hypotheses. The discriminant function is:

$$Z = W_1X_1 + W_2X_2 + W_3X_3 + W_4X_4 + W_5X_5$$

where Z = discriminant score
W_i = discriminant weights
X_i = independent variables

Now we turn to the hypotheses for the performance implications of strategic groups.

Performance Implications Analysis

Between and within-group performance analysis

The hypothesis that the structure of strategic groups within an industry can explain interfirm performance differences was tested. The formal hypothesis is:

H4a. **The level of performance between strategic groups will be significantly different.**

To test hypothesis 4a, a one-way analysis of variance (ANOVA) was used to examine whether significant performance differences exist among strategic groups.

***H4b.* Strategic group effects will outweigh individual firm effects within the strategic group when accounting for performance differences between strategic groups.**

A unit of analysis problem occurs when a data set is collected from individual firms that are located in groups. Group averages can be computed, correlated, and compared in such a data set. The inferences drawn from these aggregated average scores can be problematic (Robinson, 1950). Dansereau, Alutto, and Yammarino (1984) have noted that it is possible to test empirically for the appropriate level of analysis. They suggested that a variety of statistics and inferential procedures can be derived from a database which contains individual firms embedded in their groups. The covariance theorem (Robinsion, 1950) illustrates this point. The covariance theorem can be stated as follows:

$$r_{xy,T} = \eta_{x,B}\eta_{y,B}r_{xy,B} + \eta_{x,W}\eta_{y,W}r_{xy,W} \qquad (1)$$

where
$r_{xy,T}$ = total individual level correlation of x and y
$\eta_{x,B}$ = between-eta correlation of variable x
$\eta_{y,B}$ = between-eta correlation of variable y
$r_{xy,B}$ = between-group correlation of x and y
$\eta_{x,W}$ = within-eta correlation of variable x
$\eta_{y,W}$ = within-eta correlation of variable y
$r_{xy,W}$ = within-group correlation of x and y

As shown in equation (1), a raw unadjusted correlation is equal to the weighted sum of the between-group and within-group variances and covariances (Przeworski & Teune, 1970; Robinson, 1950). Thus, three types of correlations can be derived for this type of multiple-group data base, which contains N individual firms and J groups. These three correlations are (1) the total raw unadjusted correlation, which is based on the total N individual firms; (2) the between-group correlation, which is based on J groups, with each group represented by its average score; and (3) a within-group

correlation based on the residual variation that exists after removing between-group differences.

To examine the possible relation of between-group and within-group effects, an inferential, statistical technique proposed by Dansereau, Alutto, and Yammarino (1984) and Markham et al. (1983), the within and between analysis (WABA) procedure, was used. As an alternative to a combined analysis of covariance and the multiple regression procedure, the WABA technique uses weighted group averages in calculating between-group and within-group variation correlations. In a single step, data is transformed prior to entry into a correlation program by partitioning each firm's raw score on each measure into two components. These two components are a weighted between-group score, which is shared by all members of a group and a within-group component, which is that individual firm's unique, relative position above or below the group's average (McNemar, 1955).

Mobility dynamics - performance analysis

H5. **The performance of firms after they change group membership will be better than the performance of the same firms before they change membership.**

To test this hypothesis, the mean performance of firms for the time period after changing group membership was compared to the mean performance of the same firms for the time period before changing membership. Specifically, a t-test analysis, with the different performance measures as dependent variables and the performance changes of firms (after versus before) as the independent variable, was run to test this hypothesis (Smith & Grimm, 1987). In addition, we also examined the performance differences between firms that changed group membership and firms that did not change

membership, after removing the possible effects of prior performance, using the analysis of covariance.

H6a. **Among firms that move into an uncertain environment by changing group membership, those that move into groups characterized by similar strategic configurations will be more profitable than those that move into groups characterized by dissimilar strategic configurations.**

H6b. **Among firms that move into a certain environment by changing group membership, those that move into groups characterized by dissimilar strategic configurations will be more profitable than those that move into groups characterized by similar strategic configurations.**

In order to test these hypotheses, environment uncertainty was measured by industry sales growth forecasting error. Using the means of the Mahalanobis D^2 distance, we then classified firms that changed membership into firms that move into groups characterized by both similar and dissimilar strategic configurations.

Since the assumptions of the homogeneity of variance and normality in performance variables were violated, and sample sizes (i.e., five and nine) were unequal, a parametric analysis of variance (ANOVA), or t-test, could not be performed. Thus, its non-parametric counter-part, a Kruskal-Wallis one-way analysis of variance, was applied to test hypotheses. The Kruskal-Wallis ANOVA test is identical to a Wilcoxon rank-sum test for two group comparison.

Summary

This chapter has outlined the research setting, data sources, and the sample selection process. This chapter has also discussed in detail the issues relating to

operationalization of the constructs. Specifically, objective, secondary measures of strategic dimensions and performance have been outlined. In addition, validity assessments for the strategy construct have been presented. The statistical procedures to investigate the dynamics of strategic groups and their performance implications have also been discussed in detail.

Chapter IV: Data Analysis and Results

Introduction

The previous chapter discussed the methodology that was used to study the dynamics of strategic groups and performance implications. This chapter describes the sample firms, the data collection process, and the measurement issues. Further, this chapter also discusses the statistical analyses and results of identifying time periods of stable strategic behavior and strategic groups in each time period. Finally, this chapter details the statistical tests of the hypotheses from chapter II by using objective, secondary data relating to firms in the U.S. computer equipment industry.

Data Collection

Sampling Procedure

Initial data collection involved the identification of the total population of firms in the U.S. computer equipment industry. *Datamation* and *Annual Survey of Manufacturers* showed that the top 50 firms in 1975 and the top 100 in 1989 had over 90 percent of the accumulated market shares in the U.S. computer equipment industry (SIC 3573). Therefore, the population from which this study's sample was drawn was restricted to the top 50 firms in 1975 and the top 100 in 1989 as identified by *Datamation* and *Ward's Business Directory of the U.S. Corporations.*

The next step involved narrowing the population of firms down to a more homogenous group of single business organizations. This was necessary to establish comparability across organizations because the main concern of this study is business-level strategy. In this regard, Rumelt's (1974) definition of a dominant business was used. Thus, those firms that earned less than 70 percent of their revenues in the computer equipment industry were excluded. To accomplish this goal, the business descriptions and the Standard Industrial Classification (SIC) codes of each of the firms were scrutinized from 10-K reports and *Datamation.*

Consistent with the boundary established for this study, firms that were subsidiaries of the U.S. and foreign corporations, as well as private firms, were excluded. In addition, firms for whom data was not available on COMPUSTAT II computer files were excluded. Further, firms that existed less than two adjacent time periods of stable

strategic behavior were excluded because it was necessary to include only firms that had data available in order to study group dynamics across at least two time periods.

These sampling processes resulted in a sample frame of 38 firms that encompassed a broad range of participants in the U.S. computer equipment industry. The sample firms included the manufacturers of supercomputers, full-line computers, focused-line computers, and computer peripheral equipments. Despite differences in focus, these firms faced a relatively homogeneous, competitive environment. Appendix A provides the sample firms with their founding years and the study span for this study.

Data

As discussed in chapter III, objective, secondary data was used for the analysis. The data items of relevance were divided into two distinct categories, those that related either to firm-level data or to environment (industry). Firm-level data, such as strategy and performance, were obtained from COMPUSTAT II computer files and coded directly from annual reports and Form 10-K reports. Environment (industry) data was obtained from sources such as *Annual Survey of Manufacturers* and the *U.S. Industrial Outlook.* Random cross-checks with other secondary sources such as *Datamation, Electronic News Financial Fact Book and Directory, Electronics Buyers' Guide*, and the *Dow Jones News Retrieval Service* were carried out to ensure data validity. Table 8 provides a summary of the variable symbols and data sources used for the variables.

Table 8. Summary of Variable Symbols, Measures, and Data Sources

Symbols	Measures	Data Sources
Strategy		
Scope		
NPCL	The number of product classes	Annual reports & 10-K
FSNS	Sales outside the U.S./Sales	Annual reports & 10-K
Differentiation		
SENS	Selling expenditure/Sales	COMPUSTAT II
RDNS	R & D expenditure/Sales	COMPUSTAT II
CGNS	Cost of goods sold/Sales	COMPUSTAT II
Efficiency		
SEMP	Sales/Employee	COMPUSTAT II
FEMP	Fixed assets/Employee	COMPUSTAT II
IEMP	Inventory/Employee	COMPUSTAT II
Contextual Factors		
SIZE	Log (Employees)	COMPUSTAT II
AGE	Years in operation	Annual reports & 10-K
ENV	Change in value added	Annual Survey of Manufacturers
PERF	Return on assets	COMPUSTAT II
SLAC	Quick ratio	COMPUSTAT II
Environment Uncertainty		
ERSG	Error of sales growth forecasts	U.S. Industrial Outlook
Performance		
ROA	EBIT[a]/Total assets	COMPUSTAT II
ROE	Pre-tax income/Equity	COMPUSTAT II
SGR	Annual change in sales	COMPUSTAT II

[a] EBIT = Earnings before interest and taxes

Sample Characteristics

In order to gain preliminary insights into the nature of the data obtained, descriptive statistics on the organization were computed. Table 9 and Table 10 provide the means and standard deviations of the firm-level data for all of the sample firms in 1975 and 1989 respectively. The average firm ages were 22 years in 1975 and 27 years in 1989, and their average sizes in net sales were $1.20 billion in 1975 and $4.43 billion in 1989. The tables illustrate the tremendous inter-firm variation due to the effects of organizational size. For example, the standard deviation in the total assets category is greater than the mean. The mean value of total assets was $1.28 billion, with a standard deviation of $3.38 billion in 1975, and the mean value was $4.56 billion, with a standard deviation of $14.15 billion in 1989. This phenomenon can be attributed to the fact that the population included firms such as IBM, which had assets in excess of $77,734,000,000 in 1989, as well as a small firm in the sample with assets valued at approximately $22,120,000 in 1989. This variation reinforces the need to use standardized measures to control for the spurious effects introduced by organizational size.

Table 9. Descriptive Statistics for Firm-level Data in 1975

n = 21

Variable	Mean	Standard Deviation
Sales (dollars)	1,195,340,000	3,154,156,000
Number of Employees	28,878	64,703
Total Assets (dollars)	1,275,248,000	3,382,094,000
Selling Exp./Sales (dollars)	.245	.074
R & D Exp./Sales (dollars)	.058	.029
Sales/Employee (dollars)	37,470	6,278
Return on Assets	.118	.107
Sales Growth	.163	.215
Age (years)	22.381	26.244

Table 10. Descriptive Statistics for Firm-level Data in 1989

n = 30

Variable	Mean	Standard Deviation
Sales (dollars)	4,434,161,000	11,530,365,000
Number of Employees	31,191	73,187
Total Assets (dollars)	4,562,598,000	14,151,017,000
Selling Exp./Sales (dollars)	.252	.093
R & D Exp./Sales (dollars)	.084	.043
Sales/Employee (dollars)	163,369	87,463
Return on Assets	.049	.131
Sales Growth	.104	.189
Age (years)	27.167	25.572

Measurement

Strategy Measures

The findings from the factor analysis performed during the early stages of the strategy measurement assessment merit attention. First, the analyses suggest a three-factor solution, as proposed by this study, Hambrick (1983c), and Miller (1987). Two factors emerged as expected; scope and efficiency dimensions of strategy. Two items, product-line breadth and geographic coverage, loaded on the scope dimension factor. The efficiency dimension factor consisted of three items - employee productivity, capital intensity, and current assets intensity. Factor analysis for the differentiation dimension measures indicated that three items related to marketing differentiation, innovation differentiation, and cost efficiency (negatively) are more reliable measures of the differentiation dimension. Therefore, this study used an item of cost efficiency (cost of goods sold per sales) as an indicator of the differentiation dimension.

Validity assessment

Reliability refers to the degree to which a set of measures related to a construct is consistent or stable. Validity, on the other hand, refers to the relationship between a construct and its measures, or the degree to which the measures obtained indeed represent what they are supposed to reflect (Rosenthal & Rosnow, 1984). The following paragraphs summarize the procedure and the results that allowed us to conclude that the measures are adequate to test the substantive hypotheses in this study.

Descriptive statistics (means, standard deviations) and intercorrelations of strategy variables over the study span are provided in Table 11. The Cronbach α value for the strategy measures is 0.73 which exceeds Nunnally's (1967) suggested threshold value of 0.70. In addition, most of the item-to-total scale correlations were significantly significant at $p < 0.05$. These two assessments, taken together, provide support for the results of the measures. Additional assessments of validity (convergent and discriminant validity) were carried out using a confirmatory factor-analytic method that allows for the decomposition of measurement variance into trait and random components.

The confirmatory factor analysis procedure, as exemplified by Joreskog and Sorbom's (1989) work in LISREL, provides a systematic approach to the assessment of several aspects of construct validity as listed in chapter III. Specifically, one can assess reliability, convergent validity, and discriminant validity using confirmatory factor analysis. Following Joreskog's (1971) work, the basic measurement model for convergent validity can be written as:

$$x = \Lambda\xi + \delta \tag{1}$$

Where x is a vector of q measures or indicators,
ξ is a k ($< q$) vector of traits,
δ is a vector of residuals or measurement errors, and
Λ is a q x k matrix of factor loadings.

With the assumptions of $E(\xi) = 0$, $E(\xi\xi') = \Phi$, and $E(\delta\delta') = \Theta_\delta$, the variance-covariance matrix of x can be written as:

Table 11. Descriptive Statistics and Intercorrelations of Strategy Variables

n = 436

Variable	Means	s.d.	1	2	3	4	5	6	7
1. NPCL	1.83	.89							
2. FSNS	.34	.17	.42						
3. SENS	.24	.08	.16	.19					
4. RDNS	.08	.03	.12	.14	.56				
5. CGNS	.52	.13	-.18	-.12	-.55	-.42			
6. SEMP	92.59	65.39	.06	.17	.22	.24	-.17		
7. FEMP	24.52	17.48	.14	.16	.20	.21	-.21	.45	
8. IEMP	19.47	15.06	.18	.20	.18	.20	-.23	.51	.48

Correlations greater than .12 are significant at $p < .05$.
s.d. = standard deviation
Table 8 on page 116 details variable symbols.

$$\Sigma = \Lambda\Phi\Lambda' + \Theta_\delta \quad (2)$$

Where Σ is the variance-covariance matrix of observations,
Φ is the inter-correlation among the traits, and
Θ_δ is a diagonal matrix of error variances (θ_δ) for the measures.

The maximum likelihood parameter estimates for Λ, Φ, Θ_δ and an χ^2 goodness-of-fit index for the null model implied by equations (1) and (2) can be obtained using the LISREL program (Joreskog & Sorbom, 1989). The probability level associated with a given χ^2 statistic indicates the level of the fit of the model to the observation. The higher the value of p, the better the fit of the model. A rule of thumb considers $p > 0.10$ as indicating a satisfactory level of fit (Lawley & Maxwell, 1971). Satisfactory levels of fit, as indicated by the values of p, lend support to the convergent validity of the operational measures of a construct at a mono-method level. However, sole reliance on the χ^2 statistic is criticized for many reasons (Fornell & Lacker, 1981), and researchers increasingly complement this statistic with additional statistics. A commonly used statistic is Bentler and Bonett's (1980) incremental fit index Δ - which is an indication of the practical significance of the model in explaining the data. The Δ index is represented as:

$$\Delta = \frac{(F_0 - F_k)}{F_0} \quad (3)$$

Where F_0 = chi-square value obtained from a null model, and
F_k = chi-square value for the specified theoretical model.

Maximum likelihood (ML) parameter estimates were obtained from the LISREL VII program (Joreskog & Sorbom, 1989) for the model specified in equation (1). The overall statistics for the model are: χ^2 (df :17) = 22.91, p = 0.152, Bentler and Bonett's (1980) goodness-of-fit index, $\Delta = 0.972$. These provides support for the convergent validity of the operationalizations at the mono-method level of analysis.

Further, the reliability measure for the three dimensions can be calculated as follows:

$$\rho_c = \frac{(\sum \lambda_i)^2}{(\sum \lambda_i)^2 + \sum \theta_i} \qquad (4)$$

Where ρ_c is the reliability index for a construct,
λ_i is the factor loading of indicator i, and
θ_i is the measurement error of indicator i.

The reliability ρ_c obtained by using equation (4) reflects the percentage of trait variance over measurement variance. The values of ρ_c for the three dimensions are: ρ_c (scope) = 0.58; ρ_c (differentiation) = 0.71; and ρ_c (efficiency) = 0.70. The interpretation of these values is that the trait variance is at least 50 percent of the measurement variance in each case. Table 12 shows the results of a goodness-of-fit index of 0.97, reliability ρ_c, and the factor-loading pattern based on the confirmatory factor analysis performed for the eight strategy variables.

For discriminant validity, it is necessary to evaluate if the correlations among the three problem domains (ϕs) are significantly different from unity. The discriminant

Table 12. Confirmatory Factor Analysis Results

Variable	Scope	Differentiation	Efficiency	Goodness-of-Fit
NPCL	.59			.97
FSNS	.71			
SENS		.83		
RDNS		.67		
CGNS		-.66		
SEMP			.69	
FEMP			.66	
IEMP			.74	
Reliability ρ_c	.58	.71	.70	

Table 8 on page 116 details variable symbols.

validity can be assessed by introducing perfect correlations among the constructs in a measurement model. If the constrained model (after introducing perfect correlations among constructs) produces a significantly larger difference in the χ^2 statistic than that of the basic measurement model, then the discriminant validity hypothesis that the three strategy dimensions are indeed different, is supported. Based on Joreskog (1971), a $\chi^2 d$ statistic with an associated p-level of less than 0.05 is considered acceptable.

The constrained model has a statistic of $\chi^2 = 301.30$ (df : 20, $p < 0.0001$), and the difference in model statistic of $\chi^2 d = 278.39$ (df: 3, $p < 0.0001$), strongly indicates that the problem domains are indeed statistically different. In addition, the correlation coefficients within construct correlations among indicators are considerably higher than the average across construct correlations. The convergence reflected in these correlation coefficients shows that the measures obtained for this study are of good quality. Thus, the analysis provides strong evidence for both convergent and discriminant validity of the measurement schemes used in this study.

Performance Measures

The reliability and validity of the performance measures are based primarily on their acceptability, uniformity of use, and relevance in relation to the other variables. The content validity of the profitability and growth dimension measures is established by their use in strategic management studies. The importance of these measures is based upon both their widespread use and their acceptability. Chakravarthy (1986) and Venkatraman and Ramanujam (1987) argued that profitability such as return on assets (ROA), return on sales (ROS), and return on equity (ROE), reflect the efficiency with which organizations operate, while sales growth (SGR) demonstrates their effectiveness.

These measures are among the most frequently used criteria of performance in the strategic group study (e.g., Cool & Schendel, 1987, 1988; Dess & Davis, 1984; Fiegenbaum & Thomas, 1990; Hatten & Schendel, 1977; Lewis & Thomas, 1990). However, a correlation analysis of the sample firms revealed that return on sales (ROS) was highly correlated with return on assets ($r = 0.94$) over the study span, so return on sales (ROS) was not used in the analysis. Therefore, two profitability measures (ROA, ROE) and a sales growth measure were used in this study to assess the performance implication of strategic groups.

It has been argued that risk is an important consideration in strategy formulation (e.g, Andrews, 1980; Baird & Thomas, 1985; Cool & Schendel, 1987, 1988; Fiegenbaum & Thomas, 1990). The postulated relationship between risk and return in finance theory, notwithstanding, at least the empirical relationship of risk to return (performance) is not at all clear. However, it is widely accepted that return has some relationship to risk. Hence, it is necessary when studying performance issues to consider risk as well.

In general, the prevailing wisdom is that return and risk are positively related (Brealey & Myers, 1984), though some studies, using accounting-based measures of risk and return, have reported a negative relationship within industries at the firm level (Bowman, 1980). Fiegenbaum and Thomas (1986) reported, however, that Bowman's (1980) results did not exhibit stability over time and across industries, thus perhaps indicating the presence of other variables which might affect both risk and return, thereby moderating the relationship. Baird and Thomas (1985) also examined conceptually the issue of moderating variables in the risk-return relationship. The negative relationship between risk and return has been examined in terms of prospect theory (Bowman, 1982; Fiegenbaum & Thomas, 1988) and suggests that managers of

low-performing firms seek out risky investments, thereby giving rise to the observed negative relationship between risk and return at the firm level.

In this study, we were not concerned with attempting to clarify the relationship between strategy and risk-return. However, recognizing that risk and performance are somehow related and may, in fact, be traded against each other during strategy moves, we included risk-adjusted performance measures: risk-adjusted ROA, risk-adjusted ROE, and risk-adjusted sales growth. The standard deviation of performance measure is an accepted measure of total risk (Bettis & Hall, 1982; Brealey & Myers, 1984; Cool & Schendel, 1987), and it was used frequently in the risk-return performance and strategy studies (e.g., Bettis & Hall, 1982; Bettis & Mahajan, 1985; Chang & Thomas, 1989; Cool, Dierickx, & Jemison, 1989; Fiegenbaum & Thomas, 1988; Jemison, 1987). In their strategic group studies, Cool and Schendel (1987, 1988) and Fiegenbaum and Thomas (1990) also used the standard deviation of performance measure to study the performance comparison between strategic groups.

Identifying Time Periods of Stable Strategic Behavior

The procedure to determine time periods of stable strategic behavior was discussed in detail in chapter III. In order to identify changes in the structure of strategic groups, changes in the variance-covariance matrix of the eight strategy variables were examined. The results of the procedure are reported in Table 13.

Bartlett's test (Green, 1978: 169-171; Morrison, 1976: 252-253), using a chi-square approximation, was used to test the equality of variance-covariance matrices across

Table 13. Equality of Variance-Covariance Testing

Added Year	Base Periods	Contrasted Years	Stability Criteria	
			Bartlett χ^2	p[a]
76	75	75 vs 76	31.549	.680
77	75-76	75-76 vs 77	29.768	.759
		75 vs 76-77	38.759	.346
78	75-77	75-77 vs 78	31.189	.697
		75-76 vs 77-78	47.176	.101
		75 vs 76-78	46.733	.109
79	75-78	75-78 vs 79	23.023	.954
		75-77 vs 78-79	29.132	.785
		75-76 vs 77-79	39.610	.312
		75 vs 76-79	45.079	.143
80	75-79	75-79 vs 80	31.656	.675
		75-78 vs 79-80	41.425	.246
		75-77 vs 78-80	41.425	.246
		75-76 vs 77-80	49.184	.070
		75 vs 76-80	50.412	.056
81	75-80	75-80 vs 81	36.518	.445
		75-79 vs 80-81	56.203	**.017 ***
82	81	81 vs 82	15.034	.999
83	81-82	81-82 vs 83	52.325	**.039 ***
84	83	83 vs 84	27.105	.858
85	83-84	83-84 vs 85	97.242	**.0001 ****
86	85	85 vs 86	28.419	.812
87	85-86	85-86 vs 87	101.526	**.0001 ****
88	87	87 vs 88	15.377	.999
89	87-88	87-88 vs 89	15.156	.999
		87 vs 88-89	24.638	.924

[a] * $p < .05$, ** $p < .01$, *** $p < .001$

years. It can be seen from Table 13 that significant changes in the variance-covariance matrices at $p < 0.05$ occurred in 1981, 1983, 1985, and 1987. No significant χ^2-value was found for the last period, implying that the group structure that emerged during and after 1987 had not yet changed by 1989. In addition, the relatively short time span of stable periods in the 1980s indicated some degree of instability in the industry. Based on these findings, the identified time periods of five strategic group structures during the time span studied are:

Period I: 1975-1980

Period II: 1981-1982

Period III: 1983-1984

Period IV: 1985-1986

Period V: 1987-1989

This statistical procedure above, however objective, cannot examine whether the transitions observed were a result of macro-environmental changes, triggered by autonomous firm strategic actions, or were due to some combination of both. However, a study of the U.S. computer equipment industry indicates that major changes that took place over the study period were associated with the observed strategic group changes.

During the late seventies major industry changes took place, including the entry and growth of plug-compatible manufacturers (e.g., Amdahl Corp) and micro processors. Although these sets of changes influenced the strategy of firms in the second half of the seventies, the industry remained relatively stable owing to the dominant force of mainframes led by IBM. This was reflected by a relatively long stable time period (6 years). This period was also characterized by high-growth, with over 10 percent annual sales growth, after adjusting for inflation.

In the early 1980s, the rise in the importance of micro processors changed the competitive pattern of the U.S. computer equipment industry. Many startup companies launched by entrepreneurs (e.g., Apple Computer, Seagate Technology, and Tandon) entered into the field of personal computers and related peripheral segments. In late 1981 IBM was also a new entrant in the personal computer market and became the market leader by 1982. Other major environmental influences took place due to a moderate industry recession. After recovering from the recession, the industry enjoyed over 10 percent growth in sales for the years 1983 and 1984.

The worst slump in the industry's history, an unexpected and severe slowdown in sales began in late 1984 and continued until late 1986. It became a turning point - a sign that a profound change was occurring in the computer equipment industry. One effect of this environmental change was that firms had to pursue strategies with fewer employees and better cost controls, and had to be more aggressive in their foreign markets. Other major changes included a fundamental shift of buyers' needs from the monolithic mainframes to inexpensive small computers. In 1984 revenues from sales of microcomputers surpassed those of mainframes for the first time.

After the depressed years of 1985 and 1986, industry sales increased about 8 percent, adjusted for inflation. However, even to achieve an 8 percent annual increase, manufacturers had to sell more computers each year because the price per system declined. In the post-mainframe era, computer hardware became a commodity that buyers could easily purchase and install. These changes influenced firm strategies during the mid-1980s and created a different strategic group structure in the last time period. Firms now have to focus on low-cost manufacturing, higher employee productivity (with fewer employees), and aggressive marketing commitments.

A more extensive analysis would be needed to establish causal relationships between these industry changes and the observed patterns of strategic group structure. However, this overview of the industry over the study time span shows that the above statistical result is closely related with the major changes in the industry. Thus, this provides a validity of the statistical result.

Descriptive Statistics in Each Time Period

When clustering firms in each time period, average scores of strategy variables from the three dimensions - scope, differentiation, and efficiency - were used. Table 14 through Table 18 show descriptive statistics (means, standard deviations) and intercorrelations for the eight strategy variables over the five time periods of stable strategic behavior.

Identifying Strategic Groups in Each Time Period

Five time periods of stable strategic behavior were identified in this study. In each of these stable time periods, different structures of strategic groups occurred in terms of the number of strategic groups, group membership, group strategy, etc. Therefore, at this stage the strategic group structure for each one of the five identified time periods is examined.

Table 14. Descriptive Statistics and Intercorrelations of Strategy Variables for Period I

Period I (1975-1980)
n = 25

Variable	Means	s.d.	1	2	3	4	5	6	7
1. NPCL	1.77	.78							
2. FSNS	.33	.15	.46						
3. SENS	.23	.07	.24	.19					
4. RDNS	.07	.03	.14	.11	.46				
5. CGNS	.48	.12	-.22	-.39	-.62	.51			
6. SEMP	53.49	17.46	.15	.22	.32	.26	-.14		
7. FEMP	14.79	9.58	.11	.22	.20	.18	-.27	.53	
8. IEMP	13.50	7.14	.18	.14	.20	.25	-.23	.70	.45

Correlations greater than .39 are significant at $p < .05$.
s.d. = standard deviation
Table 8 on page 116 details variable symbols.

Table 15. Descriptive Statistics and Intercorrelations of Strategy Variables for Period II

Period II (1981-1982)
n = 30

Variable	Means	s.d.	1	2	3	4	5	6	7
1. NPCL	1.77	.89							
2. FSNS	.30	.12	.66						
3. SENS	.24	.08	.35	.47					
4. RDNS	.08	.03	.10	.11	.47				
5. CGNS	.50	.11	-.36	-.27	-.59	-.49			
6. SEMP	73.25	24.37	-.11	.11	.16	.17	-.27		
7. FEMP	18.11	10.25	.21	.25	.14	.33	-.25	.60	
8. IEMP	18.32	8.34	.20	.16	.31	.21	-.07	.63	.47

Correlations greater than .36 are significant at $p < .05$.
s.d. = standard deviation
Table 8 on page 116 details variable symbols.

Table 16. Descriptive Statistics and Intercorrelations of Strategy Variables for Period III

Period III (1983-1984)
n = 33

Variable	Means	s.d.	1	2	3	4	5	6	7
1. NPCL	1.77	.96							
2. FSNS	.28	.11	.53						
3. SENS	.24	.09	.26	.26					
4. RDNS	.08	.03	.13	.38	.64				
5. CGNS	.53	.12	-.14	-.17	-.61	-.50			
6. SEMP	95.83	49.84	-.01	.15	.26	.27	-.07		
7. FEMP	19.45	9.40	.31	.27	.17	.40	-.50	.49	
8. IEMP	22.16	14.97	.35	.08	.25	.23	-.28	.83	.52

Correlations greater than .34 are significant at $p < .05$.
s.d. = standard deviation
Table 8 on page 116 details variable symbols.

Table 17. Descriptive Statistics and Intercorrelations of Strategy Variables for Period IV

Period IV (1985-1986)
n = 36

Variable	Means	s.d.	1	2	3	4	5	6	7
1. NPCL	1.81	.95							
2. FSNS	.31	.15	.52						
3. SENS	.24	.08	.28	.26					
4. RDNS	.08	.03	.13	.17	.54				
5. CGNS	.55	.16	-.18	-.11	-.44	-.44			
6. SEMP	124.77	75.04	.08	.09	.13	.26	-.08		
7. FEMP	22.58	13.97	.21	.14	.17	.18	-.27	.40	
8. IEMP	22.22	15.48	.21	.23	.19	.19	-.18	.54	.32

Correlations greater than .33 are significant at $p < .05$.
s.d. = standard deviation
Table 8 on page 116 details variable symbols.

Table 18. Descriptive Statistics and Intercorrelations of Strategy Variables for Period V

Period V (1987-1989)
n = 32

Variable	Means	s.d.	1	2	3	4	5	6	7
1. NPCL	2.00	.93							
2. FSNS	.45	.20	.47						
3. SENS	.25	.09	.48	.14					
4. RDNS	.08	.04	.15	.18	.62				
5. CGNS	.54	.14	-.38	-.18	-.72	-.65			
6. SEMP	140.91	68.15	.11	.08	.22	.31	-.09		
7. FEMP	25.82	15.00	.32	.18	.24	.33	-.57	.45	
8. IEMP	25.85	16.49	-.14	.27	.24	.26	-.21	.74	.37

Correlations greater than .34 are significant at $p < .05$.
s.d. = standard deviation
Table 8 on page 116 details variable symbols.

Cluster Analysis

In this study, the procedure used to define strategic groups is based upon the proposition that firms having a similar strategic posture, in terms of the eight key strategy variables, can be clustered as a strategic group. Therefore, a clustering algorithm was used which minimizes the distance (in terms of the key strategy variables) between the group members while it maximizes the distance between those groups. Harrigan (1985) has summarized the application of clustering techniques for strategic group analysis.

In this study, Ward's hierarchical clustering technique was chosen as the basic clustering approach (Anderberg, 1973; Everitt, 1980; Hartigan, 1975). It should be noted that many cluster analysis studies have indicated that Ward's method is among the best hierarchical clustering algorithms (e.g., Milligan, 1980; Punji & Stewart, 1983). In addition, the average linkage and centroid methods were used to test the stability of the clustering structure.

The determination of the appropriate number of clusters is an important problem in this study since one of the major issues involves an explanation of the number of strategic groups which can be found in each stable time period. Unfortunately, there are no satisfactory, clear-cut methods for determining the appropriate number of clusters for any type of cluster analysis (Aldenderfer & Blashfield, 1984; Everitt, 1980). However, a rule-of-thumb for selecting the number of clusters is the "tightness" of the clusters as the algorithm progressively combines groups (e.g., Fiegenbaum & Thomas, 1990; Hambrick, 1983: Harrigan, 1985; Lewis & Thomas, 1990).

In order to determine how many clusters should describe the industry in each stable time period, based on Fiegenbaum and Thomas (1990) two criteria were developed as follows:

1. An additional cluster increases the overall fit by less than 5 percent ($\Delta R^2 \leq 5$ %), and
2. The clusters obtained explain at least 65 percent of the overall variance ($R^2 \geq 65$ %).

Table 19 through Table 21 provide the results of the Ward, average linkage, and centroid methods in terms of R^2. Since the results of these three methods provided similar groupings, only the results of the Ward method are reported and discussed.

Table 19. Results of Cluster Analysis Using Ward Method

(R^2 in cells)

Number of Groups[a]	Time Periods of Stable Strategic Behavior				
	I 1975-80	II 1981-82	III 1983-84	IV 1985-86	V 1987-89
10	.87	.83	.84	.82	.80
9	.84	.81	.81	.80	.77
8	.82	.78	.79	.77	.74
7	.79	.75	.76	.75	.70
6	**.75**	**.71**	.72	.71	**.67**
5	.68	.64	**.68**	**.67**	.62
4	.59	.55	.62	.62	.56
3	.49	.44	.55	.54	.46
2	.29	.24	.32	.34	.30
1	.00	.00	.00	.00	.00

[a] The R^2 reported in a bold number indicates the number of strategic groups for each time period

Table 20. Results of Cluster Analysis Using Average Linkage Method

(R^2 in cells)

Number of Groups[a]	Time Periods of Stable Strategic Behavior				
	I 1975-80	II 1981-82	III 1983-84	IV 1985-86	V 1987-89
10	.85	.82	.82	.78	.80
9	.83	.80	.78	.76	.77
8	.81	.79	.75	.74	.73
7	.77	.74	.74	.72	.69
6	**.72**	**.69**	.70	.70	.67
5	.65	.64	**.67**	**.66**	**.64**
4	.58	.58	.62	.61	.56
3	.50	.49	.56	.50	.46
2	.30	.31	.33	.36	.30
1	.00	.00	.00	.00	.00

[a] The R^2 reported in a bold number indicates the number of strategic groups for each time period

Table 21. Results of Cluster Analysis Using Centroid Method

(R^2 in cells)

Number of Groups[a]	Time Periods of Stable Strategic Behavior				
	I 1975-80	II 1981-82	III 1983-84	IV 1985-86	V 1987-89
10	.85	.82	.79	.76	.79
9	.83	.80	.76	.75	.75
8	.81	.78	.75	.74	.73
7	.77	.74	.72	.72	.70
6	**.72**	**.69**	.70	**.70**	**.67**
5	.65	.64	**.67**	.64	.62
4	.58	.58	.62	.57	.56
3	.50	.49	.56	.50	.46
2	.30	.31	.33	.32	.30
1	.00	.00	.00	.00	.00

[a] The R^2 reported in a bold number indicates the number of strategic groups for each time period

Characteristics of Strategic Groups

Table 22 summarizes the number of strategic groups identified in each one of the five stable time periods. It can be seen that for the first two time periods the number of strategic groups is six, for the next two the number of strategic groups is five, and for the last time period the number of strategic groups is six.

The other statistical methods used to test for the adequacy of the clustering results were the analysis of variance and Scheffe multiple comparison tests. These methods test whether distinct groups exist by examining separately the between-group variability for each of the strategic variables. For each time period, the ANOVA tests and the Scheffe multiple comparison tests were run. The results of these tests are reported in Table 23 to Table 27. One can see that, in each time period, the F values of the statistical tests were significant for most strategic variables at $p < 0.01$. This indicates that the between-group variance was significant relative to the within-group variance, and further supports the existence of distinct strategic groups. However, it should be mentioned that the statistical power is weak because the sample sizes for strategic groups 4, 5, 6 and 7 are small for a parametric statistic.

Table 22. Strategic Groups (SGs) Over Time

Criteria	Time Periods of Stable Strategic Behavior				
	I 1975-80	II 1981-82	III 1983-84	IV 1985-86	V 1987-89
Number of SGs	6	6	5	5	6
Number of new SGs		0	0	0	1
Number of SGs disappeared		0	1	0	0
Net change in number of SGs		0	-1	0	1

Table 23. Characteristics of Strategic Groups for Period I

Variable	Strategic Groups[a] 1	2	3	4	5	6	F[b]	Scheffe Multiple Range Tests[c]
NPCL	2.63 (.45)	1.87 (.43)	1.06 (.15)	1.00	1.00 (.00)	2.10 (1.27)	10.43 ***	1 > 3, 5
FSNS	.39 (.07)	.35 (.09)	.14 (.05)	.57	.33 (.05)	.53 (.02)	17.70 ***	1 > 3, 2 > 3 4 > 3, 6 > 3
SENS	.24 (.06)	.28 (.06)	.19 (.07)	.15	.17 (.01)	.32 (.02)	3.48 *	
RDNS	.06 (.01)	.09 (.01)	.05 (.02)	.04	.13 (.02)	.05 (.01)	14.62 ***	5 > 1, 2, 3, 4, 6 2 > 3
CGNS	.51 (.09)	.42 (.04)	.58 (.06)	.66	.34 (.08)	.33 (.09)	7.10 ***	3 > 2, 5, 6
SEMP	43.00 (3.64)	51.70 (8.08)	48.14 (4.75)	107.91	84.83 (8.26)	55.76 (6.62)	16.17 ***	4 > 1, 2, 3, 6 5 > 1, 2, 3
FEMP	11.29 (4.46)	11.06 (3.21)	10.07 (4.33)	16.61	37.79 (6.19)	27.71 (6.40)	11.81 ***	5 > 1, 2, 3 6 > 1, 2, 3
IEMP	11.92 (1.65)	11.24 (2.15)	12.07 (3.05)	33.97	28.07 (5.12)	6.02 (1.95)	18.94 ***	4 > 1, 2, 3, 6 5 > 1, 2, 3, 6
Number of cases[d]	9	5	6	1	2	2		

[a] Means are shown, with standard deviations in parentheses.
[b] Values are derived from ANOVA analysis (df = 5, 19).
[c] Groups are significantly different ($p < .05$) for Scheffe's test.
[d] n = 25

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 8 on page 116 details variable symbols.

Table 24. Characteristics of Strategic Groups for Period II

Variable	Strategic Groups[a] 1	2	3	4	5	6	F[b]	Scheffe Multiple Range Tests[c]
NPCL	2.55 (.60)	1.57 (.53)	1.00 (.00)	1.00 (.00)	1.25 (.35)	4.00	16.87 ***	1 > 2, 3, 4, 5 6 > 2, 3, 4, 5
FSNS	.36 (.09)	.32 (.08)	.18 (.07)	.37 (.17)	.28 (.10)	.46	4.57 **	1 > 3
SENS	.27 (.05)	.29 (.06)	.17 (.07)	.23 (.01)	.21 (.06)	.32	4.40 **	1 > 3, 2 > 3
RDNS	.07 (.02)	.10 (.02)	.06 (.01)	.06 (.01)	.18 (.01)	.06	24.50 ***	5 > 1, 2, 3, 4, 6 2 > 1, 3
CGNS	.50 (.06)	.45 (.08)	.61 (.08)	.50 (.02)	.35 (.09)	.30	6.48 ***	3 > 2, 5, 6
SEMP	59.72 (3.64)	69.96 (8.08)	68.07 (4.75)	148.03 (8.26)	90.86 (6.62)	88.14	22.12 ***	4 > 1, 2, 3, 5, 6
FEMP	14.65 (4.95)	17.17 (6.70)	14.71 (6.45)	16.52 (9.61)	38.71 (8.47)	48.41	9.06 ***	5 > 1, 2, 3 6 > 1, 2, 3, 4
IEMP	15.12 (1.65)	17.00 (2.15)	16.89 (3.05)	36.38 (5.12)	31.41 (1.95)	8.75	7.30 ***	1 > 5 4 > 1, 2, 3, 6
Number of cases[d]	10	7	8	2	2	1		

[a] Means are shown, with standard deviations in parentheses.
[b] Values are derived from ANOVA analysis (df = 5, 24).
[c] Groups are significantly different ($p < .05$) for Scheffe's test.
[d] n = 30

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 8 on page 116 details variable symbols.

Table 25. Characteristics of Strategic Groups for Period III

Variable	Strategic Groups[a] 1	2	3	4	5	F[b]	Scheffe Multiple Range Tests[c]
NPCL	2.71 (.92)	1.57 (.53)	1.00 (.00)	1.00 (.00)	1.50 (.71)	11.07 ***	1 > 2, 3, 4
FSNS	.33 (.08)	.29 (.08)	.19 (.09)	.20 (.16)	.40 (.07)	4.55 **	1 > 3
SENS	.28 (.07)	.31 (.07)	.15 (.04)	.23 (.07)	.19 (.03)	9.11 ***	2 > 3, 1 > 3
RDNS	.07 (.02)	.10 (.03)	.06 (.02)	.04 (.01)	.15 (.01)	11.12 ***	5 > 1, 3, 4 2 > 3, 4
CGNS	.49 (.08)	.47 (.11)	.64 (.11)	.60 (.09)	.39 (.14)	5.82 **	3 > 1, 2, 5
SEMP	75.88 (14.29)	79.14 (14.78)	82.85 (13.89)	243.33 (13.63)	111.17 (7.12)	93.77 ***	4 > 1, 2, 3, 5
FEMP	18.34 (6.27)	17.15 (6.46)	16.78 (5.48)	21.32 (6.42)	43.35 (6.28)	5.70 **	5 > 1, 2, 3
IEMP	14.99 (3.79)	16.24 (4.78)	21.94 (8.68)	60.02 (11.11)	30.15 (9.78)	19.65 ***	4 > 1, 2, 3, 5
Number of cases[d]	11	8	9	3	2		

[a] Means are shown, with standard deviations in parentheses.
[b] Values are derived from ANOVA analysis (df = 4, 28).
[c] Groups are significantly different ($p < .05$) for Scheffe's test.
[d] n = 33

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 8 on page 116 details variable symbols.

Table 26. Characteristics of Strategic Groups for Period IV

Variable	Strategic Groups[a] 1	2	3	4	5	F[b]	Scheffe Multiple Range Tests[c]
NPCL	2.77 (.98)	1.71 (.76)	1.10 (.21)	1.42 (.49)	1.50 (.71)	8.36 ***	1 > 3, 4
FSNS	.39 (.08)	.34 (.14)	.19 (.12)	.31 (.15)	.33 (.11)	3.47 *	1 > 3
SENS	.28 (.04)	.33 (.05)	.15 (.06)	.25 (.06)	.18 (.04)	14.35 ***	1 > 3, 2 > 3, 5 4 > 3
RDNS	.07 (.02)	.11 (.02)	.07 (.02)	.06 (.02)	.14 (.00)	13.90 ***	5 > 1, 3, 4 2 > 1, 3, 4
CGNS	.53 (.07)	.44 (.09)	.67 (.19)	.58 (.13)	.38 (.17)	4.12 **	3 > 2
SEMP	88.64 (16.97)	100.17 (14.06)	89.86 (19.15)	275.21 (47.81)	132.82 (4.59)	42.53 ***	4 > 1, 2, 3, 5
FEMP	19.97 (12.65)	23.89 (4.23)	21.17 (13.52)	21.37 (14.38)	42.98 (7.09)	1.25	
IEMP	17.46 (3.66)	13.76 (3.48)	18.11 (8.12)	43.08 (16.43)	36.06 (13.56)	6.77 ***	4 > 1, 2, 3
Number of cases[d]	11	7	10	6	2		

[a] Means are shown, with standard deviations in parentheses.
[b] Values are derived from ANOVA analysis (df = 4, 31).
[c] Groups are significantly different ($p < .05$) for Scheffe's test.
[d] n = 36

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 8 on page 116 details variable symbols.

Table 27. Characteristics of Strategic Groups for Period V

Variable	Strategic Groups[a] 1	2	3	4	5	7	F[b]	Scheffe Multiple Range Tests[c]
NPCL	2.97 (.78)	1.72 (.44)	1.13 (.35)	2.00 (.00)	1.50 (.71)	1.67 (.58)	10.12 ***	1 > 2, 3
FSNS	.53 (.13)	.40 (.13)	.29 (.23)	.36 (.05)	.43 (.04)	.75 (.10)	4.59 **	7 > 3
SENS	.31 (.06)	.32 (.06)	.16 (.07)	.24 (.07)	.17 (.01)	.19 (.01)	9.52 ***	1 > 3, 2 > 3
RDNS	.08 (.03)	.12 (.01)	.06 (.03)	.06 (.02)	.15 (.03)	.03 (.01)	9.16 ***	2 > 3, 7 5 > 3, 7
CGNS	.49 (.07)	.41 (.08)	.70 (.09)	.52 (.07)	.39 (.16)	.70 (.05)	13.22 ***	3 > 1, 2, 5 7 > 1, 2, 5
SEMP	108.00 (17.89)	138.13 (22.06)	102.28 (37.34)	335.73 (47.37)	190.87 (48.83)	206.99 (55.00)	23.52 ***	4 > 1, 2, 3, 5, 7 7 > 1, 3
FEMP	25.88 (8.89)	27.41 (9.97)	17.92 (5.70)	42.84 (11.38)	54.13 (4.52)	13.85 (9.34)	4.33 **	5 > 3, 7
IEMP	16.48 (4.04)	19.51 (5.54)	20.50 (11.67)	47.81 (17.10)	43.36 (1.37)	60.85 (9.34)	20.00 ***	4 > 1, 2, 3 5 > 1 7 > 1, 2, 3
Number of cases[d]	9	8	8	2	2	3		

[a] Means are shown, with standard deviations in parentheses.
[b] Values are derived from ANOVA analysis (df = 5, 26).
[c] Groups are significantly different ($p < .05$) for Scheffe's test.
[d] n = 32

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 8 on page 116 details variable symbols.

The cluster analytic assignment of a firm to a group different from that of the prior period, defined a group membership shift. Table 28 shows the group membership for each stable time period and the multivariate analyses of variance (MANOVA) results. Group members are identified for each time period. Most of the firms are located in groups 1, 2, 3, and 4. However, some firms had moved from one group to another over time. Over the study time span (1975-1989), a total of 24 group membership shifts with 19 firms were observed. From the first time period to the second, four firms (Decision Industries, Modular Computer, Qantel, Telex) changed their group membership, and from the second to the third, six firms (Computervision, Datapoint, IBM, Intergraph, MSI Data, Recognition Equipment) shifted their membership. From the third period to the fourth four firms (Datapoint, Data General, Qantel, Recognition Equipment) shifted group membership, and during the last two periods, ten firms (AST Research, Atari, Commodore International, Data General, Datapoint, Hewlett-Packard, Intergraph, Qantel, Tandon, Wang Laboratories) changed membership.

Table 29 shows over the five stable time periods, the trends for the strategic groups based on eight strategy variables. As shown in the table, over the study time span most strategic groups remained relatively stable as measured by their strategic attributes. Until recently, firms in the strategic group 1 maintained relatively stable strategy configurations across the time periods, with an emphasis on differentiation and efficiency at the industry average. However, for the last time period (1987-89), firms in this group moved their competitive position to an emphasis on the marketing differentiation profile. On the other hand, firms in group 2 maintained competitive postures on differentiation over time by emphasizing both marketing and R & D.

Table 28. Strategic Group (SG) Membership

Period I: 1975-1980			F(Wilks) = 11.04 (p = .0001)[a]		
SG1	**SG2**	**SG3**	**SG4**	**SG5**	**SG6**
Computervision	Data General	Dataproducts	Commodore	Amdahl	IBM
Control Data	Datapoint	Decision		Cray	Qantel
DEC	H-P	MSI Data			
NCR	Prime	Modular			
Recognition	Tandem	National			
Sperry		Storage			
Telex					
Unisys[b]					
Wang					
Period II: 1981-1982			**F(Wilks) = 7.29 (p = .0001)**		
SG1	**SG2**	**SG3**	**SG4**	**SG5**	**SG6**
Computervision	Data General	Cipher	Apple	Amdahl	IBM
Control Data	Datapoint	Dataproducts	Commodore	Cray	
Decision	H-P	MSI Data			
DEC	Intergraph	National			
NCR	Modular	Seagate			
Qantel	Prime	Storage			
Recognition	Tandem	Tandon			
Sperry		Telex			
Unisys					
Wang					
Period III: 1983-1984			**F(Wilks) = 10.07 (p = .0001)**		
SG1	**SG2**	**SG3**	**SG4**	**SG5**	
Control Data	Computervision	Cipher	Apple	Amdahl	
Datapoint	Data General	Dataproducts	Commodore	Cray	
Decision	H-P	Intergraph	Compaq		
DEC	Modular	Micropolis			
IBM	Prime	National			
MSI Data	Recognition	Seagate			
NCR	Stratus	Storage			
Qantel	Tandem	Tandon			
Sperry		Telex			
Unisys					
Wang					

Table 28. Strategic Group (SG) Membership (Cont'd)

Period IV: 1985-1986			F(Wilks) = 9.57 (p = .0001)	
SG1	**SG2**	**SG3**	**SG4**	**SG5**
Control Data	Computervision	Cipher	Apple	Amdahl
Data General	Datapoint	Dataproducts	AST Research	Cray
Decision	H-P	Intergraph	Atari	
DEC	Prime	Maxtor	Commodore	
IBM	Stratus	Micropolis	Compaq	
MAI Basic	Sun	National	Qantel	
MSI Data	Tandem	Seagate		
NCR		Storage		
Recognition		Tandon		
Unisys		Telex		
Wang				

Period V: 1987-1989			F(Wilks) = 85.61 (p = .0001)		
SG1	**SG2**	**SG3**	**SG4**	**SG5**	**SG7**
Control Data	Data General	AST Research	Apple	Amdahl	Atari
Datapoint	Intergraph	Cipher	Compaq	Cray	Commodore
DEC	Prime	Dataproducts			Tandon
H-P	Qantel	Maxtor			
IBM	Stratus	Micropolis			
MAI Basic	Sun	National			
NCR	Tandem	Seagate			
Recognition	Wang	Storage			
Unisys					

[a] MANOVA test F-values (Wilks' Lamda) are shown.
[b] Unisys Corp was created by a merger between Burroughs Corp and Sperry Corp in 1986. Prior to this period Burroughs Corp results were used for Unisys Corp.

Table 29. Strategic Attributes of Each Strategic Group (SG)

SG/Periods	NPCL	FSNS	SENS	RDNS	CGNS	SEMP	FEMP	IEMP
SG1								
I (75-80)	+[a] (1)[b]	+ (3)	0 (3)	0 (3)	0 (3)	- (6)	- (4)	0 (4)
II (81-82)	+ (2)	+ (3)	0 (3)	0 (3)	0 (2)	+ (4)	- (6)	- (5)
III (83-84)	+ (1)	+ (2)	0 (2)	0 (3)	0 (3)	- (5)	0 (3)	- (5)
IV (85-86)	+ (1)	+ (1)	0 (2)	0 (3)	0 (3)	- (5)	0 (5)	- (4)
V (87-89)	+ (1)	+ (2)	+ (2)	0 (3)	0 (4)	- (5)	0 (4)	- (6)
SG2								
I (75-80)	0 (3)	0 (4)	+ (2)	+ (2)	- (4)	0 (4)	- (5)	- (5)
II (81-82)	0 (3)	0 (4)	+ (2)	+ (2)	0 (4)	0 (5)	0 (3)	0 (3)
III (83-84)	0 (2)	0 (3)	+ (1)	+ (2)	0 (4)	- (4)	0 (4)	- (4)
IV (85-86)	0 (2)	0 (2)	+ (1)	+ (2)	- (4)	- (3)	0 (2)	- (5)
V (87-89)	0 (3)	0 (4)	+ (1)	+ (2)	- (5)	0 (4)	0 (3)	- (5)
SG3								
I (75-80)	- (4)	- (6)	- (4)	- (5)	+ (2)	0 (5)	- (6)	0 (3)
II (81-82)	- (5)	- (6)	- (6)	- (4)	+ (1)	0 (6)	- (5)	0 (4)
III (83-84)	- (4)	- (5)	- (5)	- (4)	+ (1)	0 (3)	0 (5)	0 (3)
IV (85-86)	- (5)	- (5)	- (5)	- (4)	+ (1)	- (4)	0 (4)	- (3)
V (87-89)	- (6)	- (6)	- (5)	- (4)	+ (1)	- (6)	- (5)	- (4)
SG4								
I (75-80)	- (5)	+ (1)	- (6)	- (6)	+ (1)	+ (1)	0 (3)	+ (1)
II (81-82)	- (5)	+ (2)	0 (4)	- (5)	0 (3)	+ (1)	0 (4)	+ (1)
III (83-84)	- (4)	- (4)	0 (3)	- (5)	0 (2)	+ (1)	0 (2)	+ (1)
IV (85-86)	- (4)	0 (4)	0 (3)	- (5)	0 (2)	+ (1)	0 (3)	+ (1)
V (87-89)	0 (2)	- (5)	0 (3)	- (5)	0 (3)	+ (1)	+ (2)	+ (2)
SG5								
I (75-80)	- (5)	0 (5)	- (5)	+ (1)	- (5)	+ (2)	+ (1)	+ (2)
II (81-82)	- (4)	0 (5)	- (5)	+ (1)	- (5)	+ (2)	+ (2)	+ (2)
III (83-84)	- (3)	+ (1)	- (4)	+ (1)	- (5)	+ (2)	+ (1)	+ (2)
IV (85-86)	- (3)	0 (3)	- (4)	+ (1)	- (5)	0 (2)	+ (1)	+ (2)
V (87-89)	- (5)	0 (3)	- (6)	+ (1)	- (6)	+ (3)	+ (1)	+ (3)
SG6								
I (75-80)	+ (2)	+ (2)	+ (1)	- (4)	- (6)	0 (3)	+ (2)	- (6)
II (81-82)	+ (1)	+ (1)	+ (1)	- (6)	- (6)	+ (3)	+ (1)	- (6)
SG7								
V (87-89)	- (4)	+ (1)	- (4)	- (6)	+ (2)	+ (2)	- (6)	+ (1)

[a] Above (+), below (-) or equal (0) the industry average at p = .15

[b] Ranks among strategic groups in each time period are shown in parentheses.

Table 8 on page 116 details variable symbols.

Firms in group 3 allocated resources below the industry average to achieve both differentiation and efficiency, and focused on a narrow product domain in the computer peripherals segment. Firms in group 4 continued to pursue an efficiency strategy by improving employee productivity. For strategic group 5, firms emphasized innovation differentiation by allocating resources above the industry average to R & D, and also tried to pursue an efficiency strategy by increasing automation. This effort resulted in the highest ratio among strategic groups on fixed assets per employee.

One interesting fact, is that for the last stable time period, group 7 appeared as a new strategic group. Firms focused on a narrow product domain and pursued an efficiency strategy similar to group 4. However, strategic group 7 differed from strategic group 4 in several key strategy attributes. Firms in this group had higher foreign market presence, higher manufacturing costs, and lower investment in fixed assets. This shows that firms in this group depended on outsourcing, or in order words, the purchasing of parts and products from outside sources rather than making them inside the firm. They also had a strong commitment to market their products overseas.

Based on the above analyses, different patterns of strategic groups, and hence competition, emerged over the time span studied in the U.S. computer equipment industry. The four basic groups, that included most of the firms in our sample, do exist throughout the time period and can be identified in Table 28 on page 151. The characteristics of these groups, and patterns of strategic variables over the five stable time periods are discussed in the following section.

Strategic Group 1: Contingency Strategy

The strategy of firms in the first strategic group corresponds to a "contingency" or status quo strategy. Both differentiation and efficiency variables are relatively close to the industry average. The directional strategy attributes over the study span display relatively stable patterns, suggesting that little dramatic changes in strategic behavior were occurring.

Strategic group 1 consisted of relatively large computer manufacturers competing in many market segments with a broad range of products. Firms in this group also had a relatively large foreign market presence. Control Data, Digital Equipment, NCR, and Unisys were included in this group. Capturing about one third of the sample firms, strategic group 1 represents the largest of the strategic groups. This suggests that many larger firms in the U.S. computer equipment industry found strategies that simply adopt industry norms, or react in a like manner to competitor strategies, easier and less risky to formulate and implement. Recently, firms in this group changed their competitive postures by allocating more resources to achieve marketing differentiation.

Strategic Group 2: Differentiation Strategy

Firms making up the second strategic group have developed what may be described as a "differentiation" strategy. On average, these firms display strong commitments to both marketing and innovation differentiation in that both function receive funding above the industry average. On the other hand, firms in this group show relatively weak competitive postures on efficiency. The strong commitments to marketing and R & D suggest that differentiation strategies were used by firms in this group to increase sales through high product visibility and product differentiation and development.

Strategic group 2 included relatively medium-sized firms that represented the industry average level for product class offerings and foreign market activities. Prime Computer, Tandem Computer, Stratus Computer, and Sun Microsystems were typical firms in this group. Accounting for about 20 percent of the sample firms, the characteristics of this strategic group closely resemble Miles and Snow's (1978) prospectors and Porter's (1980) differentiators.

Strategic Group 3: Low Commitment Strategy

The strategy developed by firms in the third strategic group represents a strategy of "low commitment." Firms in this group display weak competitive postures on both differentiation and efficiency. Production costs fell above the industry average while other strategy attributes typically fell below the industry average indicate that little effort was being given to improve the firm's already deficient strategy postures. This indicates that no emphasis was placed on any attributes of differentiation or efficiency.

Strategic group 3 consisted of relatively small firms, and were primarily engaged in the computer peripherals segment. Firms in this group had less foreign market presence. Typical firms included Dataproducts, National Computer Systems, Seagate Technology, and Storage Technology. About 25 percent of the sample firms fall in this strategic group. The strategy characterized by this group appears to correspond with Miles and Snow's (1978) reactors and Porter's (1980) stuck in the middle.

Strategic Group 4: Efficiency Strategy

The strategy developed by firms in the fourth strategic group may be designated an "efficiency" strategy and is characterized by high employee productivity. This group shows the highest mean values on employee productivity and working capital intensity. Below average allocations to R & D, combined with only average marketing allocations, also suggest that less effort was being devoted at product differentiation. In addition, the continued increase in employee productivity and fixed assets intensity indicates a continuing attempt to emphasize more efficiency.

Strategic group 4 consisted of firms with a focused product line, and an almost exclusive emphasis on the microprocessor segment of the industry. Firms in this group had relatively less foreign presence. Apple Computer and Compaq Computer were included in this strategic group. The strategy developed by this strategic group appear to correspond with Miles and Snow's (1978) defenders and Porter's (1980) cost leadership. This group was the most popular among firms that manufactured in personal computers. Less than 10 percent of the sample firms are accounted for this group. Nevertheless, firms in this group demonstrate a clear and consistent emphasis on efficiency.

Three other strategic groups are considered transient groups. The strategy of firms in the fifth strategic group appears as hybrid, combining the characteristics of innovation differentiation with those of efficiency. Firms in group 5 exhibit the highest mean values for R & D and fixed assets intensity, and low value for marketing. In addition, efficiency-related strategy attributes of employee productivity and working capital intensity fall above the industry average, an indication that firms in this group pursued an efficiency strategy. These results show that strategic group 5 followed a hybrid

strategy with respect to innovation differentiation and efficiency. This group consisted of two firms (Amdahl and Cray Research) that focused on a specialized product segment, namely mainframes and supercomputers. This strategic group had a moderate foreign market presence. Throughout the study span, no firm from other strategic groups entered this group. Emphasis on both innovation differentiation and efficiency could be imposed as high mobility barriers by both insiders and outside firms in the industry.

The strategy of firms in the sixth strategic group conforms to a marketing differentiation strategy. Firms in group 6 emphasized marketing differentiation, and exhibit the highest mean value for the marketing function. In addition, a strong commitment to invest in manufacturing facilities is noted by the particularly high values on fixed assets intensity. This group only existed in the first two stable time periods, and included IBM and Qantel. In the mid-1980s this strategic group disappeared.

Finally, the seventh strategic group appeared only in the last time period. Like those in group 4, these firms emphasized efficiency with respect to employee productivity and working capital intensity, and focused on narrow product classes. However, unlike group 4, firms in this group had higher mean values for foreign market presence and lower mean values for fixed assets intensity. Atari, Commodore International, and Tandon were included in this group.

We have identified the five stable time periods during the 1975-1989 time frame in the U.S. computer equipment industry, and also identified the strategic groups in each time period. Now the three measurements used to study the strategic group dynamics will be discussed. They are: measuring contextual factor variables that influence group

membership changes, identifying groups with similar and dissimilar strategic configurations, and identifying certain and uncertain environments.

Contextual Factor Measures

As mentioned in chapter three, the validity and reliability of the contextual factor measures are based primarily on their acceptance based on previous studies. The content validity of the contextual factor measures is a function of their use in organization theory and strategic management studies. Based upon the results of the cluster analysis, we identified 118 firms that existed across the stable time periods. Among these, 24 firm shifts were observed. Table 30 presents means, standard deviations, and intercorrelations of the contextual factor variables for these 118 firms. Although several variables are significantly correlated, correlation magnitudes do not indicate any cause for concern about multicollinearity.

A canonical correlation analysis was performed to identify the possible correlations between clustering variables (eight strategy variables) and contextual factor variables (i.e., size, age, environment, prior performance, and organizational slack). The results indicate that there are no significant correlations between strategy variables and contextual factor variables (F(Wilks' Lambda) = 3.05, p = 0.062) [12]. Thus, a two-group discriminant analysis was performed to test hypothesis 3, using the five stable time periods.

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[12] We also examined the correlations between strategy variables and contextual factor variables for stable time periods, I, III, and V, considering the possible effects of the adjacent time periods. The results also show that there are no significant correlations between strategy variables and contextual factor variables (F = 2.69, p = 0.083).

Table 30. Descriptive Statistics and Intercorrelations of Contextual Factor Variables

n = 118

Variable	Means	s.d.	1	2	3	4
1. SIZE	8.90	1.58				
2. AGE	25.08	24.01	.469			
3. ENV	.07	.08	-.003	.012		
4. PERF	.13	.13	.064	.015	.201	
5. SLAC	1.87	1.07	-.260	-.286	-.037	.097

Correlations greater than .20 are significant at $p < .05$.
Table 8 on page 116 details variable symbols.

Identifying Groups with Similar Strategic Configurations

In this study, we used the Mahalanobis D^2 distance to identify both groups with similar and dissimilar strategic configurations. The Mahalanobis D^2 distance is a generalized squared distance measure based on correlations among strategy variables. We computed the Mahalanobis D^2 distance (the distance of the multivariate group means for eight strategy variables) among strategic groups for each time period, using discriminant analysis. The means of the distances were then computed to classify groups with similar (below-average) and dissimilar (above-average) strategic configurations. The mean Mahalanobis D^2 distances of groups with similar strategic configurations for each stable time period are: 48.07, 48.36, 58.64, 53.90, and 47.10. On the other hand, the mean distances of groups with dissimilar strategic configurations are: 118.91, 116.87, 133.12, 116.53, and 120.31. The results show that there are clear differences in strategic distances among strategic groups over time. Strategic groups (SG) with similar strategic configurations are: SG1 - SG2, SG1 - SG3, SG1 - SG6, SG2 - SG5, SG2 - SG6, and SG4 - SG7. Thus, we considered group membership shifts among these strategic groups to be among similar strategic groups.

Identifying Certain and Uncertain Environment

Uncertainty is typically operationalized by using variance measures (Dess & Beard, 1984). Following Tushman and Anderson (1986), we measured uncertainty in terms of forecasting error - the ability of industry analysts to predict industry outcomes. This

data was collected from the *U.S. Industrial Outlook* and *Predicasts Forecasts.* Published one-year demand-growth forecasts were collected and compared to actual historical results. To measure environmental uncertainty, the mean forecast error for each stable time period was computed. The results show that periods II (1981-1982) and V (1987-1989) had relatively low forecasting errors: 5.52 percent and 5.92 percent respectively. On the other hand, periods III (1983-1984) and IV (1985-1986) had relatively high forecasting errors: 23.29 percent and 39.01 percent respectively. Consequently, we classified periods II and V as having relatively certain environments and periods III and IV as having more uncertain environments.

Hypotheses Testing

Chapter II outlined the hypotheses that were developed for the empirical tests performed. The theoretical foundations of these hypotheses were also identified and established. Based on the identification of time periods of stable strategic behavior and the strategic groups in each time period, several series of statistical tests were performed. A discussion of the individual hypothesis testing results follows.

Test of Hypothesis 1

H1. **Firms will remain in the same strategic group over time.**

In order to test this hypothesis, the shifts in each group membership over five stable time periods were calculated. Then, transition probabilities were computed. Four basic strategic groups existed during the period 1975-1989. These groups had an identifiable and consistent strategy in terms of the vector of strategic dimensions. Each was given a descriptive label, namely the contingency group (SG1), the differentiation group (SG2), the low commitment group (SG3), and the efficiency group (SG4).

Two other strategic groups also existed for short time periods and these two groups were identified as the transient group. An exception, though, is a group (SG5) in which no firm moved and only two firms existed over the study span. Thus, we included this group as one of the transient groups. As mentioned earlier, firms in the transient group moved around the four basic strategic groups and represent the "gene pool," (McKelvey, 1982) a collection of firms which can interbreed. In addition, firms in the transient

group may provide clues to entry paths with respect to the stable group positions. We then define the transient group as a state of the Markov chain. Hence, the four basic groups and the transient group represent the five states of the Markov chain. We use the terms state and strategic group interchangeably.

The results of the transition matrix are described in Table 31. The transition matrix shows that the transition probabilities for the five states revealed a high probability (ranging from 0.67 to 0.84) of remaining in their states over time. The transition matrix indicates that, in the U.S. computer equipment industry, there existed a relatively stable industry structure over the time periods of the study. Further, using multiple-iteration matrix we examined whether the competitive environment will reach a steady state over time. The 20-step transition matrix (P^{20}) and the 30-step transition matrix (P^{30}) are presented in Table 32. The matrices show little difference in the transition probabilities in each strategic group, and thus suggest a stable long-run industry structure.

In summary, the matrix evidence confirms the validity of hypothesis 1. There was a low level of firm movement among strategic groups and clear evidence of the temporal stability of the group structure. This suggests that strategic groups are a relatively stable element of market structure. A chi-square test was also used to examine the frequency of firm movement (Anderson & Goodman, 1957; Hoel, Port, & Stone, 1972). As expected, the test confirmed hypothesis 1 by showing that firms remain in the same strategic group over time ($\chi^2 = 264.35$, $p < .0001$).

Table 31. The Transition Matrix of Strategic Groups[a]

From \ To	SG1	SG2	SG3	SG4	TG[b]
SG1	0.816	0.132	0.026	0.026	0.000
SG2	0.200	0.760	0.040	0.000	0.000
SG3	0.063	0.063	0.843	0.000	0.031
SG4	0.000	0.083	0.083	0.667	0.167
TG	0.182	0.000	0.000	0.000	0.818

[a] Chi-square statistic = 264.35 ($p < .0001$)
Sample size = 118

[b] TG = the transient group

Table 32. 20-step and 30-step Transition Probabilities Matrices

20-step Transition Matrix (P^{20})

State	SG1	SG2	SG3	SG4	TG[a]
SG1	0.442	0.300	0.166	0.035	0.058
SG2	0.441	0.301	0.167	0.035	0.057
SG3	0.434	0.292	0.177	0.033	0.064
SG4	0.442	0.291	0.160	0.034	0.073
TG	0.447	0.294	0.153	0.035	0.070

30-step Transition Matrix (P^{30})

State	SG1	SG2	SG3	SG4	TG
SG1	0.441	0.298	0.167	0.034	0.060
SG2	0.440	0.298	0.167	0.034	0.060
SG3	0.440	0.297	0.168	0.034	0.061
SG4	0.441	0.297	0.166	0.034	0.061
TG	0.442	0.298	0.165	0.035	0.061

[a] TG = the transient group

Test of Hypothesis 2

***H2.* The level of firm movement will be higher between strategic groups with similar strategic configurations than between groups with dissimilar strategic configurations.**

Hypotheses 2 suggests that rates of mobility would be higher between groups with similar strategic configurations, rather than between groups with dissimilar strategic configurations. Before testing this hypothesis, the classification of groups with similar and groups with dissimilar strategic configurations, using Mahalanobis D^2, was made. To examine this hypothesis, a chi-square test was used to compare the mobility rate between groups with similar strategic configurations versus the mobility rate between groups with dissimilar strategic configurations.

Observations over each stable time period confirmed that each firm was either a member of the same strategic group as in the prior stable time period or a member of another group. Thus, at most there could be one shift per stable time period per firm, though there was more than one group into which a firm could move. There were 17 $(3+5+3+6)$ shifts between groups with similar strategic configurations out of a maximum observable 118 $(25+30+31+32)$ shifts, yielding a mobility rate of 0.144. In contrast, there were 7 $(1+1+1+4)$ shifts out of 118, between groups with less similar strategic configurations, yielding a mobility rate of 0.076.

Table 33 shows that the mobility rate between groups with relatively similar strategic configurations was significantly higher than that between groups with less similar ($\chi^2 = 4.17$, $p < .05$). Thus, hypothesis 2 was supported.

Table 33. Group Membership Changes

Time Period	Similar Membership Change	Dissimilar Membership Change	Possible Membership Changes
I (75-80) - II (81-82)	3[a] (.120)[b]	1 (.040)	25
II (81-82) - III(83-84)	5 (.167)	1 (.033)	30
III(83-84) - IV(85-86)	3 (.097)	1 (.032)	31
IV(86-86) - V (87-89)	6 (.188)	4 (.125)	32
Total[c]	17 (.144)	7 (.076)	118

[a] Actual membership changes
[b] Mobility rates are shown in parentheses.
[c] Chi-square statistic = 4.17 ($p < .05$).

Test of Hypothesis 3

H3. **Firms that change strategic group membership will have different contextual characteristics (i.e., size, age, environment, prior performance, and organizational slack) than firms that do not change group membership.**

A two-group discriminant analysis was used to test for statistically significant differences in the contextual characteristics (i.e., size, age, environment, prior performance, and organizational slack) of firms that changed or did not change group membership. The results of the discriminant analysis are summarized in Table 34 and Table 35.

Table 35 profiles the two groups of firms (those that changed group membership and those that did not) by presenting their respective group means for each independent variable and for the group's centroids. The two groups' centroids, the combined means of five variables, were significantly different ($p < .05$), as were three of the independent variables: prior performance ($p < .01$), environment ($p < .05$), and size ($p < .05$). The differences in group means for age ($p = .34$) and organizational slack ($p = .28$) were not statistically significant. To summarize, the two groups of firms have significant differences in the contextual factors that motivate group membership changes. Thus, hypothesis 3 was supported[13].

This issue can be examined further, again with the help of Table 34. The bottom of the table shows the standardized discriminant function coefficients of discriminating variables. The absolute magnitudes reflect their relative importance and these

[13] We also obtained the group centroids for stable time periods I, III, and V, considering the possible adjacent time period's effects. The results showed that two groups were significantly different in groups' centroids ($p < .05$), thus reinforcing support for the hypothesis.

Table 34. Results of Discriminant Analysis for Grouping

Criteria	Results
Group sizes	
Number of firms that changed membership	24
Number of firms that did not change membership	94
Significance level of the linear discriminant function	.01
Assumption of equality of group dispersion matrices	Valid (n.s.)
Percent classified accurately by linear classification rule	
Group 1 (No-change)	81.9
Group 2 (Change)	91.7
Overall	83.9
Percent accuracy of chance model based on sample group prior probabilities	68.0
Standard discriminant function coefficients	
Size	.54
Age	.24
Environment	.57
Prior performance	.72
Organizational slack	.28

n.s. = not significant

Table 35. Discriminant Analysis: Standardized Group Means

Variable	Firms Changing Group Membership	Firms Not Changing Membership	p[b]
Size	-.312[a]	.080	.046
Age	-.174	.044	.343
Environment	-.333	.085	.023
Performance	-.517	.132	.005
Slack	-.197	.050	.281
Group centroids	-.716	.183	.014[c]

[a] Standardized means are shown.
[b] p-values refer to univariate F-ratios.
[c] Multivariate statistic (Wilks' Lambda) is shown.

magnitudes are considered to be analogous to the beta weights in a regression model (Klecka, 1980). As a rule of thumb, it is suggested that coefficients$\geq$0.30 be treated as meaningful (Pedhazur, 1982). The results of the discriminant function coefficients indicate that the independent variable of prior performance was the strongest contributor to the overall discriminant function, and environmental scarcity and size were the second and the third, respectively.

Equality of group sizes is an important consideration in interpreting bias in discriminant analysis (Morrison, 1969). Because the grouping procedure used in this study yielded unequal groups (24 versus 94), we compared the classification accuracy of the discriminant function with the chance model. As can be seen in Table 34, approximately 84 percent of the cases were correctly classified which compares favorable to the 68 percent expected accuracy of the corresponding chance model. This represents approximately a 16 percent increase in predictability. Thus, the results of the discriminant analysis suggest that the predictor variables did discriminate well.

Test of Hypothesis 4

H4a. **The level of performance between strategic groups will be significantly different.**

In order to test this hypothesis, two dimensions of firm performance were examined; efficiency and growth. The efficiency dimension was measured by return on assets (ROA) and return on equity (ROE). The growth dimension involves the measure of sales growth (SGR). Risk-adjusted performance measures were also included to test this hypothesis.

A one-way analysis of variance (ANOVA) test was performed separately for each one of the six performance measures for each stable time period, in order to test whether average performance levels differ among strategic groups. As Table 36 indicates, there was no consistent evidence that any performance measures were significantly different among strategic groups in each one of the five stable time periods. In the second and fifth time periods, there were significant differences of ROA and ROE among the strategic groups ($p < .05$). However, when observed over the study span of five time periods, only 9 out of 30 cases were significantly different in performance among the groups. Further, when we considered risk-adjusted performance measures among 15 cases, only three cases were significantly different among strategic groups. Thus, based on the results of the ANOVA test, hypothesis 4a must be rejected.

Table 36. Summary of Strategic Groups and Performance Relationship

Period	ROA	ROE	SGR
Performance			
I (75-80)	2.68[a]	1.79	3.83 *
II (81-82)	2.86 *	3.01 *	1.46
III (83-84)	.52	.36	3.36 *
IV (85-86)	.63	.26	.21
V (87-89)	4.73 **	3.60 *	2.40
Risk-adjusted Performance			
I (75-80)	1.81	1.87	4.57 **
II (81-82)	4.49 **	.49	1.41
III (83-84)	.60	.38	.42
IV (85-86)	1.15	.39	1.40
V (87-89)	3.34 *	1.08	.55

[a] ANOVA F-values are shown.
ROA = return on assets
ROE = return on equity
SGR = sales growth
* $p < .05$
** $p < .01$

H4b. **Strategic group effects will outweigh individual firm effects within the strategic group when accounting for performance differences between strategic groups.**

In order to test this hypothesis, the within and between analysis (WABA) suggested by Dansereau, Alutto, and Yammarino (1984) was used, to examine the possible relationship of the between-group and within-group effects on performance. As mentioned in chapter III, Dansereau et al. (1984) have rewritten the covariance theorem so as to isolate, on the left-hand side of equation (1), the individual-level correlation of x and y on the basis of unadjusted scores, as follows:

$$r_{xy,T} = \eta_{x,B}\eta_{y,B}r_{xy,B} + \eta_{x,W}\eta_{y,W}r_{xy,W} \quad (1)$$

where
$r_{xy,T}$ = total individual level correlation of x and y
$\eta_{x,B}$ = between-eta correlation of variable x
$\eta_{y,B}$ = between-eta correlation of variable y
$r_{xy,B}$ = between-group correlation of x and y
$\eta_{x,W}$ = within-eta correlation of variable x
$\eta_{y,W}$ = within-eta correlation of variable y
$r_{xy,W}$ = within-group correlation of x and y

In an analysis of variance, the purpose of the one-way analysis of variance is to calculate the relationship between a categorical independent variable (x) and a dependent variable (y). Consequently, groups are formed by values taken on by at least one independent variable (e.g., 0, 1). As a result of this construction of groups, an independent variable x varies only between groups and not within groups; thus $\eta_{x,W} = 0$ and $\eta_{x,B} = 1$. An eta (η) correlation represents the degree of association between the raw score form of a variable and either the between-group or within-group form. In addition, a within-group correlation of a dependent variable with an independent variable must equal zero ($r_{xy,W} = 0$). By substitution, it can be summarized by the following equation:

$$r_{xy,T} = (1)(\eta_{y,B})(r_{xy,B}) + (0)(\eta_{y,W})(0) \quad (2)$$

As should be apparent from equation (2), between-group deviation scores determine the total correlation ($r_{xy,T}$). Since between-group deviation scores are based on averages, the analysis of variance is typically described in terms of a test of the difference between means.

It is clear from the above discussion that, in the analysis of variance, the F-ratio can be viewed as a test of the significance of the between-eta correlation ($\eta_{y,B}$). Since the within-eta correlation ($\eta_{y,W}$) represents the correlation of a dependent variable with itself, it represents error in the analysis of variance. In contrast, in the use of the within and between analysis (WABA), within-group deviations may be valid. In the WABA approach, a larger eta correlation defines which type of deviation (within or between) should be viewed as error or not error, based upon a test of practical significance (i.e., E ratio). To test the statistical significance between a between-eta correlation and a within-eta correlation, the F-ratio was employed (Dansereau et al., 1984: 125).

Table 37 shows η_B, η_W, and F-ratio. The η_B (between-eta correlation) is the correlation of total deviation with between-group deviation on performance, and η_W (within-eta correlation) is the correlation of total deviation with within-group deviation on performance. As the table indicates, over the five time periods, all within-group eta correlations for all performance measures (i.e., ROA, ROE, SGR, risk-adjusted ROA, risk-adjusted ROE, and risk-adjusted SGR) were higher than the between-group eta correlations, except for one (SGR in period I). In addition, 20 out of 30 cases showed that within-group eta correlations were significantly higher than between-group eta

correlations ($p < .05$). From this analysis, it appears that individual firm effects within the strategic group are significantly greater than those of strategic groups when explaining firms' performance differences. Thus, we concluded that hypothesis 4b was rejected.

Table 37. Summary of WABA Analysis on Performance

Period	ROA			ROE			SGR		
	η_B^a	η_W^b	F-ratio	η_B	η_W	F-ratio	η_B	η_W	F-ratio
Performance									
I (75-80)	.14	.77	7.96 *	.17	.82	6.12 *	.71	.71	.26
II (81-82)	.61	.79	.35	.62	.78	.33	.18	.88	4.98 *
III (83-84)	.06	.97	37.34 **	.12	.97	9.33 *	.57	.82	.30
IV (85-86)	.17	.96	4.11 *	.15	.98	5.51 *	.16	.99	4.94 *
V (87-89)	.64	.77	.28	.61	.79	.32	.11	.86	11.75 **
Risk-adjusted Performance									
I (75-80)	.17	.82	6.12 *	.17	.82	6.12 *	.74	.77	.22
II (81-82)	.70	.72	.22	.10	.95	18.80 **	.11	.87	13.03 **
III (83-84)	.09	.96	16.25 **	.14	.97	6.86 *	.25	.97	2.15
IV (85-86)	.16	.93	4.36 *	.12	.98	8.61 *	.12	.91	7.42 *
V (87-89)	.61	.79	.32	.15	.94	7.55 *	.19	.96	4.91 *

[a] η_B = between-eta correlation
[b] η_W = within-eta correlation
ROA = return on assets
ROE = return on equity
SGR = sales growth
* $p < .05$
** $p < .01$

Test of Hypothesis 5

H5. **The performance of firms after they change group membership will be better than the performance of the same firms before they change membership.**

In hypothesis 5, the relationship between performance and strategic change was considered. The performance of firms after they changed their group membership was compared to the performance of the same firms before they changed membership. To test this hypothesis, the mean performances before and after group membership changes were compared, using a one-tailed t-test. Specifically, six different t-tests were run with the six different performance measures as dependent variables, and strategic change (before versus after) as the independent variable.

As hypothesized, after changing group membership, firms significantly improved their performance. As reported in Table 38, after changing group membership, firms had significantly higher levels of all performance measures than they had before changing membership ($p < .05$), except for a sales growth (SGR) measure ($p = .12$). However, even considering risk-adjusted sales growth, firms showed significant performance improvement after they changed membership.

It was also necessary to compare the performance of firms that changed group membership with firms that did not change membership, to assess whether firms that changed group membership improved their performance with respect to firms that did not change membership. Further, it was recognized that differences in performance between these two groups might be influenced by initial differences in the prior performance of firms. If an analysis of variance (or a t-test) is conducted without considering these initial differences, the results may be biased. Thus, an analysis of

Table 38. Performance Comparison Before and After Changing Membership

Variable[a]	Group	n	Means	Standard Deviation	t-value	p	Hypothesis Supported
Performance							
ROA	Before	24	.059	.095			
	After	24	.118	.094	-2.18	.017	Yes
ROE	Before	24	.085	.236			
	After	24	.218	.187	-2.16	.018	Yes
SGR	Before	24	.085	.201			
	After	24	.155	.201	-1.21	.117	No
Risk-adjusted Performance							
ROA	Before	24	3.154	4.303			
	After	24	7.065	9.664	-1.81	.039	Yes
ROE	Before	24	2.742	3.821			
	After	24	7.799	8.451	-2.67	.006	Yes
SGR	Before	24	1.060	2.027			
	After	24	3.458	4.498	-2.38	.012	Yes

[a] ROA = return on assets
ROE = return on equity
SGR = sales growth

covariance was included to remove this possible bias. The analysis of covariance provides a means to statistically adjust the performance variable for these preexisting differences.

A 2 x 7 x 4 factorial analysis of covariance with prior performance as the covariate, was applied to assess the adjusted performance means of firms that changed group membership (Change group) and firms that did not change membership (No-change group). Prior to using the covariance analysis, a test was performed on the assumption of homogeneous regression coefficients. This test indicated that three risk-adjusted performance measures (i.e., risk-adjusted ROA, ROE and SGR) violated the assumption of homogeneity of regression. When a regression coefficient is found to be heterogeneous, the analysis of covariance should not be used (Pedhazur, 1982). Thus, we examined the performance differences using three performance measures (ROA, ROE, SGR).

Table 39 through Table 41 show the results of the performance comparison of the Change group and No-change group, using the adjusted means for the covariate. For the return on assets (ROA) and return on equity (ROE) measures, the change group had significantly higher levels of performance than those of the no-change group ($p < .05$). However, the result of the sales growth (SGR) measure shows that there were no significant differences between two groups ($p = .17$). The analysis of covariance revealed that the main effect of change on sales growth was not statistically significant since the effect was captured in the interaction term with the stable time period factor ($F = 2.95$, $p < .05$). From this analysis, it appears that the influence of change on sales growth is moderated by the stable time period factor. Based on the above discussion, we concluded that hypothesis 5 was supported, except for a sales growth measure.

Table 39. Summary of the Analysis of Covariance for ROA

Analysis of Covariance

Dependent Variable: ROA $n = 118$

Analysis of Covariance

Source[a]	df	Adjusted[b] Sum of Squares	Adjusted Mean Square	F-ratio	p
Covariate	1	.122	.122	12.20	.001
Change	1	.039	.039	3.85	.053
SG	6	.112	.019	1.93	.084
Time	3	.058	.019	1.93	.131
Change*SG	3	.047	.016	1.58	.200
Change*Time	3	.054	.018	1.81	.152
SG*Time	12	.070	.006	.58	.852
Change*SG*Time	4	.009	.002	.22	.929
Error	83	.830	.010		

Performance Comparison

Group[c]	n	Adjusted Means	Adjusted Std Err	t-value	p
Change	24	.160	.024		
No-change	94	.113	.011	1.96	.026

[a] Covariate = prior performance
Change = change and no-change group factor
SG = strategic group factor
Time = time period factor
Change*SG = Change and SG interaction
Change*Time = Change and Time interaction
SG*Time = SG and Time interaction
Change*SG*Time = Change, SG, and Time interaction

[b] Means adjusted for the covariate

[c] Change = firms that changed group membership
No-change = firms that did not change membership

Table 40. Summary of the Analysis of Covariance for ROE

Analysis of Covariance

Dependent Variable: ROE $n = 118$

Analysis of Covariance

Source[a]	df	Adjusted[b] Sum of Squares	Adjusted Mean Square	F-ratio	p
Covariate	1	.374	.374	8.70	.004
Change	1	.177	.177	4.08	.047
SG	6	.299	.050	1.15	.343
Time	3	.213	.071	1.63	.188
Change*SG	3	.104	.035	.79	.500
Change*Time	3	.188	.063	1.44	.236
SG*Time	12	.452	.038	.87	.584
Change*SG*Time	4	.064	.016	.37	.829
Error	83	3.617	.043		

Performance Comparison

Group[c]	n	Adjusted Means	Adjusted Std Err	t-value	p
Change	24	.284	.036		
No-change	94	.212	.016	2.02	.023

[a] Covariate = prior performance
Change = change and no-change group factor
SG = strategic group factor
Time = time period factor
Change*SG = Change and SG interaction
Change*Time = Change and Time interaction
SG*Time = SG and Time interaction
Change*SG*Time = Change, SG, and Time interaction

[b] Means adjusted for the covariate

[c] Change = firms that changed group membership
No-change = firms that did not change membership

Table 41. Summary of the Analysis of Covariance for Sales Growth

Analysis of Covariance

Dependent Variable: Sales Growth $n = 118$

Analysis of Covariance

Source[a]	df	Adjusted[b] Sum of Squares	Adjusted Mean Square	F-ratio	p
Covariate	1	.837	.837	20.80	.0001
Change	1	.039	.039	.96	.330
SG	6	.406	.068	1.68	.135
Time	3	.371	.124	3.07	.032
Change*SG	3	.150	.050	1.25	.299
Change*Time	3	.354	.118	2.95	.039
SG*Time	12	.929	.077	1.92	.043
Change*SG*Time	4	.167	.042	1.04	.394
Error	83	3.346	.040		

Performance Comparison

Group[c]	n	Adjusted Means	Adjusted Std Err	t-value	p
Change	24	.227	.022		
No-change	94	.235	.007	-.98	.165

[a] Covariate = prior performance
Change = change and no-change group factor
SG = strategic group factor
Time = time period factor
Change*SG = Change and SG interaction
Change*Time = Change and Time interaction
SG*Time = SG and Time interaction
Change*SG*Time = Change, SG, and Time interaction

[b] Means adjusted for the covariate

[c] Change = firms that changed group membership
No-change = firms that did not change membership

Test of Hypothesis 6

H6a. **Among firms that move into an uncertain environment by changing group membership, those that move into groups characterized by similar strategic configurations will be more profitable than those that move into groups characterized by dissimilar strategic configurations.**

H6b. **Among firms that move into a certain environment by changing group membership, those that move into groups characterized by dissimilar strategic configurations will be more profitable than those that move into groups characterized by similar strategic configurations.**

The final phase of this study focused on the relationships among the magnitude of change in group membership, environmental uncertainty, and performance. To study these relationships, we obtained a measure (forecasting error) that categorized environmental uncertainty for each stable time period, as mentioned previously. Periods II (81-82) and V (87-89) were considered the certain environments, and periods III (83-84) and IV (85-86) as the uncertain environments. Using the means of the Mahalanobis D^2 distance, we then classified firms that changed membership by moving into groups characterized by either similar or dissimilar strategic configurations. As shown Table 33 on page 168, firms in each category are:

	Similar Membership Change	**Dissimilar Membership Change**
Certain environment	9	5
Uncertain environment	8	2

When firms move into an uncertain environment, firms that changed group membership between groups with similar and dissimilar strategic configurations were eight and two firms, respectively. With these small sample sizes, we could not examine statistically and meaningfully hypothesis 6a. Consequently, we dropped the test for hypothesis 6a.

Since the assumptions of homogeneity of variance and normality in performance variables were violated, and sample sizes (i.e., five and nine) were unequal, therefore a parametric analysis of variance (ANOVA), or t-test, could not be performed. Thus, its nonparametric counter-part, a Kruskal-Wallis one-way analysis of variance, was applied to test hypothesis 6b (Hollander & Wolfe, 1973; Siegel, 1956). The Kruskal-Wallis ANOVA test is identical to a Wilcoxon rank-sum test for two group comparison.

Table 42 indicates that firms that move into groups characterized by dissimilar strategic configurations exhibited significantly higher levels of all performance measures ($p < .05$), except for return on equity ($p = .88$), than those of firms that move into groups characterized by similar strategic configurations. Thus, hypothesis 6b was supported.

Table 42. Results of Kruskal-Wallis Test on Performance Differences

Variable	Magnitude of Change	No. of Firms	F-value	p	Hypothesis Supported
Performance					
ROA	Similar	9			
	Dissimilar	5	4.84	.048	Yes
ROE	Similar	9			
	Dissimilar	5	.02	.879	No
SGR	Similar	9			
	Dissimilar	5	5.76	.034	Yes
Risk-adjusted Performance					
ROA	Similar	9			
	Dissimilar	5	5.87	.032	Yes
ROE	Similar	9			
	Dissimilar	5	8.65	.012	Yes
SGR	Similar	9			
	Dissimilar	5	7.13	.020	Yes

ROA = return on assets
ROE = return on equity
SGR = sales growth

Summary

This chapter has presented a profile of the sample firms as well as descriptive statistics pertaining to these firms. Statistical tests that were used to examine the relationships among the variables studied were presented and discussed. The results of these hypotheses were summarized in Table 43. The next chapter provides a basic assessment of the findings presented in this chapter, and suggests direction for future research.

Table 43. Summary of Study Results

	Hypotheses	Conclusion
H1.	Firms will remain in the same strategic group over time.	Accept
H2.	The level of firm movement will be higher between strategic groups with similar strategic configurations than between groups with dissimilar strategic configurations.	Accept
H3.	Firms that change strategic group membership will have different contextual characteristics (i.e., size, age, environment, prior performance, organizational slack) than firms that do not change group membership.	Accept
H4a.	The level of performance between strategic groups will be significantly different.	Reject
H4b.	Strategic group effects will outweigh individual firm effects within the strategic group when accounting for performance differences between strategic groups.	Reject
H5.	The performance of firms after they change group membership will be better than the performance of the same firms before they change membership.	Accept[a]
H6b.	Among firms that move into a certain environment by changing group membership, those that move into groups characterized by dissimilar strategic configurations will be more profitable than those that move into groups characterized by similar strategic configurations.	Accept

[a] Hypothesis 5 was supported in terms of return on assets and return on equity, but not in terms of sales growth.

Chapter V: Discussion and Conclusions

Introduction

This study was devoted to the dynamic perspectives of strategic groups and performance implications. As indicated in chapter II, previous research efforts have largely been limited to the relatively theory-free examination of the strategic group phenomenon. In this study, the theoretical and empirical knowledge gained from previous research was combined to develop a more theoretical framework. In this chapter, the results of the hypothesis tests are discussed and incorporated into the existing framework of strategic group theory. Then the practical implications of the research findings are outlined. Finally, the contributions and the limitations of this study are presented, and suggestions for future research in this area are provided.

Major Conclusions

The Dynamics of Strategic Groups

Based on the results of the hypothesis tests on the strategic group dynamics, reported in detail in chapter IV, the important conclusions can be stated as follows:

1. Firms remain in the same strategic group over time and strategic groups are a relatively stable part of the competitive structure in an industry.

2. The mobility rate is higher between strategic groups with similar strategic configurations than between groups with dissimilar strategic configurations.

3. Firms that change strategic group membership have different contextual factors than firms that do not change group membership.

Based on the empirical findings of strategic group dynamics, several points can be made. First, the methodological procedure identified five stable time periods over a 15-year period in the U.S. computer equipment industry. It appears that the time spans of stable time periods in the 1980s were relatively short (2-3 years), compared to the period I (6 years). The rapid advancement in computer technology, continued creation of new product markets, change in customer needs, and environmental change such as the industry recession of 1985-1986, tended to create a turbulent competitive environment in the industry. Consequently, firms found it necessary to change their strategy postures to meet the changing environment of the industry.

Second, the study revealed five to six strategic groups over the five stable time periods, and four basic groups (i.e., contingency, differentiation, low commitment, and efficiency groups) were shown to exist over the entire 15-year period. In addition, concerning hypothesis 1, it is found that firms remain in the same strategic group over time. This suggests that strategic groups are a relatively stable characteristic of industry structure and are more than simply an analytical convenience for researchers in strategic management (Hatten & Hatten, 1987).

Third, consistent with the findings of Mascarenhas (1989) and Oster (1982), the mobility of firms was higher between groups with similar strategic group configurations. The relative similarity of strategies between strategic groups is related to the mobility barriers that firms need to overcome in order to move between groups. Movement into these similar groups requires overcoming relatively few barriers. Few current studies on strategic groups have examined the reasons for firm movement and group change. In order to explore this question further, it is necessary to build a grounded theory of strategic group change incorporating rich descriptions of environmental change, as well as relevant firm-specific characteristics.

Fourth, the findings support hypothesis 3 that firms that change group membership have different contextual characteristics than firms that do not change membership. The analysis also reveals that prior performance, environmental scarcity, and organizational size are important contextual factors that motivate group membership changes. Although the results do not support the contention that inertia increases monotonically with age (Hannan & Freeman, 1984; Kelly & Amburgey, 1991), the study also does not provide evidence to the contrary. This puzzle may occur because of the evolutionary stages of the industry. During the study span, the U.S. computer equipment industry consisted of sub-industries, including emerging (i.e., personal computers, workstations,

and storage peripherals) and mature (i.e., mainframes) industry segments with different industry life cycles. In addition, many new firms entered into the industry. These factors may contribute to the failure to identify the effects of organizational age on group membership changes. To summarize, the findings of hypothesis 3 support an integrative approach of the population ecology and adaptation perspectives to the study of the contextual factors influencing group membership changes. The integrated model provides a good fit for the data. The results suggest the complementarity of the two perspectives with respect to contextual factors that motivate group membership changes.

The Performance Implications of Strategic Groups

The findings from the empirical results of the performance implications of strategic groups are:

1. No significant difference was found in performance among strategic groups over time.

2. Considering the relative importance of strategic group and individual firm effects on performance differences, individual firm effects contribute more to explaining the performance differences among strategic groups.

3. Firms, after they change group membership, perform better than the same firms before they change membership, in terms of profitability (ROA and ROE), but not in terms of sales growth.

4. Among firms that move into a certain environment by changing group membership, those that move into groups characterized by dissimilar strategic configurations perform better than those that move into groups characterized by similar strategic configurations.

The results of hypotheses 4a and 4b do not support the performance differences among strategic groups and the importance of strategic group effects in explaining performance differences. Contrary to the basic argument that strategic groups are characterized by performance differences (Porter, 1979), we found no consistent evidence of performance differences among strategic groups over time. This finding is consistent with the findings of recent strategic group studies such as Cool and Schendel (1987, 1988) and Lewis and Thomas (1988). The results of this study on performance differences support the perspective that different strategic types may exhibit similar levels of performance in a single industry context (Miles & Snow). Different competitive postures may require the use of distinctive competitive advantages (Porter, 1980). Thus, strategic groups occupying different competitive postures may be equally viable. Consequently, strategic groups enjoy similar levels of performance.

In addition, this study found that individual firm-specific effects are more important than strategic group effects in explaining the performance differences among strategic groups. Recent conceptual developments in entrepreneurship suggest that idiosyncratic firm strategy and structure (i.e., dimensions not shared with other group members) may significantly affect the firm's performance. Rumelt (1987) argues that strategies that are differentiated and difficult to imitate are the key to a firm's chances to earn above-normal profits.

Further, the resource-based model of strategic management also argues for a firm's unique resource position to influence performance (Barney, 1986; Wernerfelt, 1984). For example, Wernerfelt (1984) argues that a firm's capabilities consist of resources with which a firm can support its competitive postures and respond to environmental changes. A fit between a firm's strategy and capabilities results in effective strategy implementation, and thus higher performance. The closer a strategic group's strategy matches an individual member's existing capabilities, the greater are the chances for successful strategy implementation and higher performance. Recently, Lawless, Bergh, and Wilsted (1989) also propose that individual firm capabilities, which reflect capacity to implement or change strategy, moderate the effect of group members' shared strategy characteristics on performance.

Based on the findings of this study, it can be argued that the importance of strategic group membership on performance should be weighed against each member's unique capabilities, and the firm may be the important unit of analysis for explaining performance differences. However, this argument is conjectural because there are many possible contingencies (e.g., market structure, strategic groups, and firm-specific factors) that affect a firm's performance. Additional work is needed to shed more light on this equivocal issue of performance differences.

As for hypothesis 5, it is found support for the prediction that firms, after they changed their group membership, performed better than before they changed membership, in terms of profitability (ROA and ROE). This finding is consistent with the organization adaptation perspective (Chakravarthy, 1982; Galbraith & Schendel, 1983; Lawrence & Lorsch, 1967). Firms do change strategies to become aligned with their new environment, and, as a result, improve performance above the costs of changes.

The results do not support hypothesis 5 in terms of sales growth. This may occur because sales growth of firms can be influenced greatly by other contingency factors, such as industry growth. In the U.S. computer equipment industry, firms enjoyed tremendous industry growth over the study time periods, with a few exception (e.g., recession of 1985-86). Consequently, the effect of group membership changes on sales growth was not significant because most firms in the industry enjoyed high sales growth rate due to the rapid industry growth. Another possible explanation may be the existence of a time lag in sales growth. It may require more than one stable time period to realize increased sales growth after group membership changes. Alternatively, we cannot rule out the possibility of other contingencies acting jointly to affect performance. Thus, it is needed to specify the factors that induce better performance after firms change group membership, as compared to the performance of the same firms before they change membership.

Finally, the results of hypothesis 6 suggest that when they move into a stable environment, firms that change membership between groups with dissimilar strategic configurations, perform better than firms that move into a group with a similar strategic configuration. Firms may perform better because of the benefits of a tight fit with the environment above the costs of change. This finding is in line with the population ecology argument (Hannan & Freeman, 1983; Carroll, 1984). In a stable environment, specialist organizations that compete in a few domains outperform generalist organizations that compete in a number of domains simultaneously. To cope with a number of environmental changes, generalist organizations are required to retain some excess resources. However, specialist organizations are considered to be more efficient

than generalist organizations in a stable environment because of the lower requirements for organizational flexibility due to a tight fit with a particular domain.

Implications for Management Practice

This study also has some significant implications for practitioners. Rather than focus on the specific contributions to strategic management in the U.S. computer equipment industry, an effort is made to identify the general contributions of strategic group analysis, and to evaluate the usefulness of this study's findings for strategic management practice in any industry setting.

In any industry, it is of central importance for firms to understand what strategies are being pursued by competitors. This knowledge is necessary to evaluate the relative strengths and weaknesses of certain strategy positions, and to determine how defendable these positions are. A strategic group analysis is particularly suited to determining this kind of information. Such an analysis permits identification of the strategies competitors are following, and when a longitudinal perspective is taken, allows some prediction about the strategic directions firms are likely to take. The ability to parsimoniously describe and evaluate competitive positions, and to predict competitive moves, is seen as an important asset of strategic group analysis.

A second important implication, related to the previous one, is the possibility of identifying strategic alternatives, and of evaluating their performance potential. One of the central tasks of strategic management is to appraise current strategic positions, and to identify alternative, workable strategies. A longitudinal strategic group analysis

provides a systematic way to address this task. This analysis can reveal the kinds of strategies that historically lead to superior performances, and may suggest new combinations of strategic dimensions that could yield competitive advantages in the future. It can also indicate existing or new strategic positions to be targeted, provided that the strategy-specific distinctive competences have been, can be, or are being developed.

The final important implication of the relationship between group membership changes and performance, is that strategic change is not free. In fact, by extension, all strategies have potential benefits, organizational costs and impediments associated with them. Devising strategies only with potential benefits in mind, or assuming that potential benefits will always or automatically be realized, is incorrect. Managers must think through alternative strategies to full implementation before they choose any alternative. Specifically, if the strategy involves strategic group membership change, it is important first to clearly identify the magnitude of changes envisaged between groups with similar and dissimilar strategic configurations. Second, it is necessary to isolate those costs and impediments that could prevent the realization of the potential benefits derived from membership changes. Third, as shown in this study, it is equally important to identify any moderating factors, such as environment, that could alter the potential benefits, costs, and impediments in important ways. Finally, the potential benefits, costs and impediments associated with each change must be carefully evaluated.

Contributions

This study makes several contributions to the advancement of research in the strategic group theory. The following sections will delineate some of the major theoretical and methodological contributions of this study.

Theoretical Contributions

The first major theoretical contribution of this study relates to the integration of the theoretical and empirical work in strategic management, industrial organization, and organization theory, to provide a holistic framework for the study of strategic groups. Since Hunt's (1972) study of strategic groups, many research efforts have been made to deepen the understanding of competitive strategies with respect to the concept of strategic groups. However, as described in chapter II, this area of research has been dominated by the data-driven studies that examine the existence of strategic groups and performance consequences. Although the studies use some theory (e.g., industrial organization) to justify their investigation, most of these research efforts have been empirical studies without giving full attention to the theoretical development of the strategic group concept.

This research effort was designed to deal with this theoretical void by explicitly providing a link between the strategy and strategic group concepts. This study proposed explicit definitions of strategy, strategic groups, mobility barriers, and strategic group movement, based on current knowledge in these areas, to theoretically guide the strategic group study. It can be argued that these definitions provide a better theoretical

framework for strategic group research, and therefore provide the potential for a more refined model to advance the study of competitive strategies and to enrich the understanding of competition.

A further theoretical contribution of this study relates to the integration of organization theory in the study of strategic group dynamics. This study attempted to identify the contextual factors influencing group membership changes by utilizing the theoretical and empirical work in the population ecology and adaptation perspectives. This study shows that these two different perspectives provide more detailed information about the contextual factors on group membership changes, than can be derived from one perspective alone. Thus, this study offers initial guidelines for future research in the development of a richer theory of strategic group dynamics.

Methodological Contributions

Apart from the theoretical contributions of this study, methodological contributions have also been made. These latter contributions relate to the construct validity of the strategy measurement, to the identification of strategic groups, to the operationalization of contextual factors influencing group membership changes, and to the methodologies to test the between and within-group analysis on performance implications.

First, while most studies of strategic groups have used one or a few surrogates for the strategy construct (except for more recent studies), this study used multiple measures. In addition, because of the theoretical character (i.e., relatively theory-free and descriptive in nature) of the field, little work has examined the validity of the data

used. This study is one of the first to examine explicitly the validity of the strategy construct using confirmatory factor analysis.

Second, although cluster analysis has often been used to identify strategic groups, it was rarely used in combination with Scheffe multiple cluster analyses, analysis of variance, and multiple range tests. These techniques are necessary, however, because without them it cannot be determined whether the identified clusters really exhibit statistically different profiles of strategic attributes. The combination of these methodologies is therefore seen as an improvement over previous, more judgmental identification procedures.

Third, this study examined the contextual factors that motivate group membership changes. The conceptualization and operationalization of contextual factors based on the population ecology and adaptation perspectives represent two different perspectives and provide a multi-dimensional approach to the study of the dynamics of strategic groups. In addition, based on a through review of the literature the use of discriminant analysis is unique to the examination of whether or not firms that changed membership had different contextual characteristics, as compared with firms that did not change membership. The results show that this technique may productively be applied to the study of strategic group dynamics.

Finally, this study examined explicitly the relative importance of the individual firm and strategic group effects on performance differences. While previous studies of strategic groups have examined the performance differences among groups and found the linkage is equivocal, research efforts, except for the study of Cool and Schendel (1988), have not studied this issue further. An analytical technique such as ANOVA is unable to detect individual firm effects in explaining performance differences. By using

WABA analysis this study was able to capture and interpret the relative importance of the individual firm and strategic group effects on performance differences. The findings indicate that strategic group theory does not provide insight that explain the primary source of dispersion in performance across firms. By using WABA analysis, it may be possible to gain further insight into performance implications by moving beyond the concept of strategic groups. One contribution of the study, then, is the application of an existing method to a context where it has not been used.

Limitations

This research effort shed light on the dynamics of strategic groups and the performance implications explored. However, there are several limitations of this study.

The first limitation stems from the small size of the sample which is offered typical in a longitudinal study. The small sample size used for empirical analysis considerably constrained the use of statistical procedures. The inability to test hypothesis 3 for contextual factors that influenced group membership changes by strategic groups across time periods, is a case in point. In addition, the small sample size also prevented examination of hypothesis 6a on the group membership changes-environment-performance linkage. Further, this study focused on a single industry. Consequently, study results are not generalizable beyond this study because of the sample size and the fact it was drawn from a single industry.

A second limitation is the implied assumption of the homogeneity of the industry environment. Each strategic group may face the heterogeneous forces affecting

competition in an industry. This may explain the equal performance consequences among strategic groups, because each strategic group may be equally viable in their position for the competitive forces in the industry. This issue is noted as a point of departure for future research.

A third limitation relates to the sample selection procedure. Due to the data available, sample size was limited to the largest public firms. In addition, foreign firms competing in the U.S. computer equipment industry were excluded. These firms, however, represent a significant force in the industry. For example, in 1989, based on the *Datamation 100*, five of the top ten equipment manufacturers in the U.S. personal computer segment were foreign firms. Whether these firms represent a different strategic group, or whether they belong to already identified strategic groups, is not known. To develop a complete understanding of the strategic group phenomenon, future research must consider this research question and discover ways to capture the impact of foreign competition on domestic markets.

A last limitation relates to the selection and measurement of the construct indicators. Because this study depended on the COMPUSTAT II computer files and other secondary, objective sources to measure the constructs, the scope of variables was limited to the data source. It is well known that the differences in meaning between constructs and indicators cause many errors in the analyses employed in published data. This results in limited validity of the strategic groups identified. Clearly, accurate and sensitive strategic group identification should be based on objective and subjective data from the top management of firms studied, from representatives of the industry trade associations, and from analysts and independent consultants in the industry, etc. This research design issue remains open for future research. In addition, the reliability of the data can be affected by clerical errors, changes in collection procedures, instrumentation

of data collection, and the categorization of these data. The only solution to these problems is the use of extreme caution in the data collection stages, and as much cross-validation of the data as possible, through the use of multiple sources.

Suggestions for Future Research

This study offers insights into the dynamics of strategic groups and performance. First, given the importance of the strategy concept, more work needs to be done to validate the use of strategy variables. This seems to be a necessary condition for the increased use of longitudinal design in the strategic group field. More databases, such as PIMS, need to be developed and made available to researchers in order to accomplish this.

The research design described in this study needs to be replicated in other industry contexts and other measures and methods need to be developed in order to generalize this study's findings. Such replication will improve our knowledge of the moderating and mediating effects of industry settings, and help us assess the efficacy of multiple measures and methods in the strategic group field.

As was noted in chapter III, this study did not focus on issues of globalization of firms. Given the increasing trend towards globalization of markets, competition in many industries are global in scope. Thus, future studies should consider the sample frame to include multiple nations within one industry. This would lead to the isolation of strategic differences across different countries as well as shedding light on multi-point competition along a global scale.

This study emphasized the dynamics of strategic groups. However, the effects of strategic groups on rivalry were not directly taken into consideration. If the concept of strategic groups is to be integrated into a theory of competition, the effects of strategic groups on rivalry need to be developed and tested (McGee & Thomas, 1986; Porter, 1979). Important initial contributions have been made by Peteraf (1988) and Smith et al. (1991). In particular, the manner in which groups affect the patterns of rivalry within the industry needs to be tested. Is rivalry greater between members of different strategic groups than between members of the same groups? Are some groups characterized by high rivalry, and is this the source of low performance, despite the presence of high mobility barriers? These are important issues that need to be addressed in order to provide insights into both the competitive effects of strategic groups on rivalry and the nature and pattern of competitive behavior.

Another important extension relates to the prediction of future strategic behavior based on strategic group membership. Caves and Porter (1977) suggested that a "circuitous path" might characterize the market entry process. Groups with lower mobility barriers are postulated to be the first target, to be followed by shifts to groups with high mobility barriers and potentially high profitability. This issue is important to enrich the understanding of the impact of strategic groups on future strategic behavior.

This study provides some initial evidence of the contextual factors influencing group membership changes. Empirical evidence from this study indicates that the population ecology and adaptation perspectives provide a richer and more accurate picture when employed jointly rather than separately. Future research efforts need to be directed towards incorporating additional contextual factors, such as organizational structure, into theories and towards developing theoretical arguments that specify the

relationships among the contextual characteristics that motivate group membership changes. The complexity of the relationships under investigation will demand sophisticated analytical techniques including discriminant analysis or event history analysis.

A major problem in strategic group research is its relative emphasis on secondary data on strategies to identify groups. This should be accompanied by efforts that use managerial perceptions for the identification of groups because managers anchor their development of strategy in their evaluation of competitive strategies. Previous studies by Dess and Davis (1984), Porac et al. (1989), and Fombrun and Zajac (1987) offer initial contributions to this stream of research. An important referent is whether or not the identified strategic groups make sense to the managers competing in the industry. Otherwise, the richness of the results is seriously limited. Thus, future studies should attempt to validate their strategic groups with managerial perceptions. This approach can help the triangulation of results through the use of multiple measures and methods.

The importance of top management in strategy formulation and the determination of the strategic direction of the organization is apparent (Hambrick, 1989). However, little work in the strategic group field has integrated top managers into strategic group theory. Examination of the impact of top management on strategic groups should provide another useful avenue for future research. Potential topics in examining this issue are: the study of the relationship of top management characteristics and strategic groups, the influence of top management on group membership changes, and the impact of a fit between top management profile and strategic groups on performance over time.

Finally, we believe that strategic group research is at a critical cross-roads. To continue with empirical studies without theoretical insight will no longer be productive.

What is needed is well-designed, theoretically informed and precise research, preferably research that is placed within a comprehensive framework that initially covers the stable aspects of group behavior, and then moves progressively to theory development and the testing of group dynamics. For example, the use of ideas and models from organizational ecology (e.g., an ecological model of resource-partitioning or organizational form-specific models of density) may give insights as to why groups form and how groups evolve over time (e.g., Carroll & Swaminathan, 1989). When this occurs, proper attention can then be given to the issues of modeling competitive rivalry (e.g., using game theory models) which is absent from most existing research on competitive strategy.

Conclusion

This study addressed the questions of strategic group dynamics and their performance implications. This study combined with the multitude of others that are emerging from different perspectives, will provide a cohesive platform from which to understand the nature and role of strategic groups in competitive strategy. We hope that this study will stimulate further efforts in new directions and will enhance the understanding of the value of strategic groups in the formulation and implementation of strategies.

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Appendix A. List of Sample Firms

Company Name	Year Founded	Study Span
AMDAHL CORP	1970	76-89
APPLE COMPUTER INC	1977	81-89
AST RESEARCH INC	1980	85-89
ATARI CORP	1984	85-89
CIPHER DATA PRODUCTS INC	1968	81-89
COMMODORE INTERNATIONAL LTD	1958	76-89
COMPAQ COMPUTER CORP	1982	83-89
COMPUTERVISION CORP	1969	75-86
CONTROL DATA CORP	1957	75-89
CRAY RESEARCH INC	1972	77-89
DATA GENERAL CORP	1968	75-89
DATAPOINT CORP	1968	75-89
DATAPRODUCTS CORP	1962	75-88
DECISION INDUSTRIES CORP	1969	75-86
DIGITAL EQUIPMENT CORP	1957	75-89
HEWLETT-PACKARD CO	1939	75-89
INTERGRAPH CORP	1969	81-89
INTERNATIONAL BUSINESS MACHINES	1911	75-89
MAI BASIC FOUR INC	1971	85-89
MAXTOR CORP	1982	85-89
MICROPOLIS CORP	1976	83-89
MODULAR COMPUTER SYSTEMS	1970	75-84
MSI DATA CORP	1967	75-86
NATIONAL COMPUTER SYSTEMS INC	1962	75-89
NCR CORPORATION	1884	75-89
PRIME COMPUTER INC	1972	75-88
QANTEL CORP	1964	75-89
RECOGNITION EQUIPMENT INC	1962	75-89
SEAGATE TECHNOLOGY INC	1978	81-89
SPERRY CORP	1955	75-84
STORAGE TECHNOLOGY CORP	1969	75-89
STRATUS COMPUTER INC	1980	83-89
SUN MICROSYSTEMS INC	1982	85-89
TANDEM COMPUTERS INC	1974	77-89
TANDON CORP	1975	81-89
TELEX CORP	1963	75-86
UNISYS CORP[a]	1886	75-89
WANG LABORATORIES INC	1951	75-89

[a] Unisys Corp was created by a merger between Burroughs Corp and Sperry Corp in 1986. Prior to this period Burroughs Corp results were used for Unisys Corp.

Vita

Bong-Gyu Park

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Business Address

Department of Management
Virginia Tech
Blacksburg, VA 24061

(703) 231-6353

Education

- Virginia Polytechnic Institute and State University, VA

  Major: Strategic Management

  Minor: Industrial Organization Economics

  Degree: Ph.D. in Management (December 1991)

- St. Bonaventure University, NY

  Major: Management

  Degree: Master of Business Administration (1984)

- Hanyang University, South Korea

  Major: Industrial Engineering

  Degree: Bachelor of Science in Industrial Engineering (1978)

Work Experience

- Instructor: Virginia Tech; May 1990 — May 1991

Course: Undergraduate strategic management course

Full teaching responsibilities including textbook selection, teaching planning, and grading

- Graduate Assistant: Virginia Tech; Sept. 1988 — May 1989

  Supervisor: Dr. Richard E. Wokutch

  Responsibilities: Assistance in research

Research Papers

- Research Papers

  Park, B. 1990. Strategic Group Membership and Performance: A Meta Analysis. Virginia Tech

  Park, B. & Wokutch, R.E. 1990. Operationalizing the Concept of Corporate Social Performance: Toward an Integrative Framework. Virginia Tech

  Park, B. 1989. The Dynamics of Strategic Groups and Performance: Toward a Theoretical Framework. Virginia Tech

  Wokutch, R.E., Spadaro, D.S., & Park, B. 1988. Worker Protection in the U.S. and Japan: The Regulation and Management of Occupational Safety and Health. Virginia Tech

  Park, B. 1988. Toys 'R' Us, Inc. A Case Study in Strategic Management. Virginia Tech

- Presentations

  Operationalizing the Concept of Corporate Social Performance: Toward an Integrative Framework. Presented at National Academy of Management Meeting, August 1991, Miami, Florida

  Worker Protection in the U.S. and Japan: The Regulation and Management of Occupational Safety and Health. Presented at National Academy of Management Meeting, August 1989, Washington, D.C.

Areas of Interests

- Current Research

  A Dynamic Perspective of Strategic Groups and Performance: A Longitudinal Study of The U.S. Computer Equipment Industry, 1975-1989 (dissertation research)

  A study of Strategic Groups in the Global Auto Industry

The Implications of Top Management Leadership on the Strategic Groups Study

A Strategic Management Model in the Developing Countries

- Research Interests

  Integration of Organizational Strategy, Leadership, Structure, Environment, and Performance

  Methodology in Strategic Management Research

  Global Strategic Management

  The Entrepreneurship and Small Business

- Teaching Interests

  Strategic Management and Business Policy

  International Strategic Management

  Principles of Management

  Organization Theory and Organizational Behavior

  Social Issues in Business

Honoraries and Awards

- Beta Gamma Sigma, National Scholastic Honor Society in Business (1988)

Professional Societies

- Academy of Management
- Strategic Management Society
- Academy of International Business
- Southern Management Association

Personal Data

Birth date and place: July 25, 1954, Pusan, South Korea

Married (2 sons)