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ENVIRONMENTAL INFLUENCE ON STRATEGY AND PERFORMANCE IN SMALL TECHNOLOGY-BASED FIRMS: A RESOURCE DEPENDENCE PERSPECTIVE

Ву

George Russell Merz

A DISSERTATION

Submitted to Michigan State University in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Department of Marketing and Transportation Administration

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ABSTRACT

ENVIRONMENTAL INFLUENCE ON STRATEGY AND PERFORMANCE IN SMALL TECHNOLOGY-BASED FIRMS: A RESOURCE DEPENDENCE PERSPECTIVE

Ву

George Russell Merz

The apparent sensitivity of small technology-based firms (STBFs) to environmental factors, and the commonly held belief that such factors constrain and shape the strategies and performance characterisitics of STBFs, provided the situational background and impetus for this study. The importance of the topic is based on the primary and secondary economic effects attributed to STBFs together with the increasing level of public policy interest directed toward them.

Theoretical contributions from four streams of organizational research were integrated into a conceptual model based upon resource dependence theory. Resource dependence theory was considered appropriate because it seemed to explain conditions isomorphic to STBFs. From this theory base, three hypotheses were derived to test empirical observations of environment -> strategy, environment -> performance, and strategy -> performance linkages against theoretical predictions.

Four classes of measures were developed from theory: resource dependence indices, intraorganizational power indices, strategy indices, and performance indicators. The first two classes of measures were external and internal resource-related environmental variables developed from the sum and products of several other theory-based measures. The strategy indices were factor scores developed from a factor analysis of thirty four separate strategy dimensions. The performance indicators were a series of univariate measures.

Empirical data was collected by mail questionnaire from a population of STBFs in two four digit SIC code technologybased industries. A total usable sample of 175 respondents resulted. A check of representativeness and non-response bias was conducted and despite its small size the sample was found to be representative of the larger populations and relatively free of response bias. The internal reliability of the measures was also evaluated by using Cronbach's Alpha Coefficient.

Each of the three hypotheses were tested by stepwise multiple regression analysis and an examination was made of the variance explained by each equation. The resource dependence and intraorganizational power indices were found capable of explaining significant amounts of variation in the strategies and performance characteristics reported by the sample respondents in accordance with theoretical predictions. The findings were discussed with regard for their implications on further theory development and future research.

To Brigitte, Alexander, Remy and Undine for their patience and understanding.

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Patricia Weber and John Hazard also served on the Drs. dissertation committee. Dr. Weber provided the original inspiration for the research topic and was always available for counsel when impediments arose. Additionally. she provided expert insight into the development of the research Dr. Hazard's presence on the committee served design. to keep the author's work on target. His wise advice helped insure that the scope of the project remained managable and that it was clearly communicated. Together their advice was always constructive and is greatly appreciated.

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CHAPTER I

INTRODUCTION

Recently, public attention has been directed toward the "high technology" phenomenon in American industry, particularly toward those entrepreneurs whose technologycompanies have garnered spectacular results based in the capital markets (Time 1982, 1983, 1984, and Business Week 1983, 1984). Research investigating the phenomenon has uncovered facts about the vitality and economic contributions small technology-based firms make to the macro-economic environment (see Bollinger, Норе and Utterback, 1983, pp.2-5 for a review). Consequently, public-policy makers at the national, state and local levels have initiated extensive programs to develop and attract new technology-based firms (OTA 1983, 1984). Likewise, venture capitalists and other investor groups have courted fledgling high technology firms in the expectation of large capital gains (Time 1984). This precipitious dash to cash-in on high technology has been further fueled by writers in the popular press who have coined such phrases as the "Third Wave" and "Hi-Tech/Hi-Touch" as descriptors of the high technology revolution (Toeffler 1980 and Naisbitt 1982).

Behind much of the public and private interest driving the attention directed toward technological

entrepreneurships is the belief that such firms wi11 contribute to employment growth as well as bolster the tax base of many beleagered regions where more mature industries are now in decline. Unfortunately, the attention drawn to high technology developments through the mass media and the popular press along with the avalanche of assistance programs offered at every level of government, conceals a real understanding of the contributions and operations of technology-based firms. Recent employment statistics and projections indicate that of the 23.4 to 28.6 million new wage and salary jobs which will be created between 1982 and 1995, only 1.0 to 4.6 million of these jobs will be found in technology-based industries (Riche, Hecker and Burgan 1983). Despite the employment shortcomings, the real value of the attention directed toward such firms is the innovation, technological change and productivity growth engendered by them especially in the form of secondary and tertiary effects (National Science Foundation 1983).

Small technology-based firms warrant research attention for three distinct reasons. First of all, they are small, and while small firms vastly outnumber the larger firms more research time and effort has been expended in understanding the nature of larger firms. As one small business researcher noted "...small enterprises in the eyes of the academic community are analogous to plain girls and acne-ridden boys at a high school dance, they are all present in large numbers, but usually are unnoticed. Small firms move through their typically brief lifespans neglected, untouched and

unassisted by the sophisticated hand scholarship" of (McGuire 1976). Within technology-based industries large and small technology-based firms differ in their abilities to deal with similar R&D, production, financing, marketing and problems. The larger management companies are multiproduct, multidivisional firms with large sales volumes. sophisticated management teams, specialized functional departments, and have often accumulated a large amount of experience in developing, producing and marketing technology-based products. In contrast. the small technology-based firm (STBF) has limited access to financial and other types of resources. Its management system is simple, and there is little specialization. Typically such companies were established around an idea or an invention and the driving force is the inventor-founder-entrepreneur assisted by a small group of partner-managers. They mav excel in the area of R&D but lack experience and abilities management and marketing. (Gibbons and Watkins in 1970: Horwitch and Prahalad 1976; Roberts 1976; and St. John 1978).

Thus. their smallness represents a liability as relates to their ability to cope with the environmental it forces impinging upon them. Several environmental conditions which may differentially affect STBFs have been noted in the literature. Goldman (1982) and Goldman and Muller (1982) explored the short product life cycle of technology-based products and the marketing problems for

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STBFs that result from it. Lamont (1971), Braden (1977), the National Science Foundation (1981), Brophy (1982), and Bruno (1982) discussed the impact of and Tvebjee resource availability and resource suppliers on STBF strategies and However, the research performance. at this point has provided little insight about how environmental factors influence STBF strategies and performance characteristics.

despite their smallness Secondly. and apparent environmental vulnerability, STBFs are more flexible They uncover market strategically. opportunities more quickly and can marshall their resources more effectively to build new markets for radically different technologies (National Science Foundation 1983). The evidence that STBFs innovate more efficiently and commercialize technology can quickly than larger firms is abundant and more widely accepted (Wetzel 1982; Gellman 1982; Obermayer 1981; Mueller et al 1982; and Mansfield 1968).

Lastly, from a performance standpoint, STBFs have been documented to exhibit greater sales and employment growth rates than larger TBFs (Birch 1979; Morse and Flender 1976; and U.S. House of Representatives 1978). And, STBFs also show higher levels of profitability and survivability than other types of small firms (Roberts 1972; Cooper and Bruno 1977; Cooper 1982).

However, despite these differences, a paucity of STBF studies exist. Among them, few have attempted to develop and test explanatory models of the factors which may influence the strategic behaviors and performance

characteristics of such firms. The general purpose of this dissertation is to extend the existing knowledge of STBF strategies and performance characteristics and the environmental factors outside and within the firm which may influence them.

Α factor consistently associated with common the establishment and ongoing success of STBFs is their apparent upon other organizations for the provision of reliance critical resources needed to support start-up and growth specific nature of these environmental activities. The interdependencies (see Aiken and Hage 1968, and Schermerhorn 1975 for reviews of the organizational interdependence concept) while not well understood, ma y be instrumental determinants of firm strategic behaviors, performance levels and ultimately firm survival.

Studies investigating whether STBFs are dependent upon certain types of resources for their development and survival have not been systematically developed and evaluated in a clearly discernable stream of research. several studies of STBFs and other types of small However. firms provide some evidence of such a linkage^{*}. Research by Lamont (1971), Braden (1977), Bollinger, Hope and Utterback (1983), and the Office of Technology Assessment (OTA)(1984) identified the types of critical resources needed has bv _____

* In general, studies devoted to STBFs are given priority in the literature review, however, where there is no information, studies of other types of small firms will be relied upon to provide insight into the relationships of concern in this dissertation.

ς t ī t e а STBFs and the supporting infrastructure used for acquiring them. The National Science Foundation (1981), Bruno and Tyebjee (1982), Kazanjian (1984) and Krasner and Ray (1984) together identified various environmental factors which were either the source of operational problems for STBFs or were associated with new venture success. Others have linked geographical variation in financing (Brophy 1982) and boundary spanning activities (Dollinger 1983) with STBF and small firm performance.

Another important environmental factor concerns the internal operating environment of the firm. That is, which functional areas within the firm play important roles in securing critical resource exchanges. Since it has been postulated by several researchers (Pfeffer and Salancik 1978; Hickson, et al 1971; Anderson 1982; Arndt 1983; and Day and Wensley 1983) that functional areas within the organization perform critical roles and may acquire power within the organization as a consequence of their ability to negotiate favorable resource exchanges, it seems reasonable that this facet of the firm be considered as well. Α few studies mentioned did examine above the internal environments of STBFs detailing how resources were allocated across the functional areas within the firm (Lamont 1971. Braden 1977), and the types of internal allocation problems such firms faced (NSF 1981, Kazarjian 1984, and Krasner and Ray 1984).

Thus, given that the existing evidence supports a separate treatment of STBFs as unique organizational forms,

the research devoted to STBFs seems to provide face validity for the assertion of STBF resource dependence especially during formative periods of the organization's life cycle. suffer However. previous studies from theoretical insufficiency because no conceptual frameworks guide systematic evaluation of hypothesized linkages between environmental factors, firm strategies and subsequent performance levels.

Despite this weakness in theory development and evaluation, the presumed relationships outlined above have provided the basis for many publicly financed Economic Development Initiatives (EDIs) created in recent years. Census reports from the OTA (1983, and 1984) have documented the existence of 153 State government programs, and 54 local/community initiatives. Unfortunately, no research has been reported investigating the efficacy of certain resources or resource combinations for STBF formation and development. Yet. the rush to attract and develop technology-based complexes by establishing various kinds of resource and interorganizational dependencies, persists in the absence of empirical evidence to evaluate the effectiveness of the various initiatives now in place.

Several factors may explain this deficiency. First, many of the initiatives are in their infancy and require more time before they can be adequately evaluated. Second, the goals of many of the programs are not clearly specified making evaluation problematic. Third, the statistics

generated are often highly aggregated preventing detailed analysis of the micro-level effects necessary for complete understanding. Finally, and most important, no theoretical framework has been specified to assist policy makers in making program evaluations.

THEORETICAL CONSIDERATIONS

The current state of research devoted to STBFs suffers from theoretical insufficiency because no attempts have been made to test the appropriateness of existing theoretical frameworks for explaining STBF strategies and/or performance The general theoretical notion characteristics. that environmental factors can influence or constrain organizational strategies and ultimately performance is not one. These types of relationships have been the а new object of conceptualization and evaluation in a number of fields.

Major contributions have been made by organization theorists who investigated environmental/ have the organizational "fit" and its relationship to organizational morphology and performance (Dill 1958; Burns and Stalker 1961; Woodward 1965; Thompson 1967; Lawrence and Lorsch 1967, 1969; Duncan 1972). The industrial organization economics (IOE) literature contains work mostly concerned the relationships of environmental factors such with as business position and industry structure with industry or firm performance (Bain 1956,1959; Scherer 1970,1980; Caves and Porter 1978; Gale 1972; Newman 1978; Hatten, Schendel

and Cooper 1978; and Porter 1980), however some in the field have attempted to broaden the IOE orientation to include considerations of firm organization and administration (Williamson 1970,1975). In the area of business policy, or strategic management, considerable work has evaluated the the extent to which organizational structure is influenced by strategy decisions (Chandler 1962; Rumelt 1974; Bower 1970,1972). Finally, organizational ecology has contributed two research streams, population ecology (Hannan and Freeman 1977; Aldrich 1979) and resource dependence theory (Pfeffer and Salancik 1978), which focus primarily on the issue of external (environmental) control of organizational behavior although resource dependence theory also addresses intraorganizational constructs as well. Some recent work on small business birth and death rates has used the population ecology perspective (Pennings 1982; Freeman and Hannan 1983). (For a more in-depth review of the four areas mentioned above see Filly, House and Kerr 1976; Bourgeois and Astley 1979; White and Hammermesh 1981; Pfeffer 1982; and Carroll 1984).

RESEARCH PROBLEM

Given the previous introductory discussion this study addresses the following research questions:

Can resource related environmental factors, both external and internal to the firm, explain the nature of the strategies pursued by small technology-based firms, and their subsequent performance levels?

And,

If the relationships can be established, are there industry differences with respect to the environmental factors, strategies and performance levels and their interrelationships?

The following schematic provides the basic conceptual framework underlying this research.



This research attempts to accomplish the following six interrelated objectives:

- 1. To analyze evidence for a theoretical link (linkage (1) above) between external and internal resource related environmental factors and the strategies pursued by small technology-based firms.
- 2. To analyze evidence for a theoretical link (linkage (3) above) between external and internal resource related environmental factors and certain performance levels of STBFs.
- 3. To analyze evidence for a theoretical linkage between firm strategies and performance levels (linkage (2) above).
- 4. To determine the superiority of environmental factors or firm strategies in explaining firm performance levels (linkages (2) or (3) above).
- 5. To illustrate the public policy implications of establishing criteria based on linkages (1), (2) and (3) and possible industry differences for evaluating economic development initiatives targeted toward attracting nurturing STBFs.

The first objective contributes to strategy research by empirically demonstrating the relationship between resource related environmental variables and firm strategy. This represents an extension to a commonly held tenet which sees competitive and market demand influences as the dominant influences on strategy formulation environmental (see especially Hofer 1975). Thus this research will explore whether resources in addition to market and competitive demand information should be considered as influencers of (Recently in marketing there appears to be some strategy. movement to consider alternative influences in strategy development, Zeithaml and Zeithaml 1984; Anderson 1982; Day Wensley 1983). In addressing the first objective and the dissertation research explicitly tests the degree of association between resource related environmental variables and strategy measures.

The second dissertation objective contributes to understanding of how resource related environmental greater factors relate to the performance levels of STBFs. As discussed above, and further evaluated in Chapter II. anecdotal and descriptive data suggest that such linkages and that they wield considerable influence firm exist on performance (e.g., Brophy's (1982) studies into the relationship between financing availability firm and performance found a significant relationship between sales growth and the asset level of the sample firms. His findings also revealed that the relationship varied across geographic locations indicating that dependence for funding in one location differentially influence performance). can Unfortunately, these apparent relationships are not explained adequately from a theoretical perspective.

The third dissertation objective contributes by adding to the well developed body of research on the strategy performance linkage (Anderson and Zeithaml 1984; Hambrick 1983; Hambrick, MacMillan, and Day 1982; and Hambrick and Schecter 1983; see Smith 1986 for a review of these and other works investigating the linkage). However this research will depart from the others by considering strategy as a multivariate variable rather than as a categorical one.

The fourth dissertation objective compares the relative association between the resource related of strengths environmental and strategy constructs in explaining firm performance levels. This is an important objective because it allows conclusions to be drawn about which linkage makes greater contribution in attempting to explain firm а performance. This is a critical consideration in evaluating the adequacy of the hypothetical linkages and the manner in which the constructs are measured.

The fifth dissertation goal illustrates the public policy relevance of the research by revealing which resources are more strongly related to firm strategies and performance levels and how those resource related influences are different across industries. As mentioned earlier. underlying many of the Economic Development Initiatives (EDIs) to foster the establishment and development of STBFs is an assumption that publicly financed investments in STBF targeted programs will result in the establishment of the necessary technological infrastructure for fostering STBFs. Unfortunately, large investments are made to develop

resources without sufficient guidance as to their importance necessity to STBFs. Furthermore few if any EDIs are or developed with particular types of STBFs in mind, they are simply assumed to be similar in their needs and little regard is given to differences that may exist across technology-based industry groups. This research will public policy makers with guidelines for provide establishing criteria useful in developing and evaluating EDIs and will reveal the efficacy of their underlying assumptions.

JUSTIFICATION FOR THE STUDY

The justification for this study occurs at two levels, and the practical. The theoretical the theoretical justification rests primarily on the need to better understand the factors which may influence STBF strategies and performance. The literature concerned with STBF has been preoccupied with describing such activities firms and their characteristics. Consequently, no testing of theoretical frameworks to aid in explaining the apparent environmental dependence and its effect on strategy and/or performance has been accomplished. This dissertation will develop a theory-based model relating external and internal resource related environmental factors to STBF strategy and performance, and will test the degree of association between the theoretical constructs.

At the practical level, public policy makers charged with designing and administering resource assistance

programs targeted toward STBFs need guidance in program development. The Office of Technology Assessment surveys (1983,1984) and Bollinger, Hope and Utterback (1983) report in the policy instruments used by STBF wide variation assistance programs. Typical mechanisms include favorable government procurement practices (such as set-aside programs), subsidies, tax incentives, support for scientific and technological infrastructure (such as universities or regional research institutions, incubators or greenhouse complexes), favorable regulation policies (such as clean air/water laws), state provided venture capital plans (such as Michigan's Strategic Fund), and patent protection. Yet despite the number of and variation in policy instruments, one program or set of programs has proven to bе no overwhelmingly and consistently successful. Context seems to important. As Bollinger et al point out (p.13), be "policies in one country or industry may be unsuccessful in another...consequently, effective government policy must take into account the environment existing in that nation and its industry". However, Bollinger et al fail to provide Thus this research can guidance for implementation. be justified as a first step toward modelling the relationships between resource related environmental factors of the type developed and administered by public policy makers, and the firm performance outcomes of public policy interest (such as employment growth).

SCOPE OF THE STUDY

As indicated in the discussion of the dissertation's objectives, the thrust of this research is exploratory. The rationale for the project is to develop and empirically test conceptual model which examines the ability of resource а environmental factors or variables to explain related the strategies and performance levels of STBFs. To answer the research problems and accomplish the dissertation objectives the units of analysis in this study consist of STBFs within defined technology-based industry groups (four digit SIC code). The basic variables, developed in Chapter II, are resource dependence variables, intraorganizational power variables, strategy scores, and performance measures.

LIMITATIONS

Given the scope of the research as described above, three limitations inherent in the project should be noted.

1. Since empirical verification is restricted to fragmented technology-based industries and small (i.e., less than 500 employees) firms, caution must be exercised in generalizing conclusions to other types of industries and larger firms.

2. As explained in a later chapter, the methodology employed is survey-based field research. Consequently, the rigorous control over variables available in experimental laboratory research is not present in this study. However, field research does offer the advantage of studying the interrelationships in their natural settings, thus avoiding

the contrived and artificial environment often associated with the experimental approach. If carefully designed and executed, the field research should yield results that are both interpretable and realistic. Nevertheless the findings are considered as tentative and exploratory.

3. Because of time and cost constraints this study is cross-sectional in nature. Consequently, the measures reported represent only one data point on a time dimension. Therefore, it is not possible to generalize about the manner in which the variables may vary across time.

PLAN OF THE DISSERTATION

This dissertation is organized into five chapters. The sections which follow this introductory chapter include the following:

Chapter II. Literature Review

The objective of this chapter is to uncover the state knowledge about STBFs with respect to the relationships of resource related environmental factors, between firm strategies, and performance levels and to develop the conceptual framework guiding this research. Thus. this chapter consists of two components. Part one is devoted to a discussion of the conceptual and empirical research concerned with environmental influences, strategies and performance levels. It will also introduce the theoretical constructs in each area which are used to design the Part two is devoted to the development of a research. conceptual model linking the constructs together and to the
statement of hypotheses which are tested by the research.

Chapter III. Research Procedures

This chapter outlines and discusses the procedures and criteria employed in selecting the sample, operationalizing the variables, data collection, and statistically analyzing the data.

Chapter IV. Analysis of Results

This chapter presents the results of the statistical analyses performed on the data collected including a profile of the respondents, a check for response bias and item reliability, and the testing of the research hypotheses.

Chapter V. Summary, Conclusions and Implications

The research findings are summarized, interpreted, and theoretical as well as public policy implications delineated.

CHAPTER II

LITERATURE REVIEW AND CONCEPTUAL MODEL DEVELOPMENT

As mentioned earlier in Chapter I, four streams of organizational research are concerned with the relationship between an organization's environment and its activities and there seems to be consensus performance. Among the four, that the relationship is valid, however, there are differences in conceptualizing and defining the environmental construct, and in specifying what aspects of the organization are influenced. In Table l elements of major research streams related to environmental the four influence are presented for comparison. In this chapter it is shown how elements of each approach are used to model the interrelationships between the contextual factors faced by STBFs and their influence on firm strategies and performance characteristics.

In Chapter I STBFs are characterized as unique organizational forms because of three reasons. First, their smallness in technology-based industries subjects them to external environmental influences, especially in the form of resource and interorganizational dependencies, to which their larger counterparts are mostly immune. Additionally, their small size also means that their internal environment somehow reflects the resource dependencies of their external

Table l

Theoretical Approach	Environmental Factors/Concepts	Firm Behaviors Affected	Contri- butors	
Organization Theory	-Uncertainty	-Managerial Autonomy	Dill (1958)	
(Contingency Theory)	-Variety	-Organizational Form/Structure	Burns/Stalker (1961)	
	-Dynamism	-Structure/ Performance	Lawrence/ Lorsch (1967) Galbraith (1973)	
	-Complexity	-Information Processing		
Industrial Organization Economics	-Industry Structure (Barriers, numbers of Buyers and Sellers,etc.) -Business Position (Market Share,Strategic Groups, etc.)	-Economic Performance)-Competitive Strategy	Gale (1972) Caves and Porter (1978) Hatten,Schendel, Cooper (1978) Porter (1980) Buzzell,Gale & Sultan (1975)	
Business Policy	-Product/Market Characteristics (e.g.,PLC)	-SBU Strategy -Performance	Hofer (1975) Ansoff (1965) Anderson/Zeit- ham1 (1984)	
	-Corporate Strategy (i.e.,Diversification)	-Organizational Structure	Chandler (1962) Rumelt (1974)	
	-Resource Allocation (w/in Functional areas)	-Strategy	Bower (1970, 1972)	
Organizational Ecology	l			
-Population Ecology	-Uncertainty -Compatibility of Resource States -Environmental Grain	-Survival (Through Variation, Selection and Retention)	Hannan/Freeman (1977,1983) Aldrich (1979) Pennings (1980, 1982)	
-Resource Dependence	-Interorganizational Dependence -Organization Set -Resource-Dependence -Intraorganizational Power	-Strategies (Adapting or Modifying the Environment)	Aiken/Hage (1968) Evan (1966) Pfeffer/Salancik (1978)	

A Comparison of Four Streams of Organizational Research Concerned with Environmental Influence

(Adapted From: White and Hammermesh 1981; Bourgeois and Astley 1979; Pfeffer 1982; and Carroll 1984)

milieu. Secondly, in terms of strategies, they exhibit the capability to innovate more efficiently and commercialize technology more quickly than larger TBFs. Lastly, their performance characteristics, especially in employment, sales and profitability growth rates, are higher than other larger TBFs and other types of small firms.

If the fundamental premise of this dissertation (that STBFs indeed subjected resource and are to interorganizational dependencies which conceivably affect or shape their internal environment, their strategies and their performance characteristics) is to be tested, then a theoretical approach is needed which specifically addresses Unfortunately, no one theoretical such relationships. approach of the four outlined in Table 1 cohesively ties all of these elements together. Thus it becomes necessary to integrate some of the approaches in order to arrive at а comprehensive conceptual model. In the following three sections conceptualizations related to external and internal environment, strategy and performance constructs, drawn from each of the four approaches above, are discussed in terms of their relevancy to the research problem. The theoretical discussion is then supported by a review of the available empirical work related to STBFs (in some cases work among other types of small firms is also used). The chapter concludes with the development of the conceptual model which is used to guide this research study. The rationale for the model and the specific research hypotheses are highlighted.

RESOURCE ENVIRONMENT LITERATURE

<u>Relevant theory concerned with external resource-related</u> <u>environmental influence</u>

Focusing on the interorganizational dependencies experienced by organizations in the acquisition and use of resources, the resource-dependence critical paradigm articulated by Pfeffer and Salancik (1978) possesses elements isomorphic to this study. Thus it is useful as a framework for modelling some of the relationships of concern.

This population ecology approach posits that organizational actions are dependent upon the availability of usually controlled critical resources by other organizations or institutions. Since organizations are not seen as internally self-sufficient, they require resources from the environment and, thus, become interdependent with those elements of the environment with which they transact. These interdependencies may result in attempts by external Thus, resource dependence coalitions to gain influence. theory suggests that organizational behavior becomes externally influenced because the focal organization must attend to the demands of those in its environment that provide resources necessary and important for its continued survival.

Three factors are hypothesized to be critical in determining the level of dependence of one organization upon others. First, the importance of the resource, or the extent to which the focal organization requires it for continued operation and survival. Second, the extent to which an interest group (i.e., a social actor external to the focal organization) has discretion over the resource allocation and use. And, third, the extent to which there are alternatives available for resource supply (Pfeffer and Salancik 1978, p.45-46). Thus a firm will experience a high degree of resource dependence if the resource in question is very important to the firm, its use is tightly controlled external interest group, and there are few by an alternative sources (see Figure 1).



Figure 1 Determinants of Dependency

The resource importance dimension is further seen as a function of two components, the relative magnitude of the exchange and the criticality of the resource. The relative magnitude of an exchange concerns the proportion of total inputs (or outputs) accounted for by the exchange. Thus a firm that acquires all of its financing from venture capital sources would place high relative importance upon that exchange.

The criticality of a resource refers to the importance that resource to the continued functioning and survival of of organization. Such a resource may not be used the in great quantities and may contribute only a small proportion of total output. Furthermore, its criticality may vary over of the environment time the nature changes. as Organizational vulnerability derives from the possibility of environmental change affecting the stability of resource an availability (Pfeffer and Salancik 1978, pp46-47). Thus. during periods of low interest rates, the availability of financing from banks may be much greater than during recessionary periods when interest rates climb and lending criteria tighten. Therefore STBFs relying totally upon for financing as opposed to internally generated banks sources may experience high levels of financial dependence during recessionary times.

The second determinant of dependency, discretion over resource allocation and use, can occur in a number of ways. Salancik mention four Pfeffer and possible control mechanisms (1978, pp.48-49): possession or ownership in or partially (such as in the case of total patents or copyrights), regulation of access to a resource (such as gatekeepers who may control access to certain customer groups), actual use of the resource (such as employees using company vehicles), and most importantly, the ability to make rules or otherwise regulate the possession, allocation, and use of resources, and to enforce the

regulations (such as SEC regulations governing investment procedures, or company boards of directors setting company investment policy).

dimension of dependence, concentration The last of alternative sources is based upon the extent to which input or output transactions are made by a relatively few, or only significant organizations. The potential for one. substituting sources of a resource is the fundamental aspect Thus, if an organization such as of this dimension. an STBF acquires financing from banks and venture capitalists, the concentration of outside sources is lower than the STBF which relies entirely upon banks.

Together these three dimensions combine to create a state of resource dependence which acts as the motive force development and implementation driving the of the organizational actions to reduce the level of dependency. The reactions of organizations in response to interdependence fall into two general categories, compliance avoidance (these activities will be further discussed in or the strategy section of this review).

Furthermore, resource dependence theory predicts that as the level of dependence varies, the relationship between dependence and the strategy response will vary directly and positively as the concentration level within the industry varies. Pfeffer and Salancik (1978, pp124-125) report supporting evidence showing an inverse U-shaped relationship between resource interdependence and industry concentration levels. Their findings suggest that up to an intermediate

level of four firm concentration (thev report а concentration ratio of about 40%) as resource dependence its ability to predict firm mergers (a type increases. of strategy used for managing interdependencies) within the increases. Past the industrv intermediate point the likelihood that dependence predicts mergers diminishes.

<u>Relevant</u> theory concerned with internal resource-related <u>environmental</u> influence

The level of dependence experienced by an organization the internal environment mediated of may be by the organization because power accrues to those in the organization more able to reduce uncertainties. Such an effect is posited in sociological analyses of organizations, recently in the development of the and most strategic contingencies theory of intraorganizational power bv Hickson. Hinings, Lee, Schneck, and Pennings (1971) (See Pfeffer 1982 for a review of this theory). This approach is closely related to many aspects of contingency theory which views organizational structure as responding to or aligning with the external environment as а way to reduce environmental uncertainty.

Following Crozier (1964), Thompson (1967), and Perrow (1970), the strategic contingencies' theory argues that the most critical organizational function or the source of the most important organizational uncertainty determines power within the organization. Those subunits (i.e., functional areas) most able to cope with the organization's critical

problems acquire power within the organization. Since many the uncertainties and contingencies faced of by the are a product of the external organization resource environment, this aspect of environmental context partially determines the distribution of power within the organization. Pfeffer and Salancik define power in this ability of a influence the subunit to sense as organizational decisions in ways that produce outcomes favored by the subunit. Therefore the power of a particular functional area in an organization may be enhanced to the extent that it is able to acquire important resources and thus lessen environmental uncertainty (Pfeffer and Salancik 1978, p.230).

Following the conceptualization of Hickson et a1 (1971), intraorganizational power is conceived as а composite variable consisting of three sub-elements (see Figure 2): (1) the ability of a functional area to cope with organizational uncertainties by contributing to the acquisition of critical resources, (2) the substitutibility the functional area's capabilities for the capabilities of another functional area as they relate to overall firm of success, and, (3) the pervasiveness of the functional area's influence within the organization. Therefore, greater intraorganizational power accrues to that subunit with the greatest ability to bring about the acquisition of needed lowest level of substitutibility resources, the in contributing to firm success, and the highest degree of interfunctional influence (also see Pfeffer and Salancik

1978, pp.230-234 for a discussion and review of relevant empirical work).



(Adapted from: Hickson, Hinings, Lee, Schneck and Pennings 1971)

Figure 2 The Strategic Contingencies Model

the functional intraorganizational power concept Thus. becomes an important component for assessing the extent the internal environment accounts for the nature of a firm's strategies. such it serves as a counterpart As to the resource dependence measure, reflecting the power those functional areas within the firm accrue as a result of their ability to acquire needed resources. It is presumed here that those functional areas with the highest degree of intraorganizational power will play larger role а in determining the nature of the strategies by an organization as it attempts to lessen the effects of resource dependence.

At this point the two theoretical approaches concerned with the external and internal resource-related environmental influence have been discussed. Attention is now directed to examining the congruence of existing STBF empirical studies to these conceptual choices.

Empirical evidence of external resource-related effects on STBFs

The foregoing conceptual discussion is particularly attractive as a framework for the explanation of STBF activities because of an apparent dependence exhibited by these upon external resource suppliers. firms This resource dependency of STBFs has received some research attention in the form of studies attempting to identify those resourcerelated factors which may impinge on the formation and ongoing success of STBF populations. In this section research investigating the resource and resource supplier effects on is reviewed for its congruence with the theoretical STBFs discussion of the previous section.

Three recent reviews lend credence to the general notion of external resource-related influence on STBF formation, behavior and performance. In a review of articles concerned with identification of external resourcerelated environmental factors conducive to stimulating STBF Bruno and Tyebjee (1982) outlined the findings formation. of 17 studies reporting the importance of 12 environmental factors. They point out that it is widely believed. especially by public policy makers, that pockets of technological entrepreneurship such as "Silicon Valley" and "Route 128" area around Boston result from the presence the of important resources and resource suppliers. (Table 2 lists the factors identified and the researchers in the articles reviewed by Bruno and Tyebjee.)

Table 2

Environmental Factors Related to New TBF Formation

Environmental Factors	Author/Year
Venture Capital Availability	Cooper (1970) Susbauer (1972) Hoffman (1972)
Experienced Entrepreneurs and Incubator Organizations	Cooper (1970) Naumes (1978)
Technically Skilled Labor Force	Draheim (1972) Stanford Research Institute (1962)
Accessibility of Suppliers	Cooper (1970) Shapero (1972) Schollhammer and Kuriloff (1979)
Accessibility of Customers or New Markets	SRI (1962)
Favorable Government Policies	Hollingsworth and Hand (1979), Cooper (1973), Mahar and Coddington (1965), Vesper and Albaum (1979), Cetvin (1978)
Proximity of Universities	Shapero (1972), Coo- per (1973), Mapes (1967), Allison (1965), Pennings (1979)
Availability of Land or Facilities	Mahar and Coddington (1965), Quirt (1978)
Availability to Transportation	Mahar and Coddington (1965), Cooper (1973), Schary (1979)
Receptive Population	Mahar and Coddington (1965), Cooper (1970)
Availability of Supporting Services	Naumes (1978)
Attractive Living Conditions	Shapero (1972), Coo- per (1970,1973), Ma- har and Coddington (1965)
Adapted from: Bruno and Tyebjee 1982	

.

The main thrust of the articles reviewed by Bruno and Tyebjee was on STBF formation and the description of those factors associated with such formations either based on observational type studies or surveys of the perceptions of entrepreneurs.

In a similar way the reviews by Bollinger, Hope and Utterback (1983) and The Office Technology Assessment (1984) draw upon research focused on external resource-related environmental factors for stimulating technological Bollinger, Hope and Utterback reviewed entrepreneurship. research investigating the following factors considered to STBF formation: various critical aspects of the entrepreneurial firm and founder team, regional policies designed to attract STBFs, industrial sector differences, the ability of technology-oriented complexes (such as research parks) to stimulate STBF formation, information flows, the existence of financial markets, government and large firm procurement policy, and general social attitudes (e.g., towards job security).

The OTA review focuses on an examination of existing technology-based centers (such as Silicon Valley and Route 128). theoretical Ιt then explores the various explanations for these geographic concentrations of innovative activity, highlighting environmental conditions such as technological infrastructures, agglomeration effects and entrepreneurial networks (OTA 1984, pp.33-40).

On the whole the research reported by the reviewers above, represents evidence of the importance of resource and

supplier availability to the founding and on-going success of STBFs. While many of these studies are theoretically sophisticated statistical methods, based and use the aggregation levels of the data prevents close examination of factors influence how environmental individual firm activities and performance levels (Armington, Harris and Odle, 1984, and Pennings 1982). However, the results of studies suggest some degree of congruence with these the resource dependency model to the extent that various types of resources and suppliers are critical to STBFs.

At the level of the individual firm, a few empirical studies addressed influence have the of external environmental factors upon firm activities and performance (see Table 3 for a summary). The earliest of the resourcerelated studies of STBFs was performed on a cross-industry sample of science-oriented spin-off firms by Lamont (1971). Within of the formation his descriptive model and of technology-based spin-off firms STBFs development were classified pursuing one of three basic as business (1) R&D, testing and consulting, (2) custom activities: products and services, and (3) standard products and From this starting point he was able to relate services. the degree of resource transfer (e.g., business skills, market knowledge, etc. pp.23-39) with technology, the business activity pursued by the STBF (See Appendix II.A to this chapter for additional information about the studies discussed here). Additionally he speculated upon the

Table 3

Resource Related Environmental Factors Examined in STBF Studies

External Environment

Internal Environment

Author/ Date	Resource Type	Supplier Type	Activity Reported	Resource Type	Functional Area	Activity Reported
Lamont (1071)]	Technical	Founder	Transferred			
(1),1)	Daper erse	Employees	Acquired			
	Financial	Only form not sup- lier	Acquire: success varied by business activity			
	Managerial Expertise	Founder	Transferred			
	anpererbe	Employees	Acquired			
	Market In-	Founder	Transferred			
	101	Friends/ Business Assoc's	Acquired			
		Customers	Acquired			
Braden (1977, (1982) ²	Financial	Personal/ Friends	Sought/ Obtained	Financing	Eight func- tional areas: Acctg, Admin	Allocation
		Banks	"	Mamt Time		
		Venture Capital	"	Consul- Fin,Mktg,		
		SBICs	"	cants	Mftrg,PR	
		Insurance Co.	"			
National Science Foundation (1981) ³	Financial		Problems Obtaining	Financial	R&D	Maintain levels
	Personnel		Attracting	Personnel		Providing Attractive Salaries
Brophy (1982) ⁴	Financing	Ten types examined	Obtaining			

(ļ

Table 3 (continued)

	External Environment			Internal Environment		
Author/ Date	Resource Type	Supplier Type	Activity Reported	Resource Type	Functional Area	Activity Reported
Kazanjian Fi (1984) ⁵ Ma Ex Pe	Financing		Problems Obtaining	Mgmt Expertise	Various functional	Needed to solve
	Managerial Expertise		"	·	areas: Mktg Production, Gen Admin	various problems
	Personnel		**		oen numm.	
Krasner/ Ray (1984)6	Financing		Problems Obtaining	Mgmt/Tech Expertise	Various Functional	Needed to solve
	Managerial, Technical	/		•	areas: Mktg R&D, Mfrg,	various problems
	Expertise		"		Legal	
	Personnel		"	Financial	**	**
Dollinger (498) 1985) ⁷		Nine types	Contacts			

Notes to Table 3

 $1\,$ Lamont made no attempt to evaluate whether the environmental factors he identified affected other aspects of the firms' studied although he postulated a relationship between transfered resources and business activity. Only summary statistics were used, no tests of significance were performed.

² The 1982 study examined the relationship between allocations of financial resources in functional areas and firm performance and thus represents one of the few studies examining the internal environment - performance linkage. Seven hypotheses were tested utilizing ANOVA and correlation techniques.

³ The NSF analysis consisted of cross-tabulations of resource problem areas by degree of concern each represented to the responding firms in various categories. No tests of significance were reported.

⁴ Brophy's research examined the extent to which the availability of financing in a particular geographic area was related to the performance of STBFs seeking that financing. He used regression analysis to test two hypothses concerning the relationships. Furthermore he detailed the sources of financing obtained and how the sources used varied across a four year period. The sources he identified were founders, friends and relatives, private individuals, limited partnerships, SBICs, investment banks, commercial banks, private firms, public offerings, and insurance companies.

Table 3 (continue)

⁵ Kazanjian's study operationalized the stage of growth of STBFs by using an assessment of the dominant problems faced by the firms. Many of the problems are either externally or internally resource related.

⁶ The objective of this study was to evaluate the relationship between the severity of various problems (many of which are resource related) and firm performance. Preliminary results seemed to indicate a differential impact of certain types of problems on the performances of sample firms. Further insight was hampered by the level of statistical analysis (only summary statistics provided).

⁷ Dollinger's studies investigated the relationship between environmental contacts with nine different external groups and firm performance. While his research was not explicitly concerned with resource acquisition or disposition within STBFs he found that there was a generally positive relationship between the number of environmental contacts and firm performance. Methods used were partial correlation and causal modeling. The types of specified contact were: customers/clients, suppliers/vendors, potential employees, consultants, trade associations, regulators/unions, and competitors. relationship between a firm's innovativeness, major markets, and role of marketing activities to each level of business activity.

The value of Lamont's work in the context of this study is that he was the first to document the types and relative importance of resources used by STBFs as well as the suppliers and methods by which the resouces were secured (see Table 3). Furthermore, through his conceptualization, essentially hypothesized a relationship between he the transference of resources and business activity (the environment --> strategy linkage).

In a subsequent study, Braden (1977) conducted a survey of STBFs in Michigan which examined the technology base of new business formations in the state and detailed the structure and operating characteristics of responding firms. Braden's research expanded the scope of the earlier Lamont study by providing more detailed information concerning the suppliers used and the relative magnitude of the resources contributed by each type of supplier (see Table 3 and Appendix II.A for specific details).

Three additional studies (NSF 1981, Kazanjian 1984, and Krasner and Ray 1984) conducted among samples of STBFs highlight the extent to which resource related difficulties (both internal and external to the firm) are perceived as major problems. Each study collected information about the major problem areas faced by STBFs, but differed in the manner the findings were used (see Table 3 and Appendix II.A for additional details).

In a survey of 1,232 small TBFs, the National Science Foundation (1981) identified eleven problem areas of varying levels of concern (see Table 4). Many of the problems reported in the study appear to be related to resource allocation issues (see Table 3 for a acquisition and classification) such as adequate financing levels, attracting and keeping critical personnel, keeping current on government activities. These results suggest that small TBFs may engage in behaviors (or strategies) to ensure an adequate supply of critical resources. Unfortunately, while the study revealed the basic motivations for such Table 4) actions (viz., the problems listed in no information was provided regarding subsequent behavior toward resolution of the problems.

Drawing upon secondary theoretical literature Kazanjian (1984) developed a four stage life cycle model for STBFs which postulated that the particular problems (many of which were resource-related) faced at given times defined the venture's position in its life cycle. The findings partially supported the notion that certain types of problems were more dominant for firms in one stage of the life cycle than in another. However, apparent overlap in problems across stages prevented complete substantiation of the model. (See Tables 3 and Appendix II.A for additional methodological information.)

An exploratory study by Krasner and Ray (1984) attempted to link the perceived operational problems (again, many were resource-related) of technological entrepreneurs

Problem Areas of Major Concern	to Small	TBFs	
Problem Areas:	Percent	Major	Concern:
Financial Problems:			
Maintaining Adequate R&D Levels		68%	
Obtaining Venture and/or Working Capital		66%	
Purchasing Capital Equipment		62%	
Personnel Problems:			
Providing Competitive Salaries and Benefits		69%	
Attracting and Keeping Necessary Personnel		65%	*
Government Regulations:			
Dealing With Nonprocurement Regulations		66%	
Dealing with Procurement Regulations		62%	
Other Problem Areas:			
Making the Transition from R&D to Marketing		56%	**
Undertaking High-Risk R&D Projects		50%	
Government/Industry Communication		53%	
Patenting and Licensing		29%	
<pre>* major concern for 82% of firms with ** major concern for 68% of public co the youngest firms.</pre>	over 100 rporation	employ s and (ees 53% of
Adapted from: National Science Fou Small High-Technology Firms, Special R	ndation, eport NSF	<u>Prob1</u> 81-30	ems <u>of</u> 05.

Table 4

with growth in sales and employees across a three year period (see Table 3 and Appendix II. A for methodological details). The findings indicate that the higher performing firms appear to weight the severity of problems differently than lower performing firms.

Like the earlier results found in the Lamont and Braden studies, Kazanjian and Krasner and Ray, report evidence that external resource and supplier related environmental factors are associated with STBF activities and performance. Thus collectively they provide support for the basic premises of the resource dependence conceptualization. The fundamental weakness of these studies is that they are not specifically designed investigate external resource-related to environmental dependence and therefore assigning correspondence to the resource dependence model is At best, the studies describe different types problematic. of external resources sought and the suppliers relied upon In some cases limited information provide them. is to provided concerning the relative magnitudes of the certain resources provided by various suppliers (Braden 1977) and the degree of criticality associated with various resources (NSF 1981). Thus they appear in general to address the "resource importance" concept, but none of the above reviewed studies examined issues related to the concepts of resource use" or "concentration "discretion over of alternative suppliers".

In contrast to the previously reviewed studies, the research by Brophy (1982) and Dollinger (1983) provides some

empirical evidence supporting the resource dependence notion that the concentration or availability of alternative resource suppliers is related to firm performance. Brophy's (1982)work examined the relationship between the availability and nature of financing for STBFs across two geographic locations (Ann Arbor-Detroit and Boston) and their sales performance during the first four years after formation. His findings showed significant relationships between the availability of capital support for asset the performance of firms as measured by acquisition and growth in sales. He also found important differences in the institutional nature of the capital support sources between the samples. Thus, Brophy demonstrated the viability of using an aspect of the resource environment as a predictor of firm performance.

In a study of the boundary spanning activities of entrepreneurs^{*} Dollinger (1983,1985) evaluated whether the entrepreneur's environmental contacts tended to improve the firm's performance. The results indicated that in general, the boundary spanning activity of the entrepreneur was positively correlated with the firm's financial performance. Thus, Dollinger concluded that the successful entrpreneur spent a considerable amount of time and energy on negotiations, transactions, and information gathering

^{*} Dollinger's sample was composed of small businesses in general not explicitly STBFs, his study is included in this review because of the issue he investigated and its relationship to this study.

with individuals and organizations of many types. The research methodology and research results also appear to exhibit characteristics congruent with the "relative magnitude" and "concentration of alternatives" elements of resource dependency theory

Furthermore, the Dollinger study, like the Brophy study discussed before, makes a valuable contribution to understanding how interactions with the external resourcerelated environment affect firm performance. In a sense Dollinger's results complement Brophy's by focusing on the interorganizational exchanges that occur rather than the resources involved. Presumably these exchanges involve resources of some kind. Dollinger's study did not reveal why the contacts occurred although he suggests that they may have involved information exchange.

This concludes the review of those empirical studies concerned with external resource-related environmental effects on STBFs. In general the results contribute to this study in two ways. First, they show that the observations by the researchers tend to be congruent with made the resource dependence theory and its fundamental premises. From Table 5, which cross classifies each reviewed study against the components of the resource dependence model, it can be concluded that the results address issues related to three of the four components. None of the studies evaluated issues related to the "discretion over the use of resources" the power outside suppliers may possess concerning or the disposition of resources. Secondly, the studies constitute

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Table 5

The Relationship of Existing STBF Studies to the Components of Resource Dependence Theory

Studies:	lies: Components of Resource Dependence Model:				
Author(Date)	Relative Magnitude	Criticality	Discretion Over use	Concentration of Alternatives	Measures/ Methods
Lamont(1971)	*				Freq.Dis.
Braden(1977)	*				Freq.Dis.
NSF(1981)		*			Ordinal Ranking
Bruno/Tyebjee (1982)(R)		*			Observation of Assoc.
Brophy(1982)	*			*	Freq.Dis. Regression
Dollinger(1983)) *			*	Constant Sum Part.Corr.
Bollinger et al (1983)(R)	L	*			Observation of Assoc.
Kazajian(1984)		*			Importance Scale,ANOVA
Krasner/Ray (1984)		*			Importance Scale,Freq. Dist.
OTA (1984)(R)		*			Mostly Observation

(R)=Review article

an important secondary source that will be utilized in the identification of those resources and suppliers considered salient to STBFs.

The studies are alike in their treatment of external environmental context. Across the studies the environmental contexts of all STBFs are considered to be similar except on the variable(s) that each author is concerned with in his/her study. Further, except for one study, there is no attempt made to investigate whether variations occur across Porter (1980) industrv groups. suggests that the differences in the bargining power of suppliers, customers, industries may produce different competitive etc.. across strategies. Controlling for variation is vitally important if the environmental conditions in terms of suppliers, and customers are to be compared. Neglecting competitors of the environment can introduce this aspect additional variation into the investigation confounding the results of 0n1yof the studies reviewed the analyses. one above maintained industry integrity within the sample frame and results across the industries (Krasner and compared Ray). Ιn view of this methodological weakness it becomes very difficult to assess whether the findings observed are more important from one industry to This less the next. or possesses important public policy implications (this issue will be further explored in Chapter V).

Empirical evidence of internal resource-related effects on STBFs

While four of the studies reviewed in the previous mention some aspect of a firm's internal resourcesection related environment (see Table 3), only Braden's (1977,1982) work shows some congruence with the strategic contingencies Ιn model. her earlier study she examined the internal

allocation patterns for four categories resource of resources across eight functional areas, and also obtained ratings of which functional areas were most important. These two measures are roughly equivalent to two aspects of the strategic contingencies model. Resource allocation patterns across functional areas may represent measures of how well each functional area can cope with uncertainty. Thus those functional areas perceived as being more capable might receive a higher allocation of resources. The perception of which functional area is more important corresponds to the pervasiveness component of the model.

In her later study (1982) Braden extended the level of analysis by testing for relationships between certain resource allocation patterns in functional areas and firm performance (profitability). The findings indicated that there was no direct relationship between the profitability of a business venture and the relative level of financing marketing among technology-based firms applied to in Michigan. However, allocation differences in accounting, engineering and production functional areas showed significant amounts of variation across unprofitable, moderately profitable, and highly profitable STBFs. Thus, if it is assumed that a functional areas' ability to cope with uncertainty is represented by the allocation of critical resources it receives, then Braden's second study indicates that this aspect of intraorganizational power can at least partially explain firm performance.

STRATEGY LITERATURE

In this section the concept of strategy will be The concern here is with isolating reviewed. strategy concepts related to firm behaviors responding to, or resulting from, the environmental factors reviewed in the previous sections. The following discussion is comprised of two parts. The first part is conceptual and presents several approaches for evaluating and measuring the content of the strategy construct. These approaches represent the resource dependence, industrial organization economics, and business policy perspectives. The second part will review those studies of strategy content within STBFs and other small business.

Contributions from resource dependence theory

The resource dependence theory argues that through a variety of approaches "managers and administrators will attempt to manage their external dependencies, both to ensure the survival of the organization and to acquire, if possible, more autonomy and freedom from external control" (Pfeffer 1982, p.193). Two options exist for managers in the face of interorganizational dependencies, they can comply passively with those demands or if possible they may develop pro-active strategies for avoiding the demands.

These latter strategies may be of two general forms, strategies that adapt to the existing external environment or strategies that attempt to modify the external environment. Furthermore, since resource dependency comes

about because of the importance placed by a focal organization on critical resource exchanges (the relative magnitude and criticality components), and the control which other organizations might possess over the exchange of that resource (as captured in the discretion and concentration components), strategies can be classified it terms of these two dimensions as well. Thus, given the two general of resource dependency and the two types of sources proactive strategic responses to environmental demands, four groups of pro-active strategies emerge possible from resource-dependence theory (see Table 6).

Table 6

Strategies for Managing Environmental Demands

Responses to Sources of Dependence	: General Responses : : Adapting to : Environment	to Environmental Demands : Modifying the : Environment
Attempt to: avoid dependence on particular resource exchanges	:(1) Buffering - Smoothing - Demarketing	:(2) Control Rules of Exchange (e.g. cartel formation) Vertical Integration Market Segmentation Diversification New Product Development and Demand Creation
avoid the control of other organi- zation over resource use or availability	:(3) Executive Socialization Interlocking Directorates	:(4) Political/Legal (e.g. : anti-trust suits, : lobbying, etc.) : Mergers/Acquisitions : Cooptation : Joint Ventures :

Adapted from: Pfeffer and Salancik 1978, Chapter 5

The of the abilitv resource dependence conceptualization to explain both passive (or compliance) firm hehaviors in and pro-active response to interorganizational demands has been confirmed in a number of empirical studies.

- Pfeffer (1972a), investigated the extent to which the dependence of plant managers in Israel on the government, affected their willingness to pursue export policies favored by the government. He found that the percentage of a firm's sales to the government, the firms general financial condition, and the percentage of foreign ownership explained the extent to which managers would be willing to pursue activities consonant with the government's interest.

(1973), investigating branch offices of - Randall the employment service, found that the degree of Wisconsin interorganizational power with respect to the suppliers (potential employers) of a critical resource (job orders), presence or absence of competition. and the did significantly affect the extent to which the various branch offices adopted a particular orientation (strategy).

- Salancik (1979), used the context of affirmative action to investigate the relationship between transactions dependence (sales to the government) and compliance with external control (affirmative action policy). He found evidence of a strong relationship moderated by the level of firm visibility.

- Several studies have examined pro-active strategies undertaken to manage interdependencies such as mergers (Pfeffer 1972b), joint venture activity (Pfeffer and Nowak 1976). officer and director interlocks (Pfeffer 1972c,1973,1974)(Pfeffer and Salancik 1978)(Burt, Christman and Kilburn 1980), executive movement (Edstrom and Galbraith 1977), executive recruitment and succession (Pfeffer and Leblebici 1973), and cooptive patterns (Burt 1980).

the whole, the evidence on the ability of resource 0n dependence considerations predict environmental to strategies tends to support the theory. Yet management а the suggested strategies (outlined in Table number of 6) have not been tested with respect to resource dependence study was found which variables. For instance, no

which investigated the extent to interorganizational dependencies influenced marketing strategies (such as those the top half of Table 6), although such an found in investigation has been proposed (Evan 1966) and Pfeffer and Salancik explicitly mention several types of marketing strategies as environmental management tools (1978. pp.99,106-109). Furthermore, all of the studies tend to strategies found in the bottom half of Table 6, focus on are mostly concerned with that is they environmental adaptation or modification strategies developed for the avoidance of control by an external agent. This reflects organizational sociology bias of the the researchers involved and their concern with how organizations influence each other. Thus, studies using this paradigm have directed little attention to investigating how dependence upon certain resource exchanges are related to firm strategies.

Another issue not addressed by Pfeffer and Salancik is whether or not it is possible that organizations pursue multiple strategies simultaneously. Since firms probably require a number of different resource combinations it can be argued that it is likely that firms develop multiple strategies in response to the different kinds of interdependencies they face.

Such a likelihood could not be captured by using more traditional conceptualizations of strategy which rely on categorical measures (e.g. the strategic types suggested by Miles and Snow 1978) since it would not be possible to know a priori what strategies are possible. Thus this study will

rely on Porter's (1980) work on the analysis of competitive strategy to provide guidance in developing multivariate measures of firm strategies.

Contributions from Porter's work

Since Pfeffer and Salancik (1978) in their articulation of resource dependence theory provide no guidance for the measurement of strategy, Porter's conceptualizations from the industrial organization economics area are drawn upon. Porter's contribution to this study is found in his ideas concerning the composition of strategy. His notion of a strategic dimension provides a fundamental building block. In developing his arguments for the existence of strategic dimensions, Porter notes that:

"It is clear, however, that industry structural analysis can be used at greater depth than the industry as a whole. In many if not most industries, there are firms that have adopted very different competitive strategies, along such dimensions as breadth of product line, degree of vertical integration, and so on, and have achieved differing levels of market share. Also, some firms persistently outperform others in terms of rate of return on invested capital". (Porter 1980, p.126)

Porter goes on to explain that:

"The five competitive forces provide a context in which all firms in an industry compete. But we must explain why some firms are persistently more profitable than others and how this relates to their strategic postures. We must also understand how firms' differing competencies in marketing, cost cutting, managemnt, organization, and so on relate to their strategic postures and their ultimate performance." (Porter 1980, p.127)

So, it is clear that Porter views external and internal environmental factors as major explanatory agents relative to firm performance. Additionally, he sees the competitive strategies, each firm pursues, as moderating or intervening influences between environment and firm performance.

suggests that thirteen strategic dimensions can Porter capture the possible differences among a company's strategic a given industry (see Table 7). in This study options adopts Porter's view that strategy is a multidimensional construct. Thus strategy is seen as a pattern or а of activities (i.e. strategy dimensions) collection concurrently pursued by the firm to enhance its position relative to the environment it faces. In developing measures the strategy construct, the dimensions of competitive of strategy presented in Table 7 are used. The viability of this approach to the investigation of competitive strategy been supported in recent empirical studies by Dess and has Davis (1982, 1984).

This perspective is important since Pfeffer and Salancik did not elaborate on the dimensions of strategy, Porter's emphasizing categories instead. By using conceptualization, greater specificity regarding measurement Dimensions are chosen for their is possible. apparent congruence with firm activities classified as dependence avoidance / environmental modification strategies in cell 2 The focus is upon marketing and of Table 6. technology oriented dimensions shown to be associated with STBFs. The next section addresses contributions useful for choosing dimensions appropriate to STBFs.
Table 7

Dimensions of Competitive Strategy

SPECIALIZATION: the degree to which a firm focuses its efforts in terms of the width of its line, the target customer segments and the geographic markets served.

BRAND IDENTIFICATION: the degree to which a firm seeks brand identification rather than competition based mainly on price or other variables.

PUSH VERSUS PULL: the degree to which a firm seeks to develop brand identification with the ultimate consumer directly versus the support of distribution channels in selling its product.

CHANNEL SELECTION: the choice of distribution channels ranging from company-owned channels to specialty outlets to broad-line outlets.

PRODUCT QUALITY: the firm's level of product quality, in terms of features, specifications, etc.

TECHNOLOGICAL LEADERSHIP: the degree to which the firm seeks technological leadership versus following or imitation.

VERTICAL INTEGRATION: the extent of value added as reflected in the level of forward and backward integration adopted.

COST POSITION: the extent to which the firm seeks the low-cost position in manufacturing and distribution through investment in cost-minimizing facilities and equipment.

SERVICE: the degree to which the firm provides ancillary services with its product line.

PRICE POLICY: the firm's relative price position in the market.

LEVERAGE: the amount of financial leverage and operating leverage the firm bears.

RELATIONSHIP WITH PARENT COMPANY: requirements on the behavior of the unit based on the relationship between a unit and its parent company.

RELATIONSHIP TO HOME AND HOST GOVERNMENT: in international industries, the relationship the firm has developed or is subject to with its home government as well as host governments.

(Source: Porter 1980, pp.127-129)

Other theoretical approaches to strategy construct

Reflecting a business policy perspective that product market conditions can influence firm strategies and ultimately performance, Ansoff and Stewart (1967), Goldman (1982) and Goldman and Muller (1982) developed similiar conceptual schemes for explaining STBF strategies. Ansoff Stewart (1967), proposed a framework for the and and analysis of a firm's identification technological The authors considered the characteristic profile. parameters of technologically based businesses, described impact on administrative and operating problems, their and strategic implications discussed their for the organization's competitive posture. More specifically, the authors postulated that five key management issues would affect the overall marketing strategy of the TBF. The five dimensions were: Research versus development mix, downstream coupling, product life cycle, investment ratios, and technological "state of the art".

Research versus development mix: Such a mix was seen as being composed of two concepts labeled "R-intensive" and "Dintensive" to denote a tendency toward the basic and experimental on the one hand, and a tendency toward commercial product design on the other. Each of the concepts possessed measurable characteristics which would allow assessment of degree of R or D intensiveness.

Downstream Coupling: Explained the extent to which the success of the company's product introduction process depended on communication and cooperation between the R&D

and the manufacturing and marketing functions, which were seen as further "downstream" toward the customer. Industries were viewed as differing in their coupling requirements, exhibiting what Ansoff and Stewart termed "degrees of coupling". The authors suggested that there existed a "critical balance" in coupling that was related to "interfunctional control" and "product planning" processes.

Product Life Cycle: The authors suggested that TBFs may be faced by "short" or "long" product life cycles. Of the two, the short product life cycle presented unique organizational problems requiring extreme flexibility and quick response. Ansoff and Stewart focused attention on the organization's structure and suggested that the short life cycle environment tended to favor "short-circuit" devices -managers, project such as product managers, or interfunctional committees -- which sped up the interfunctional transfer of information.

Investment Ratios: Ansoff and Stewart suggested that there was some "critical mass" of investment intensity in R&D activities. They claimed that evidence did not support the common assumption that the effects of R&D investment varied directly with the investment ratio as the latter ranges from zero to some high performance. On the contrary, in their view, R&D efforts were almost entirely ineffective below a certain level. Several factors that influenced this "critical mass" were discussed.

Technological "State of the Art": How close a

company's technology was to the state of the art had important implications for management planning and decision identified three making. The authors factors which influenced managerial activity: stability, predictability, and precedent. Ansoff and Stewart noted that near the state of the art, a company must settle for more approximation and less precision in goals and standards. Thus planning and control must be tailored accordingly. In such a company, judgment was critical, and precision was viewed as specious.

Ansoff and Stewart concluded their work by considering the collective impact of the factors outlined above on a strategic issue: the timing of the technologically intensive firm's entry into an emerging industry. The alternatives were grouped into four generic categorical strategies:

First to Market: based on a strong R&D program technical leadership, and risk taking.

Follow the Leader: based on strong development resources and an ability to react quickly as the market starts its growth phase.

Application Engineering: based on product modifications to fit the needs of particular customers in a mature market.

"Me-Too": based on superior manufacturing efficiency and cost control.

The authors developed profiles of each strategy based on the five dimensions described above. The value of this conceptualization is that it provides another view of the components of the strategy construct, one especially concerned with technology-based firms. Thus the five dimensions outlined above provide additional input for the development of strategy scales in conjunction with those of Porter.

Goldman (1982) and Goldman and Muller (1982) have recently expanded the theoretical treatment of the short product life cycle (PLC) especially as it affects the marketing strategies pursued by small TBFs. Such firms are as facing highly unattractive PLCs in which the seen development time is long and the development cost is steep. introduction/growth time is long, the maturity period the is short, and the decline is fast. This type of PLC is seen by the authors as contributing to the failure of many small TBFs because they must invest a great amount of time and to develop their product. It may then require a long cost introduce it to the market due to the time to innovative nature of the product. However, once market acceptance high product diffusion rate quickly satiates occurs, a market demand, and the life cycle of the product culminates in а steeper than usual decline phase. The rapid technological change occurring in most high-tech industries is seen as the primary causal agent explaining this process (Goldman and Muller 1982).

The ability of small TBFs to operate effectively in the environment represented by the short PLC, is hampered by three managerial issues (Goldman 1982). First, in most small TBFs a gap may exist between the nature of the marketing tasks necessary and the resources available to

Second, there is a tendency of carry them out. the management of such firms to underestimate the magnitude of the marketing task they face and overestimate their abilities to effectively cope with them. And third, because base and limited of their narrow financial access to resources, small TBFs depend heavily on the success of each new product and are highly vulnerable to mistakes.

short PLC is seen by Goldman (1982) as possessing The eight operational implications for (Note: small TBFs. Goldman offers his implications not as fact supported by empirical study, but rather as speculation based on what is known about the nature of small TBFs and the strategic value of PLC. Consequently his notions the are basically hypothetical in substance):

(1) A firm facing a short PLC may have a very limited amount of time to reach potential customers. Consequently, the small TBF must institute an extensive marketing effort in order to capture as large a proportion of the available market potential as quickly as possible. This may increase exponentially the resource requirements necessary to accomplish the task given the shorter time frame.

(2) It may also be necessary for small TBFs to simultaneously appeal to a number of market segments. This may be necessary due to the rapid diffusion of the product through all segments within a very short time period.

(3) The success of the marketing program is not only seen as a function of the number of customers contacted, but also the proportion "converted", that is the number out of

the total contacted that ultimately buy the product. This proportion is seen as a function of the intensity and quality of the firm's marketing effort.

(4) STBFs reduce the risks and uncertainties involved the introduction of a new product through the mechanism in of learning by doing. Firms utilizing this mechanism learn about the market early in the marketing process and apply is learned in later time periods. By adjusting what and changing its marketing approach on the basis of earlier experiences, the firm avoids expensive mistakes and improves the effectiveness and efficiency of its marketing efforts.

(5) The short PLC inhibits the small TBF from making simultaneous commitments to R&D and marketing. This inability to maintain the technological edge may cause such firms to lose ground to larger, better financed competitors.

(6) Technological products are characterized by long lead times which reduces the flexibility of a company and ability to quickly respond by a change in its product its offering. Since many small TBFs are dependent on the success product offering, should it of a single fail in the marketplace, there may not be enough time to develop a replacement.

(7) Since technologically sophisticated products often require a heavy investment in R&D and engineering, small TBFs face characteristically long payback periods. The combination of a short PLC and a long payback period places difficult demands on the firm to achieve payback, breakeven

and adequate return on investment in the short time available to it.

(8) The rapid obsolescence of most technological products followed by users quickly switching to the latest offerings, characterize the steep decline stage. This situation is seen by Goldman as placing additional burdens on management because the total market position of a product can be lost in a short period of time not leaving the firm enough time to gradually shift its emphasis to an alternative product.

In elucidating on the relationship of a short PLC to other strategic factors influencing STBF activities, Goldman has made a valuable contribution to this study by suggesting additional dimensions to the strategy construct.

Together the work of Porter (1980), Ansoff and Stewart (1967), and Goldman (1982) provide insight into the nature of the strategy construct and the dimensions which can be associated with it. Ansoff and Stewart and Goldman are especially useful with regard to the uniqueness of the strategic dimensions within technology-based industries. In the following chapter the manner in which their observations are used for the measurement of STBF stategies is discussed and illustrated.

<u>Studies of Small Business Strategy Content</u>

Empirical evaluations of small business strategy content (as opposed to strategy formulation procedures or strategic planning activities) is sparse. Recently, Robinson and Pearce (1984) reviewed over 30 strategy related articles in the small business management area. The studies were classified by them into four areas: (1) research to confirm empirically the presence or absence of strategic planning practices; (2) research to confirm the value of strategic planning; (3) research to examine the appropriateness of specific features of the planning process; and (4) research to examine empirically the content small firm strategies. Yet, despite the volume of of research that was accomplished they found only two articles that investigated small business strategies (Sineath, Hand and Robinson 1982, and Dess and Davis 1982). Neither of which used STBFs as a sampling frame nor addressed the research problems explored by this study.

<u>General conclusions regarding the strategy construct</u> <u>literature</u>

The first observation that can be made regarding the previous review of strategy related literature is that apparently the prescriptive guidelines for the development of strategy in technology-based industries (Ansoff and Stewart 1967, and Goldman 1982) are exclusively directed toward strategies classified into the second cell in Table 6. That is, they are concerned primarily with strategies intended to avoid dependence through some kind of environmental modification.

Additionally, the same sources suggest that these strategies are partially related to the power of functional subunits within the firm. For example, Ansoff and Stewart

(1967) imply that the ability of a firm to exhibit a high degree of downstream coupling results from nearly equal amounts of interorganizational power between R&D. marketing functional areas. Likewise. production, and Goldman (1982)submits that high degrees of intraorganizational power in the R&D/engineering area driving a state of the art technology strategy may have adverse financial performance effects.

Furthermore, the guidelines of Porter (1980) for analyzing strategic content, along with the writings of Ansoff and Stewart (1967) and Goldman (1980), are consistent with three fundamental premises of this study; that external and internal environmental factors may drive strategy choices, that strategy is multidimensional, and that the strategies pursued by firms may vary across industries.

And lastly, the current empirical knowledge about the state of small business strategies provides no insight into the relationships between the environmental factors of concern and strategic choices by STBFs.

Thus the strategy literature reviewed does appear to linkages with the external and internal resourcepossess related conceptualizations illuminated earlier in this chapter, and reveals a gap in knowledge about the nature and content of STBF strategies. The implications of this be examined in the concluding section of conclusion will this chapter.

PERFORMANCE LITERATURE

In this section the concept of firm performance, or the broader rubric of organizational effectiveness, for small organizations will be reviewed. As in the previous sections devoted to the environment and strategy constructs, conceptual issues concerning performance measurement will be addressed first, followed by empirical studies related to performance characteristics of STBFs.

Relevant Theory

A key underlying premise to the study of firm strategic behaviors or strategies is that such actions are undertaken with some favorable result in mind. The problem that arises however, concerns identification of the appropriate measures of performance (or as it is sometimes termed, organizational effectiveness).

commonly used performance measure among studies of Α smaller firms is success or failure (Schollhammer and Kuriloff 1979, Robinson and Pearce 1984). Though success or failure (going out of business) may be conclusive measures of effectiveness, studies using such nonspecific criteria offer little help to the small business manager who needs specific information. Furthermore, they are of little use to the researcher interested in studying either existing small and growing firms or in examining multiple dimensions of organizational effectiveness in these firms. Public policy makers and administrators also have a need for more specific indicators of firm effectiveness, especially with

respect to specific public policy goals such as creating employment growth.

Considerable research has been devoted to the issue of organizational effectiveness, yet as Robinson (1983) has devotes virtually all of its attention to observed, it larger organizations (Cunningham 1977, Rhorpade 1972. Kirchoff 1975, Mahoney 1969, Mott 1972, Thompson 1967, and Yuchtman and Seashore 1967). The predominant issue in this literature, according to Robinson's (1983) review, is whether organizational effectiveness is better assessed bv looking the goals of the organization or by taking a at systems approach and looking at the organization's ability to satisfy itself and others at points of interdependence.

It should be noted here that Pfeffer and Salancik view organizational effectiveness as an external standard of how well an organization is meeting the demands of the various organizations that are concerned with groups and its activities (1978, p.11). Thus, the performance measurement issue relevant to this study is whether or not a measure of effectiveness utilized is appropriate for assessing how well organization responds to its an interorganizational dependencies.

The seminal work related of to assessment organizational effectiveness within small firms is Friedlander and Pickel's (1968) investigation into the components of effectiveness in small organizations. They took a systems approach and identified several components of effectiveness. These are:

- Societal-Environmental: community, government, customers, suppliers, creditors.
- 2) Owners: profitability, growth.
- 3) Employees: satisfaction.

Friedlander and Pickle surveyed ninety-seven small firms and the components (such as customers) involved with these firms. They examined the degree to which fulfillment of the needs of the organization's environmental components fulfillment of related to the needs of the was organization's internal subsystems (owner and employees). They found:

"...that there are only a moderate number of relationships between the degree to which the organization concurrently fulfills the needs of its internal subsystem components (employees), its owners, and the components of its larger society"(p.299).

However, upon reinterpretation of their findings (based on correlation analysis), Robinson (1983) concluded that:

"...there are four major components of organizational effectiveness in small firms from a systems theory perspective: community involvement, customer satifaction, owner return, and employee satisfaction

Furthermore, effectiveness as measured by improvement in profitability and growth in sales appears to be significantly associated with increased effectiveness as measured by satisfaction of community, customer, and employee needs."(p.24)

Robinson's reinterpretation and conclusions have important implications for the small firm researcher with limited access to the latter effectiveness measures or with a need to focus upon financial measures of effectiveness.

Several other authors have advanced the importance of basic financial measures. Cooper (1981) has suggested that small firms have limited resources to withstand bad

decisions. Therefore he argues, small firms must be particularly attuned to short-term profitability. Drucker small firms must (1977) argues that concentrate upon profitability and growth in sales if thev are to successfully cope.

Hammermesh, Anderson, and Harris (1978) made a strong argument for an emphasis on profitability as the primary performance measure for low market share firms. They consider it much more important than growth in sales or the market share as objective in the development of strategies in small firms. Several others have made the same argument (Abdelsamad, Degenaro, and Wood 1977, Ward 1975, Edmunds 1979, Ellis 1975, and Woodward 1976).

The dissertations of Alves (1978), Edmister (1970) and Gru (1973)multiple discriminant applied analysis to determine the best predictors of successful versus unsuccessful small firms. In all three studies, a measure profitability and a measure of change in sales proved to of be the most significant components of predictor equations.

In his review of the organizational effectiveness literature Robinson concludes that evidence suggests two issues appear central to developing operational criteria for effectiveness in small firm research: organizational (1)identification of the most appropriate conceptual framework which to define organizational effectiveness, from and (2)identification of the most appropriate measures of organizational effectiveness (1983, p.27).

The consensus from the research reviewed seems to be that growth in sales, growth in profits and return on sales offer the most practical indicators of organizational effectiveness. The rationale underlying these choices are found in their general ease of accessibility and, as Robinson (1983) illustrated in his reinterpretation of the Friedlander and Pickle data, in their implicit linkage to frameworks for basic theoretical conceptualizing organizational effectiveness (such as the systems approach of Yuchtman and Seashore 1967, or the constituent approach Thompson 1967). Pfeffer and Salancik in developing of the resource dependence theory relied on conceptualizations developed by both Thompson and Yuchtman and Seashore and felt that growth, regardless of how achieved, provides with additional control organizations over their environments and enhances their likelihood of survival (Pfeffer and Salancik 1978,pp.131-139).

Robinson concludes:

"Thus, profitability and sales growth can be viewed as surrogate measures of a small firm's effectiveness in meeting the needs of key constituencies. For small firm research, sales growth and return on sales offer readily available, reasonably accurate effectiveness measures that also appear to be operationally consistent with three different frameworks for conceptualizing organizational effectiveness."(p.29)

Studies of STBF Performance/Organizational Effectiveness

Given the previous discussion regarding the appropriateness of particular types of measures when studying smaller firms it is useful to examine how the performance characteristics of STBFs have been evaluated in

the past. The indicators most often associated with technology-based firms generally fall into three categories: (1)studies of the innovative efficiency of STBFs; (2) studies of the sales and employment growth characteristics of STBFs; and, (3) studies of STBF survivability and Studies representing each category profitability. are briefly reviewed in this section.

Innovative Activity:

Ample evidence exists that STBFs play important roles in the development and diffusion of innovations. The Small Business Administration in the 1983 Report of the President detailed the results of several studies on the frequency of innovations by small firms or independent inventors major (pp.121-128). In addition, Wetzel (1982) has reported the results of four studies concerned with the ratio of innovations to R&D employment and/or expenditure as well as innovation frequency. On the surface the studies reported SBA Wetzel present a strong case bv the and for the innovative efficiency of small firms in general and STBFs in particular. The following three examples from the SBA report illustrate the nature of the findings.

extensive studies (Gellman One the most of and Associates 1982) cited by the SBA covered 635 product innovations marketed in the United States during the 1970s and represented 121 industries (4-digit SIC code level). Products identified from trade journals were tracked by telephone inquiries and mail questionnaires to the

innovating firm or individual. Forty percent, or 226 firms, of the 563 successfully tracked firms were small technologybased businesses. The results of the study indicated that small businesses contributed a disproportionately greater share of product innovations (2.5 times as many as larger firms) and brought those products to market faster than larger businesses (2.22 versus 3.05 years).

Obermayer (1981) in a study on the use of patents in technologies, reported that small companies brought new product improvements or modifications to the marketplace in than 12 months and new products in less than 2 years. less This contrasted with larger firms in the study which took more than a year for most product modifications, and over two years for new product introductions.

And lastly, Mueller et al (1982) investigated the role of small business in process innovation. In their study of award winning improvements introduced into the food processing and manufacturing industries, the authors found 45 percent of the 226 innovations tracked that were introduced by small businesses with less than \$10 million in annual sales. Further. three industry groupings in (machinery manufacturing; plant maintenance, sanitation and design; and instrument and controls manufacturing), small firms contributed one-half or more of the award winning innovations.

The findings illustrated above have attracted considerable public policy attention to STBFs. Presumably

developing infrastructures conducive to fostering innovative activity STBFs will result in further bv innovative Unfortunately, as the studies presented above activity. attempt has been made to link show. no measures of innovativeness to other explanatory constructs besides firm size. Thus, little guidance is available, apart from anecdotal observations, to help develop the necessary support systems and therefore increase the efficiency of expenditures. Innovative performance may occur public because firms are attempting to avoid the dependence or control associated with a well meaning yet meddlesome resource supplier, especially those STBFs with strong R&D orientations. The studies reported by the SBA and Wetzel neglect these relationships. It may be interesting to know, Gellman study determined, the that STBFs bring as innovations to the market faster than larger firms, but such factual information does little to enhance understanding of the reasons behind the observation.

Sales and Employment Growth:

Apart from their innovative activities, STBFs have received considerable public policy attention because of studies which indicate that they may contribute to the total pool to a greater extent than other small iob firms. However some confusion seems to exist about what the results the studies actually reveal. A separation must be made of between the sales and employment growth rates of STBFs at the firm level and their total aggregate economic

contribution in each of these areas.

The SBA has extensively documented the role that small businesses in general play in the job and capital creation process (see the SBA report <u>The State of Small Business: A</u> <u>Report of the President 1983</u>, Chapter 3 for a recent review of research on the topic), however studies related to STBFs are sparse. Two frequently cited studies are the following:

The first, by the Massachussets Institute of Technology Development Foundation (Morse and Flender 1976), shows compounded average annual growth rates from 1969 to 1974 for the following three groups of companies:

Growth Areas

	Sales	Jobs
Mature Companies	11.4%	0.6%
Innovative Companies	13.2%	4.3%
Young High-Technology Companies	42.5%	40.7%

(NOTE: In this study, Mature Companies were Bethlehem Steel, Dupont, General Electric, International Paper, and Proctor & Innovative Companies were Polaroid, Minnesota Gamble. Mining and Manufacturing, International Business Machines, Xerox, Young and Texas Instruments. High-Technology Companies included Data General, National Semiconductor, Compugraphics, Digital Equipment, and Marion Laboratories. The companies selected in each group were, in every case, leaders in their particular industry. Also it is important note that number of different industries to а were represented.)

The MIT report states:

"It is worth noting that during the five year period, the six mature companies with combined sales of \$36 billion in 1974 experienced a net gain of only 25,000 jobs, whereas the five young, high-technology companies with combined sales of only \$857 million had a net increase in employment of almost 35,000 jobs. The five innovative companies with combined sales of \$21 billion during the same period created 106,000 jobs." This study also observed that the innovative companies produced three times the level of tax revenues as a percentage of sales as did the mature firms.

Conclusions similar to those mentioned above emerged from a study of 269 firms by the American Electronic Association (United States House of Representatives 1978). The report showed the following growth of employment for new established firms as contrasted to more mature companies:

Years Since Founding	Stage of Development	Employment Growth <u>Rates in 1976</u>
20+	Mature	0.5%
10-20	Teenage	17.4%
5-10	Developing	27.4%
< 5	Start-up	57.7%

The study also reported that the annual benefits to the economy realized in 1976 for each \$100 of equity capital that had been invested in Start-up companies founded between 1971 and 1975 were:

- Foreign Sales	\$70 per year
- Personal Income Taxes	\$15 per year
- Federal Corporate Taxes	\$15 per year
- State and Local Taxes	\$ 5 per year
- Total Taxes	\$35 per year

According to the study,

"this data shows that the benefits of investment in small innovative ventures are large (e.g., jobs are created and these jobs are kept at home -- exports are created instead of imports -- a new \$35 per year flow in tax revenues is realized for each \$100 initial investment). This large and powerful flow of benefits starts soon after the investment is made, and the benefits are substantially greater than those of large corporations." Despite these findings, it remains to be explained why STBFs exhibit the growth dynamics which they appear to possess. As in the case of innovative activity, indicators of employment and sales growth are only linked to firm size, no other constructs have been evaluated.

Survivability and Profitability:

Additional insight into the performance characteristics of STBFs has been provided by research findings on discontinuances, survival rates, and profitability of small businesses. Cooper (1982) reviewed the small business management literature in this area and illuminated contrasts between STBFs and other small firms. Some of the more important results are summarized below.

Cross-sectional studies showed in general that:

- One of three new firms survived the first four years.

- Not all discontinuances were failures in economic terms. In only a small portion (less than 5 percent) of all discontinuances did the creditors lose money.

- Available data on manufacturing firms showed that, when all firms within a given size class were averaged, profitability increases with size. However, such statistics neglected strategies small firms used to minimize tax liabilities by paying large salaries or perquisites to the owners.

- Large corporations that showed a loss were less unprofitable as a group than the smaller corporations which showed losses.

- For profitable small firms, return on net worth was higher than for the profitable larger firm. These smaller companies, well conceived and well managed, earn the highest returns in American industry.

While few of the cross-sectional studies reviewed dealt exclusively with STBFs, Cooper did review six longitudinal



studies, of which two focused on high technology firms (Roberts 1972, Cooper and Bruno 1977). Two others focused new manufacturing businesses (Kinnard and Malinowski on Hoad and Rosko 1964), one on service and retailing 1960. (Mayer and Goldstein 1961), and one looked at firms a11 businesses with new or transferred ownership operating (Churchill 1955). In general, according to Cooper, the results indicated that:

- A higher percentage of non-TBFs failed to survive the first few years. This was contrasted with a much lower rate of discontinuance among TBFs.

- There were major differences in the rate of merger or acquisition. TBFs exhibited a higher rate than non-TBFs.

- The rate of acquisition or merger also differed in that physical assets were less important than the product lines and technological capabilities. These results suggested that rather than discontinuation, TBF managers saw acquisition as an "escape route" for marginal or unsuccessful firms.

- In those non-TBFs which survived, performance or profitability was low to modest. For instance, in one study only 2 of 41 survivors at the end of two years had more than 4 employees (Mayer and Goldstein 1961). A second study reported that 21 of 59 survivors had fewer than four hired employees, and only two of the firms had more than 40 employees. The owner's salary plus profit for the median firm was only \$10,000 per year (Hoad and Rosko 1964).

- For TBFs performance was substantially better. A typical firm in one study achieved annual sales of \$1.5 million after four to five years (Roberts 1972). The second study reported 27 of 250 firms with sales in excess of \$5.0 million and 20 with sales in excess of \$10 million. Return on equity however, varied between 0-3.0% for most years (Cooper and Bruno 1977).

Overall the longitudinal results suggested modest growth and economic returns for most of the surviving firms. However, there appeared to be considerable variation in the staying power according to the type of firm. Retail and service firms had the highest discontinuance rates and the lowest average employment among survivors. Manufacturing was next, and TBFs had the highest survival rates and the highest average growth among surviving firms.

Cooper isolated from previous studies a set of performance and founding characteristics which seemed to be consistently associated with most successful firms in each group. Two of them were resource related and suggested that success generally attended founders who had more initial capital (Roberts 1972, Mayer and Goldstein 1961, Lamont 1969), and who had systematically sought the advice of professional advisors as they started their firms (Hoad and Rosko 1964).

Summary:

The results of the studies reviewed in this section can be summarized in the following way:

	Performance Outcome	Explanatory Variables	Research Results
1.	Innovative Efficiency	Size of Firm	Inconclusive Associations
2.	Sales and Employment Growth	Age of Firm/Industry	Generally Positive Correlations
3.	Survivablity, and	Resources and Founder Characteristics	Consistently Positive Correlations
	Profitability	Size	Larger Firms More Profitable
		Type of Firm	TBFs More Profitable

In general it is apparent that most of the research conducted regarding the performance characteristics of STBFs decriptive in nature and lacks explanatory power. is For part the explanatory variables hypothesized the most to influence performance outcomes have received weak support derived from inspection of the data, and in some cases contradictory results. Critical explanatory variables, such the strategies pursued by the firms or the resources and as interorganizational dependencies STBFs are known to face, have not been incorporated into the studies.

CONCEPTUAL MODEL AND HYPOTHESES

In the previous sections of this chapter various theoretical approaches are presented and shown to possess characteristics congruent with the empirical knowledge about STBFs. Thus, these approaches collectively represent the building blocks of a conceptualization that is useful for modelling the relationships reported in the literature.

The resource dependence theory of Pfeffer and Salancik (1978) forms the core of this conceptual model because it fundamental rationale from provides the an environmental for the activities which perspective an organization face of resource undertakes in the instability or uncertainty. The primary axiom provided by this theory is that because organizations are not self sufficient in terms of interact with resources. then they must other organizations in their environment to acquire those needed resources. Furthermore, virtue of these by interdependencies, external suppliers may attempt to organization's activities through influence the leverage associated with the resource they supply. Thus, the state of dependency associated with particular resources, acts as a motivator for organizational action to reduce or eliminate the dependency.

Additionally, those organizational actions (i.e., strategies) most likely reflect the biases of the functional areas within the firm instrumental in acquiring the needed resources. Thus, the dependency faced by the organization works in conjunction with the intraorganizational power of functional units to influence organizational actions (Pfeffer and Salancik 1978, pp.225-235, and Pfeffer 1982, pp.202-204).

Another axiom associated with resource dependence theory is that the strength of dependence and its influence on organizational actions, varies across environments with different degrees of concentration. Pfeffer and Salancik (1978, pp.124-125) report that existing empirical evidence suggests an inverted U-shaped relationship between industry concentration and environmental uncertainty resulting from dependence. Uncertainty being lowest at either low or high levels of concentration and being greatest at intermediate levels of concentration.

The types of strategies that firms can undertake to affect the dependency situation are quite varied (see Table 6). Since it is unknown how STBFs respond to dependency, in this study, strategy is conceptualized as a multivariate construct consisting of a number of dimensions considered characteristic of technology-based firms (Ansoff and Stewart 1967, and Goldman 1982). These dimensions of STBF strategy appear closely related to the strategies classified by Pfeffer and Salancik as strategies developed for the avoidance of dependence through environmental modification in cell 2 of Table 6 (1978, pp.106-111).

Finally, the performance construct draws upon the conceptual work of Friedlander and Pickle (1968) and Robinson (1983). They identify the appropriate set of organizational effectiveness measures to use in assessing how well the firm meets the needs of its key constituencies. These constituencies could be stakeholders or external organizations on which the focal organization (i.e., the STBF) is dependent (See the complete model in Figure 3).





Conceptual Model for the Study of the Relationships Between Resource-Dependence, Intraorganizational Power, Firm Strategies, and Performance

Hypotheses

Given the rationale behind the development of the conceptual model presented in Figure 3, and the axioms of the resource dependence theory, three hypotheses provide the theoretical focus of the empirical evaluation in this study.

Hypothesis 1: The first hypothesis is concerned with evaluating the relationship between the resource dependence intraorganizational power concepts and the types of and strategies associated with STBFs. Pfeffer and Salancik have hvpothesized that resource dependence is а fundamental motive force behind organizational action (i.e., strategies such as those outlined in Table 6), and that its strength varies across environmental contexts. Thus, it follows that as the level of resource dependence varies, its ability, in conjunction with that of intraorganizational power, to addition, given explain strategy should vary directly. In the work of Ansoff and Stewart (1967) and Goldman (1982), the strategies of concern are those found in cell 2. Table dependence avoidance / environmental modification 6. the type strategies.

The greater the level of resource H1: dependence, the greater the ability of resource dependence measures in conjunction with intraorganizational power measures to explain dependence avoidance / environmental modification type strategies.

Hypothesis 2: Pfeffer and Salancik also postulated that resource dependency can ultimately influence the survival of the firm. Therefore, it is expected that the ability of resource dependence and intraorganizational power to explain firm performance will vary directly with the variation in resource dependence across environmental contexts.

H₂: The greater the level of resource dependence, the greater the ability of resource dependence measures in conjunction with intraorganizational power measures to explain firm performance.

Hypothesis 3: Finally, since the strategies pursued by STBFs are presumed to be partially developed in response to external dependency, then it follows that as dependency varies, there should be a direct and consistent variation in the ability of dependence avoidance / environmental modification type strategies to explain performance.

H₃: The higher the level of resource dependence, the greater the ability of dependence avoidance / environmental modification type strategies to explain firm performance. APPENDIX II.A

APPENDIX II.A

EMPIRICAL	STUDIES	OF	TECHNOLOGY-BASED	FIRMS

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AUTHOR YEAR	FOCUS	UNITS OF ANALYSIS	LEVELS OF ANALYSIS	SAMPLE PLAN/ SIZE	MEASURES SCALES	STATIS- TICS	RESEARCH DESIGN	RESULTS
Lamont 1971	Model development	Transfer- red tech., innovation, markets, marketing activities	Indi- vidual, firm	Uni- verse, n=76 (60% res- ponse)	Non- metric, some metric	Sum- mary	Mail sur- vey, per- sonal in- terview (n=38)	Descriptive model
Cooper/ Bruno 1977	Survival, founder charac- teristics	Categories of success failure, founder character- istics	Indi- vidual, firm	Uni- verse, n=250	Non- metric (cate- gorical)	Sum- mary	Mail sur- vey, per- sonal in- terview, secondary sources, longitu- dinal	Documented success rates,dis- continu- ances, and acquisition rates;foun- der factors
Braden 1977	Struc- ture and opera- ting charac- teristics	Firm and founder character- istics, resource allocations	Indi- vidual, firm	Uni- verse, n=69 (41% res- ponse)	Non- metric (cate- gorical) metric	Sum- mary	Mail sur- vey, per- sonal in- terview (n=12)	Identification of "manager" and"caretaker" type founders, resource allo- cation pat- terns
National Science Found- ation 1981	Problems of small high-tech firms	Eleven problem areas (see Figure 5)	Firm	Uni- verse, n=1232 (9% res- ponse)	Non- metric (cate- gorical) ordinal, metric	Sum- mary	Mail sur- vey,per- sonal in- terview (n=71)	Documented the extent to which the various prob- lems were of high, medium or low concern

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APPENDIX II.A (Continued)

EMPTRICAL	STUDIES	OF	TECHNOLOGY-	-R	ASED	FIRMS
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AUTHOR YEAR	FOCUS	UNITS OF ANALYSIS	LEVELS OF ANALYSIS	SAMPLE PLAN/ SIZE	MEASURES SCALES	STATIS- TICS	RESEARCH DESIGN	RESULTS
Braden 1982	Relation- ship bet- ween per- formance and func- tional in- vestments	Functional investment levels,pro- fitability, age,objecti firm life cycle	Firm 	(See Braden 1977)	(See Braden 1977)	ANOVA, CORR	(See Braden 1977) Seven hypo- thses tested	Variability be- tween firm per- formance and investments in marketing was significant and inversely re- lated
Brophy 1982	Relation- ship bet- ween fi- nancing & perfor- mance	Firm sales growth, assets,age, sources of financing, location	Firm	Two areas; n=26 in each, total N=52	Metric	Sum- mary, Regres- sion	Personal interview, of matched samples	Documented that variations in financing avail- ability is sig- nificantly re- lated to perfor- mance
Kazan- jian 1984	Stage of growth	4 stages of growth, and 18 problem areas,age, size,rate of growth	Firm	n=101 sampl- ing pro cedure unknown	Cate- gorical, -interval	MANOVA, ANOVA, Factor Analysi	Mail sur- vey,cross sectional s	Evidence indica- ted that some problems more dominant in various stages of growth, also stages overlap
Krasner/ Ray 1984	Percei- ved prob- lems,per- formance, risk	6 groups of prob- lems,5 risk ca- tegories, revenues, number of employees	Firm	Random, from SR databas n=21,(i tial fr total o N=179)	Metric I e, ni- om f	Sum- mary	Mail sur- vey,cross sectional, robotics, and bio- tech firms	Indication of differential impact of prob- lems depending on performance level
Dollin- ger 1985	Environ- mental contact, perfor- mance	Percent- age of time in contact w/9 types of external groups,per- formance	Firm L	Random, from telepho directo n=82	Metric ne ry	Sum- mary, partial CORR	Mail sur- vey,cross sectional, small busi- ness	Significant but low levels of variation in firm perfor- mance explained by environmen- tal contacts

CHAPTER III

RESEARCH PROCEDURES

chapter outlines and discusses the research This procedures and criteria used: (1) in selecting the hightechnology industries which supplied the universe of firms (2) in developing participating in the study, the operational measures of the research variables, (3) in designing a specific data collection format, and (4) in statistically analyzing the data collected.

SAMPLE SELECTION PROCEDURE

In choosing a sample frame the criteria appropriate for identifying a technology-based industry must be delineated. In the following section various definitional methods are discussed and one is chosen for use in this research.

<u>High-Technology</u> Industries: <u>Definitional</u> Controversy

Experts differ as to the makeup of the high-technology While there no widely industry group. is accepted definition of high technology industries, three criteria are often used to classify high tech industries: (1) research (2) the and development expenditure levels, use of scientific and technical personnel relative to total (3) the level of product sophistication employment, and (Riche, Hecker and Burgan 1983).
A recent document prepared by the Office of Technology Assessment (1982) illustrates a complex approach to the problem by considering a series of factors believed critical in the description. It points out that these companies typically use state-of the-art techniques, have a high proportion of R&D costs, employ a high proportion of scientific, technical and engineering personnel, and serve small specialized markets.

Other government agencies have formulated definitions to suit their own particular research needs. The International Trade Administration in a recent report, presented four techniques for defining technology intensive trade, one identified industries, and three focused on products. (ITA 1983)

The industry-based definition uses two measures frequently employed in examining high technology: R&D expenditures as a percentage of industry value added, and industry employment of scientists, engineers, and technicians as a proportion of the industry work force. These measures allow the discrimination between technology intensive and high technology industries.

Two of the product-based measures are similar. One uses R&D expenditures by product field and value of product shipments to develop R&D intensity ratios. Products can then be ranked according to R&D intensity and categorized into different technology levels. The second method follows the same methodology but combines the information with Standard International Trade Classifications.

The third product-based definition utilizes inputoutput analysis and R&D expenditure and shipment data by product group to develop an index of technological intensity. Product groups are then ranked according to total R&D to shipments intensity, with only those groups showing a significant R&D intensity designated as high tech products.

More recently, the Bureau of Labor Statistics (1983) developed three groupings of high-tech industries (see Table based on three criteria: (1) a steady stream of 8) new products as a result of technological advancement, (2) the of scientific and technical workers ratio to total employment, and (3) the proportion of R&D expenditures to sales. Group I, labeled High-Tech Manufacturing Industries, consisting of nine three-digit SIC code industries, possess high proportion of total employment in scientific and а a11 technical occupations, twice the average for manufacturing (cutoff of 12.6%), and a high proportion of net sales devoted to R&D, also twice the average for a11 manufacturing (cutoff of 6.2%). Group II, Technology-Intensive Manufacturing Industries consisting of eleven three-digit SIC code industries, have one to two times the average proportion of workers in scientific and technical occupations (6.3% to 12.6%), and spend less than the average ratio of R&D to sales (<3.1%). Group III or High-Technology Industries do not produce high tech products, Service but contribute to the development of such products through research and development activities and computer services.

Table 8

High-Technology Industry Groups

SIC	Industry	<u>High-Tec</u>	chnology	Group
		I	II	III
283	Drugs	x		
357	Office, computing and accounting machines	х		
366	Communications equipment	х		
367	Electronic components an accessories	x		
372	Aircraft and parts	х		
376	Guided missiles and space vehicles	x		
381	Engineering, laboratory, scientific, and research	:h		
	instruments	x		
382	Measuring and controlling instruments	x		
383	Optical instruments and lenses	x		
28 [*]	Chemicals and chemical products		x	
291	Petroleum refining		x	
348	Ordnance and accessories		x	
351	Engines and turbines		x	
355	Special industry machinery, except metalworking		x	
361	Electric transmission and distribution			
	equipment		x	
362	Electrical industrial apparatus		x	
365	Radio and TV receiving equipment		x	
369	Miscellaneous electrical machinery		x	
384	Surgical, medical and dental instruments		x	
386	Photographic equipment and supplies		x	
737	Computer and data processing services			x
7391	Research and development laboratories			x

* except 283

Source: U.S. Employment Picture in the Eighties, Congressional Record 1983:H241-30.

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In this study, the approach offered by the Bureau of Labor Statistics is used because: it includes criteria found in manv other definitional approaches, it is clearly oriented to identification of industries rather than hightech products, and, it provides a listing of those industries meeting its classification criteria whereas the others only provide guidelines (see Table 8).

Industry Selection Procedure

The sampling frame for this study was derived from the nine industries identified as Group I or High-Tech Manufacturing Industries defined above. Two industries were utilized to verify the research hypotheses identified earlier. Since it was desired that industries populated by large numbers of STBFs be selected, those four digit (SIC code) technology-based industries with the highest degree of fragmentation were identified on the basis of the following procedure (Scherer 1980, p.57):

-First, two three-digit industries were chosen which had the largest number of firms as determined from the 1982 U.S. Census of Manufacturers.

-Second, the industry concentration ratios for the largest 4, 8, 20, 50 firms in each four-digit case were obtained from the 1982 quinquennial edition of the U. S. Census of Manufacturers.

-A Lorenz curve was fitted to the four data points provided.

-A Gini coefficient was computed indicating the amount of departure between the Lorenz curve actually observed and the curve that would appear if all firms had equal market share or sales (a uniform distribution). A Gini coefficient of zero indicated perfect equality of firm shares, while a coefficient of 1.0 revealed total inequality with the leading firm producing all of the output.

-Two industries with low Gini coefficients, unequal concentration ratios, and with large populations were chosen to provide the sampling frame for this study.

It is widely agreed that the four-digit level of analysis is a satisfactory one for between and within industry comparisons (Porter 1980, and Scherer 1980). As is discussed later in this chapter, questionnaires were then mailed to all firms in each industry.

OPERATIONAL DEFINITIONS AND MEASURES OF VARIABLES

In this section the operational definitions and measures of the variables used for testing the research hypotheses are delineated. Those definitions and measures associated with the resource dependence, intraorganizational power, strategy and performance variables are presented respectively (see the conceptual model, Figure 3, on page 76 for reference).

Resource-Dependence Variables

In this study an overall measure of resource dependence, for each resource investigated, was combined measures of functional intraorganizational power as with part of the independent variable set. As discussed in the previous chapter, resource dependence is a function of three resource importance (RI), discretion basic components: over use and allocation of the resource (DIS), and the concentration of alternative sources (CON). Each component consists of several measures.

Before the operational definitions and measures of the resource-dependence variables are presented, two important issues need to be clarified. The resource-dependence theory requires that both the critical inputs or resources which the firm needs to function successfully, as well as the suppliers of those resources, be identified.

With respect to the type of resources required, the review in Chapter II of the conceptual and empirical work related to environmental effects on STBFs, illuminated a number of different types of resources consistently associated with STBF formation and operation. Using these secondary sources three types of resources were identified as being critical for STBF operation and success *:

- Financial resources: both to support on-going market operations and to invest in promising R & D projects.
- (2) Market information or intelligence: in order to assess the nature of consumer needs as well as competitive activities.

^{*} The procedure for arriving at the list of resources and suppliers was as follows. Drawing from the findings of Lamont, Braden, Brophy, and others (see Tables 2 and 3 on pages 29 and 32) 6 exhaustive categories of resources and 15 categories of suppliers were identified from the the studies reviewed. If the category was mentioned at least twice by two different researchers it was included in the list. Thus, the salient resources and suppliers were inductively derived from secondary literature sources. No focus groups, or individual depth interviews were performed.

(3) Technological and Managerial expertise: necessary for generating a continuous stream of product innovations and avoiding or staying ahead of obsolescence, and for developing and administering effective strategies in a scarce resource environment.

Secondly, since one of the main postulates of the resource-dependence theory is that organizations vary in of their resource endowments and therefore rely upon terms suppliers to provide what they lack, it is necessary to provide some description of their ecological context. A useful in this regard is the notion of concept an (Evan 1966). Defined those organization-set as organizations with which a focal organization interacts in pursuit of its goals, Evan (1966) proposed that an examination of the organization-set would enable greater understanding of both the internal structure and behavior of the organization. Of the many properties of organizationsets identified by Evan, three were utilized in this study:

- (1) The nature of the organization-set: the types of external organizations or groups with which the focal organization interacts.
- (2) The size of the organization-set: The absolute number of organizations or groups of each type with which the firm interacts.
- (3) The diversity of the organization-set: The degree to which reliance for particular resources is concentrated within certain types of organizations.

Pfeffer and Salancik (1978, p.84) suggest that a "useful guide for developing a list of relevant interest groups is to consider what resources and activities are critical to the organization and what individuals or groups do at present, or could potentially, provide or affect those resources."

Again, drawing from the secondary literature reviewed earlier a list of groups and organizations was inductively derived and used in this research as representative of the organizational-sets relied upon by most STBFs for resource acquisition purposes.

Twelve categories were delineated:

Banks or other lenders
State/local government agencies
Joint venture partners
Federal government agencies (SBA,DOD)
Raw material/component suppliers
Holding companies or parent firms
Internally generated
Others

This list of organizations was used to order the data collected on resource requirements into categories of potential influence. The manner in which this was accomplished is discussed in the following sections.

Resource Importance:

The resource importance variable is defined by Pfeffer and Salancik as "the extent to which the organization requires it (a resource) for continued operation and survival"(p.45). They further explain that resource importance possesses two dimensions: the relative magnitude of a resource exchange, and, the criticality of the resource to the continued functioning of the organization, each of which must be operationally defined.

Criticality is defined operationally as:

The rated importance of a designated resource type to the successful implementation of the firm's strategic activities within a designated time period.

Relative magnitude is defined operationally as:

The proportion of a designated resource type contributed by each member of the firm's organization set.

The relative magnitude of a resource was measured by assessing the proportion of total inputs (a designated type of resource, such as financing) accounted for by a particular exchange (such as the firm's lenders). For example, the constant sum scale used took the following form (see page 5 of the questionnaire in Appendix III.A for the final form used):

> Assign 100 points across each of the following types of organizations or individuals so as to reflect the proportion of your firm's overall financing each contributes: (Include any research grants received, or any other similar funding in your consideration)

Banks Venture Capital Firms Government Agencies	
•	
•	
•	
etc.,	100

This measure is not without precedent, Knoke (1983) in an empirical study of social influence associations based on the resource dependence paradigm, used a constant sum scale to measure the percent of an association's annual budget that was contributed by outside organizations. Knoke investigated the relationship between resource transactions (money, information, and moral support), as measures of resource dependency, and an association's influence reputation in a community.

The criticality of a resource in the functioning of an organization is more difficult to determine than the sheer magnitude of its use. A resource may be critical although it contributes only a small proportion of the total input. Further, its criticality may vary over time as the nature of the environment changes (Pfeffer and Salancik 1978, pp.46-47). For purposes of this study criticality was assessed by asking respondents to rate the importance of each designated resource to the firm in the conduct of its current competitive activities. For example (again see Appendix III.A page 4 for final form):

"Using the scale below;

Not At All Extremely 2 5 Important 3 4 6 Important 1 Please indicate the extent to which the following types of resources have been important to your firm's strategic activities in the last year.

- Operating Capital
- Investment Capital
- Consumer/Customer Information
- Competitor Information
- Technological Expertise
- Managerial Expertise

Discretion over resource allocation and use:

The second major determinant of dependence is defined the extent of discretion over allocation and use of a as resource possessed by an actor outside of the firm. Pfeffer Salancik identified and described four bases of control and externalities may use over resources: possession or ownership in total or partially (such as in the case of patents or copyrights), regulation of access to a resource (such as gatekeepers of various kinds), actual use of the resource (such as employees using company vehicles), and, ability to make rules regulating the allocation and use of resources (such as SEC regulations governing investment procedures)(1978, pp.48-49). The "ability to make rules" was chosen for this study because if an external group possesses the ability to make rules, then presumably they could influence the other three control processes as well.

A variety of mechanisms for "making rules" and influencing internal decisions and actions have been investigated. Mintzberg (1979, pp.65-67) has identified the following five control mechanisms: social norms, specific constraints, pressure campaigns, direct controls and membership of the board of directors.

In order to capture the power of an external actor to influence decisions and actions by making of rules or regulations governing the use of a resource, two aspects of interorganizational power were measured, perceived power and potential power. Perceived power is defined as the subjective evaluation by an individual of the ability of a

social actor to influence decisions and actions within the focal organization. Potential power is the ability a social actor may possess by virtue of its qualities to influence events within the focal organization. Power in the former case was measured subjectively, and in the latter case it was evaluated objectively.

Perceived power is operationally defined as:

The rated ability of each organizational-set member to exercise influence over the decsions and actions of the focal organization.

This was measured with the following scale (see page 6 in Appendix III.A for final form):

"Using the scale below;

No Strong Influence 1 2 3 4 5 6 Influential

Rate the extent to which each of the following organizations or individuals are able to exercise influence over the way critical resources are used by your firm.

(This item would be followed by a list of organization-set members)

An objective measure of potential power over the internal operations of the firm is the number of outside sitting on the firm's board of directors (see directors 1980, and Mizruchi and Bunting 1981, for a Provan et al discussion of this measure).

Therefore, operationally, potential power is defined as:

The proportion of total board of directors membership filled by individuals from outside the company who represent organizations or groups in the firm's organization-set which have supplied some proportion of the focal organizations designated resource requirements.

It	can be measured by asking respondents to answer the
following	two items (see Appendix III.A pages 5 and 7):
(1)	"Indicate the total number of members of your firm's Board of Directors."
	number of members
(2)	"Indicate the number of individuals sitting on your Board of Directors who are employees, members, or otherwise represent the following groups or organizations:"
	Bank Venture Capital firm Distributer/dealer
TT 1	
Ine	overall potential power (PtP) measure for a
particula	er organizational set member type (j), was then
computed	in the following manner:

PtP_j = Number of board members from organization set member Total number of board members

The results of the perceived power (PcP) and potential power (PtP) measures were then combined arithmetically to arrive at an overall discretion (DIS) score for each organization-set member (j):

 $DIS_j = PcP_j + PtP_j$

(Note: Discretion is theorized to vary directly with the level of dependence which an organization may experience, so that, the more discretion externalities possess over resource use and allocation, the greater the amount of dependence.)

Concentration of alternative sources:

The dependence of one organization on another also derives from the concentration of resource control or "the extent to which input or output transactions are made by a relatively few, or only one significant organizations" (Pfeffer and Salancik 1978, p.50). The issue is not the sheer number of potential suppliers, but whether the focal organization has access to alternative sources. This element of dependence is consistent with the third property of the organization-set noted earlier -- diversity -- or the extent to which the focal organization depends on a few or many elements of its organization-set for resources (Evan 1966, p.179).

Operationally, then, the concentration rating for a given type of organization set member is defined as:

That proportion of the total organization set contributing resource (i) that organization-set member (j) represents.

The CON measure for a particular organization-set member type (j), was therefore:

CON_j = Total # of organization-set type (j) contributing some proportion of resource (i) Total # of organization-set types contributing (i)

Again this measure is similar to the one used by Knoke (1983). It differs in that his measurement combined all resources together rather than examining each resource type separately.

The overall resource dependence score for a respondent was then computed from the values of criticality (C),

relative magnitude (RM), discretion (DIS), and concentration (CON). Dependence is defined by Pfeffer and Salancik (1978, p.51) as "the product of the importance of a given input or output to the organization and the extent to which it is controlled by a relatively few organization." Implied in their definition is a multiplicative relationship between the components described above.

Thus the dependence score for resource type (i) was calculated in the following manner:

$$DEP_i = C_i \sum_{j=1}^{m} RM_{ij} DIS_j CON_{ij}$$

Where:

It should be noted that Pfeffer and Salancik's verbal description of the relationships between the components of dependence was taken quite literally in the derivation of the above dependence score formula. Thus, its configuration is unique to this study and should be considered as an index developed to concisely capture the values of the various components of dependence. It validation as a measure will be addressed later in this chapter.

Intraorganizational Power Variables

The intraorganizational power (IP) variables comprise the second half of the independent variable set. The notion dependencies experienced by focal organizations that the be manifested by intraorganizational power variations wi11 within firms, has received some research attention. Hickson (1971) noted that power accrues to those et al the in organization able reduce uncertainties for to the Salancik and Pfeffer (1974) have organization. indicated that the power of a department in an organization is а function of the amount of important resources contributed by of formulations the department. Both these are also consistent with the recent constituency-based model of the firm advocated by Anderson (1982) who notes that,

> "...functional areas that negotiate vital resource exchanges will come to have greater power within the corporation...Thus, the constituency-based model views the major areas as specialists in providing functional particular resources for the firm. The primary objective of each area is to ensure an uninterrupted flow of resources from the appropriate external coalition"(p.22).

Intraorganizational power has been conceptualized as a function of three elements (Hickson et al 1971):

(1) The ability of the subunit to cope with the organizational uncertainties or contingencies.

(2) The substitutability of the subunit's capabilities.

(3) The degree of pervasiveness of the subunit within the organization, or the relative effect one subunit has on others.

Therefore, the intraorganizational power of а particular functional area can be seen as a function of its ability to deal with uncertainties in the firm's environment by acquiring critical resources, the substitutability of its capabilities for another functional area's by contributing to overall firm success, and the pervasiveness of its influence throughout the firm. Greater intraorganizational power will accrue to that functional area best able to acquire needed resources, the least substitutable with regard to overall firm success, and possessing the highest degree of influence within other functional areas.

According to Hickson et al (1971), each of these factors represent separate dimensions of intraorganizational power and were operationalized and measured separately. They were then combined to give an overall intraorganizational power score for each functional area within the respondent firms.

Operationally, each component is defined as:

The ability to cope with uncertainty (ABT) is reflected by the extent to which each functional area (k) contributes a proportion of a designated resource type (i).

Substitutability (SUB) is the proportion of the contribution made by a designated functional area (k) toward the overall success of the firm.

Pervasiveness (PER) is the rated ability of a designated functional area (k) to influence the activities within other functional areas.

For purposes of this study a functional area within the firm refers to a set of activities that are similar in

While it is unlikely that small firms nature. have formalized subunits devoted strictly to some function, such a marketing department, Lamont (1971) and Braden (1977) as documented that STBFs typically pursue activities in seven functional areas: general administration, accounting/finance, engineering/R&D, marketing/sales, personnel/staffing, production/manufacturing, and public relations. Therefore these seven areas were used in this study for the collection of intraorganizational power related measures.

The ability to cope with uncertainty (ABT) was measured by asking respondents to indicate the proportion of each critical resource which was contributed by each functional area using a constant-sum scale (see questionnaire in Appendix III.A, page 8). The overall ABT rating was then calculated by finding the average amount of all critical resources combined:

the sum of the proportion of all critical resource types (i) contributed by functional area (k) ABT_k = ________n (= no. of resource types)

The substitutability (SUB) of a particular functional area (k) was assessed by asking each respondent to assign a proportion indicating the extent to which each subunit contributed to the overall success of the firm using a constant sum scale (see Appendix III.A, page 7). The overall SUB rating was calculated as:

 SUB_k = Proportion of contribution to overall success of firm

And finally, the pervasiveness (PER) of a particular subunit (k) was assessed by asking each respondent to rate the extent to which other functional areas within the firm are affected by the activities of the designated functional area (k). This was accomplished by the use of a six point interval scale with 1= "Doesn't Influence Other Areas At All", and 6= "Influences Other Areas Strongly" (See Appendix III.A, page 8).

The overall IP rating for each functional area (k) was calculated as:

$$IP_k = PER_k (ABT_k + SUB_k)$$

As in the previous case with the dependence scores, since Hickson et al (1971) didn't specify a combinatory relationship between the determinants of intraorganizational power, it was felt that rather than using each component for each functional area as a separate explanatory variable, a more parsimonious approach was needed. Thus the components were combined into an index value. Discussion of its validation as a measure is provided later in this chapter.

The intraorganizational power scores along with the previously discussed resource dependence scores formed the independent variable set for this study.

Strategy Indicators

According to Porter (1980), and others (Hambrick 1983, Dess and Davis 1982) a firm's overall strategy can be conceptualized as a function of its position along a number of strategy dimensions. As noted in Chapter II he delineated thirteen such dimensions but allowed for the addition of others to refine the picture of the firm's position in the market.

Given that the focus in this study is upon the actual strategic behaviors (Robinson's strategy content notion) of STBFs, and taking the view that strategic behavior is multidimensional, strategy is then considered to be the pattern or collection of activities (i.e., strategy dimensions) concurrently pursued by the firm to enhance its position (survival or success) relative to the environment it faces.

For purposes of this study , a strategy dimension is operationally defined as:

A particular activity or operating policy which describes a portion or component of the actual strategy of the firm.

Since the strategic activities are conceivably interrelated (i.e. correlated), several may be components of an underlying firm strategy. Thus, the fundamental strategies pursued by the sample STBFs are defined as:

> The factor or linear combination of strategic activity values which summarizes the information among a particular set of intercorrelated strategic activity measures so that it represents the latent or underlying quality common to each individual measure.

The measures used in the development of the strategic market orientations consist of thirty four strategic policy items. Each respondent was asked to rate the extent to which each statement described the strategic behaviors or policies followed by his or her firm in the past year. A six-point interval scale was used with values ranging from "1 = Describes My Firm Not At All" to "6 = Describes My Firm Perfectly".

The majority (18) of these items were borrowed from Dess and Davis's 1982 study of Porter's generic strategies, they were modified slightly to conform to the demands of Sixteen others were developed from this study. the theoretical contributions of Ansoff and Stewart (1967) and Goldman (1982). They were added because they related well with the suspected R&D orientations of STBFs (See Section One of the questionnaire in Appendix III.A for the instructions and a complete listing of the items).

The following is a listing of the strategy dimension items, what they were expected to measure, and the contributing authors:

<u>Item Number</u>	<u>Measure</u> of:	Contributing Author(s)
1 to 5	R - Intensiveness	Ansoff/Stewart (1967)
6 to 8	D - Intensiveness	11
9	Downstream Coupling	**
10 to 13	Reactions to short PLC	" and Goldman(1982)
14	Reactions to long PLC	11
15	Close to state-of-the-art	11
16	Far from state-of-the-art	11
17	Product innovation	Porter(1980),Dess and
		Davis (1982)
18	Customer service	11
19	Cost position	11
20	Product quality	11
21	Experienced personnel	11
22	Inventory levels	11
23	Price level	11
24	Range of products	11
25	Refining existing products	s "
26	Brand identification	**
27	Marketing innovation	11
28	Control of distribution	11
29	Raw material supply	11
30	Serving specialized market	ts " and Goldman(1982)
31	Industrial markets	11
32	Use of advertising	11
33	Use of PR/publicity	"
34	Salesforce effectiveness	Goldman (1982)

Performance Measures

Six measures of performance were used in this study, sales growth, profit growth, employment growth, percent of firm's revenues spent supporting R&D activities, number of scientific and technical personnel employed, and a commercialization measure.

Consistent with the guidelines developed by Robinson's (1983) reinterpretation of Friedlander and Pickle's (1968) findings on the measurement of organizational effectiveness in small firms, two financial measures were used in this research, sales growth and profit growth (questionnaire items 5 and 6 in Section Three, see Appendix III.A, p.9). They were measured by asking each respondent to calculate an

index of sales and profit growth by dividing the revenues or profit from the last full year by the revenues or sales from the previous year. Thus if a firm experienced revenues in the last year of \$750,000 and had revenues the previous year \$650,000 sales of the growth would be \$750.000/\$650.000=1.154 or a 15.4% increase. The profit growth measure only indicated profit changes among those firms that were profitable for a two year period. Firms with profits or with losses indicated a zero value. Only no sales and profit growth over a one year period was collected because it was felt that a longer period would require too much effort on the part of respondents and increase the likelihood of non-response.

In addition an employment growth value, two measures of innovative activity, and one measure of the ability to commercialize effectively were employed. Employment growth was determined by dividing the current number of employees number of employees at the end of the last by the full fiscal year (items 1 and 2, page 9 Appendix III.A). Innovative activity was measured by the percent of firm's revenues spent supporting R&D activities (item 15, p.11), by the number of scientific and technical personnel and employed (item 16, p.11). Finally, commercialization effectiveness was an index value determined by dividing the number of new products/processes introduced in the last calender year by the total number of patents held by the firm or its principals (items 7 and 8 Appendix III.A, p. 9).

DATA COLLECTION PROCEDURES

The technique for gathering the above information was the mail questionnaire. In this section a brief description of instrument used in this study is made. the (For а complete treatment of the specific guidelines followed here for the development of the mail questionnaire, see Erdos 1974, pp. 2-90 to 2-104) (Also the cover letter and questionnaire are included in Appendices III.A and III.B).

The questionnaire used in this study consisted of five major components:

(1) Identification data: Identification of the respondent or intended respondent. In this study the questionnaire was directed to the chief operating officer or general manager of the firm. It was felt that this individual would be in the best position organizationally to supply the requested information.

(2) Request for information: This section of the questionnaire (found in a cover letter, see Appendix III.B) discussed the intention of the study and requested the cooperation of the respondent. The interviewer organization identified. The and sponsoring organizations were respondent was also told the approximate amount of time required to complete the questionnaire adequately and the type of information desired.

(3) Instructions: At the begining of the instrument the respondent was informed as to the specific purposes of the survey, and general guidance regarding how the respondent

to answer each section of questions. Before each data was section specfic instructions and comments directed more toward particular types of questions were included where appropriate (e.g., constant-sum scales).

(4) Information Sought: This component refers to the actual data collection part of the questionnaire, more specifically, question content, respose format, wording, and questions previously described were organization. The organized into three sections:

- Competitive strategy dimensions

- Resource-dependence indicators, and Intraorganizational power indicators

- Performance and classification indicators

Each group was clearly separated from the others and headed with short introduction. The questions within а also possessed their own sequencing.

(5) Classification Data: The questionnaire closed with a request for the respondent to provide several indicators about the nature of the small TBF he/she represented. They were:

> - The age of the firm - The total number of employees - Growth rate in sales last year - financial, international business and nature of product mix (see Appendix III.A).

scope.

Once the questionnaire was constructed and reviewed for compliance to generally accepted guidelines, it was pretested among a group of business school professors and students. Based upon their comments and observations, revisions were made and the final draft produced. The questionnaire was mailed third class, and included a first class return envelope. A reminder postcard (Appendix III.C) was mailed one week after the initial mailing. Because of cost constraints a second wave was not conducted.

DATA ANALYSIS

Three multivariate and one bivariate statistical techniques were utilized in the analysis of the data. First, to identify the nature and extent of the underlying strategies followed by the firms in the sample, a common factor analysis procedure was performed. The exact procedure is described in detail in the following chapter. It allowed the identification of the strategies existing in each industry evaluated and produced factor scores for each firm which supplied a measure of the extent the firm pursued a particular strategy. The factor scores then comprised the dependent variable set in the tests of hypotheses one. They also acted as the independent variable set for testing hypothesis three.

Hypotheses one and two were evaluated in a sequential manner using Pearson product moment correlations and stepwise multiple regression. Pearson product moment correlations allowed an assessment of the pairwise correlations of the dependence and intraorganizational power variables. The correlations computed assessed the relative strength and direction of the relationship investigated, along with its significance level. Its use helped identify those variables in the independent variable sets with high levels of intercorrelations.

Multiple regression allowed an evaluation of the strength and statistical significance existing between the hypothesized predictor and criterion variables. The stepwise option allowed exclusion of those independent variables which failed to contribute adequately to the explanation of the criterion variable. The significance of the overall relationship between variables was assessed by and the significance of the betas for each F-test, an variable retained in the final regression equation was evaluated by the t-test. This technique is considered by Kerlinger and Pedhazner (1973, p.3) to be appropriate for evaluation of theoretical relationships such as those investigated in this study.

T-tests were also used to assess the statistical significance between the mean values of each major group of variables across each industry investigated.

The statistical reliability and internal consistency of the various scales (in the factor scores, and dependence and intraorganizational power indices) were examined by using Cronbach's Alpha Coefficient.

APPENDIX III.A TO III.C

APPENDIX III. A

A STUDY OF STRATEGIC POLICY AND RESOURCE DEPENDENCE AMONG TECHNOLOGY-BASED FIRMS



Sponsored by

National Federation of Independent Business Department of Marketing Eastern Michigan University Ypsilanti, Michigan

Sequence No.

TECHNOLOGY-BASED INDUSTRY SURVEY

SECTION ONE

This section of the questionnaire focuses upon information relating to the marketing and manufacturing policies of your firm.

Several statements are listed below describing various policies which your firm may practice. Using the six point scale below, please rate the extent to which each statement DESCRIBES the policies your firm has followed in the last year. If a statement is NOT AP-PLICABLE to your firm, enter a zero (0). Place your response in the square following each statement.

DESCRIBES MY FIRM NOT AT ALL 1 2 3 4 5 6	DESCRIBES MY FIRM PERFECTLY	NOT APPLICABLE 0	
1. The task of the R&D activities pursued solutions to defined problems	by my firm is to discover and eval	luate alternative	9
2. Technical personnel in my firm are alw pursued by my firm	vays informed about the overall obje	ectives being	10
3. It is the policy of this firm to allow tec than assigning them to specific parts of a w	chnical personnel freedom for indivivell defined solution	dual initiative rather	11
4. The R&D project portfolio of my firm actions, or other in-house research results v	is continuously revised to accommo which may obsolete a project	odate competitive	12
5. Innovation is highly prized by my firm.	, even if it raises overall operating	costs	13
6. In my firm, the R&D task is to reduce solution for implementation	available alternatives to a single pr	oblem	14
7. The R&D personnel in my firm have s in the work of others	pecific tasks to perform and should	n't be involved	15
8. In my firm there are certain sequences the greatest amount of efficiency	of R&D tasks which must be adher	ed to in order to realize	16
9. In my firm it is common that senior ex more functional area	ecutives be given managerial respon	nsibilities in more than	17
10. Project/product managers are often use and marketing of our products and services	ed in my firm to coordinate develop	pment, production,	18
11. In my firm, joint product/service plan is required for all market offerings	ning by R&D, production, and mar	keting personnel	19
12. The planning and control processes in rapidly in this industry	my firm are very flexible because	change occurs	20

PLEASE CONTINUE ON THE NEXT PAGE

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PAGE 1

Card	۱
(Cont	.)

DESCRIBES MY FIRM
NOT AT ALLDESCRIBES MY FIRM
PERFECTLYNOT APPLICABLE
0

13. My firm values the ability to respond quickly to market changes even at incrementally higher levels of cost	
4. Planning in my firm is usually sequential, that is, detailed R&D is completed before the nanufacturing and marketing planning is begun	
5. The managers of my firm are expected to keep up to date on the significant technological events occurring in this industry	
6. The competitive product improvements or changes occurring in this industry can be foretold with confidence and planned for by my firm	
7. My firm continuously engages in new product/service development procedures	
8. Customer complaints receive the attention of the top managers in my firm	
9. My firm operates very efficiently (at low cost) because of continuous improvements in our production processes	
20. The level of product/service quality is supervised directly by the top management of my firm	
21. When hiring new management for my firm, it is not important that they have experience n this industry	
2. For my firm to compete effectively it is necessary to maintain high inventory levels	
23. In general my firm's prices are among the lowest in the industry	
4. My firm attempts to offer a broad range of product/service lines, rather than specializing n a particular product/service line exclusively	
25. In order to defer the cost of developing new products/services, my firm attempts to improve or refine existing products/services first	
26. It is important to the success of my firm that its trademark(s) or brandnames be instantly ecognizable by potential end-users	
7. Being innovative and creative in marketing is more important to my firm than innovation in product/service development	
28. My firm relies on established distributors to sell its products/services, rather than distributing lirectly to end-users	
9. My firm possesses steady and reliable sources of raw materials or components	:

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DESCRIBES MY FIRM
NOT AT ALLDESCRIBES MY FIRM
PERFECTLYNOT APPLICABLE
0

30. My firm seeks out and attempts to serve highly specialized markets with its products/services rather than serving a number of diverse markets with the same products/services	s,	IJ
31. The products/services my firm produces and markets are used mostly in the production processes of other firms		30
32. My firm depends very heavily on advertising to make a sale		4(
33. To compete successfully, my firm must attract publicity about our products or services either through trade journals, newspapers or broadcast media		41
34. The salesforce of my company is so effective that it convinces potential customers to purchase our products/services within the first few contacts		4;
35. My firm's reputation in the industry for product innovation and quality is ranked among the leaders		43

In your firm, approximately what PROPORTION (%) of top managerial attention and effort is directed toward the following activities?

PLEASE ENSURE THAT THE COLUMN TOTAL EQUALS 100%

a. Supervising R&D processes	%	44-45
b. Supervising Production processes	%	46-47
c. Supervising Marketing/Sales activities	%	48-49
d. Overseeing Financial administration	%	50-51
e. Solving Personnel/Staffing problems	%	52-53
f. Engaging in PR/Publicity activities	%	54-55
g. Seeking Outside Investors for the firm	%	56 57
h. Seeking potential Joint Venture partners	%	58-59
i. Seeking potential merger partners or acquisition candidates	%	60.61
j. Other activity (What?))	%	62 63
TOTAL I	00%	

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SECTION TWO

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This section requests information about the resources used by your firm and how they are allocated.

1. Please indicate the extent to which the following types of resources have been important to your firm's strategic activities in the last year.

	NOT AT ALL IMPORTANT	1	2	3	4	5	6	EXTREMELY IMPORTANT	
Operating Capital		1	2	3	4	5	6		64
Investment Capital		1	2	3	4	5	6		65
Customer Information		1	2	3	4	5	6		66
Competitor Information		1	2	3	4	5	6		67
Technological Expertise		1	2	3	4	5	6		68
Managerial Expertise	••••••	1	2	3	4	5	6		69

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2. Please divide 100 points vertically in each of the three columns below to reflect the **PROPORTION** (%) of Overall Financing, Market Information, and Managerial/Technical Expertise that EACH OUTSIDE RESOURCE SUPPLIER (listed below) CONTRIBUTES to your firm.

PLEASE ENSURE THAT THE TOTAL OF EACH COLUMN EQUALS 100.

RESOURCE SUPPLIERS:

PROPORTION (%) CONTRIBUTED OF:

(Organizations or individuals your firm may rely upon for certain operating resources.)	OVERALL FI (Include any re- grants received, similar funding	NANCING search , or .)	MARKETMANAGERIAINFORMATIONTECHNICAL(CompetitorsEXPERTISEand customers)EXPERTISE		IAL/ \L E	
Banks or other lending Institutions		9-10		33-34		57-58
Venture Capital Firms		11-12		35-36		59-60
State/Local Government Agencies		13-14		37-38		61-62
Universities/Colleges		15-16		39-40		63-64
Joint Venture Partners		17-18		41-42	<u> </u>	65-66
Industrial/Commercial Customers		19-20		43-44		67-68
Federal Government (e.g., DOD,SBA)		21-22		45-46		69 -70
Raw Material/Component Suppliers		23-24		47-48		71-72
Dealers or Distributors of Products		25-26	<u> </u>	49-50		73-74
Parent Firm or Holding Company		27-28		51-52		75-76
Internally Generated		29-30		53-54		77-78
Others (Who?)		31-32		55-56		79-8 0
TOTAL=	100%		100%		100%	

3. What is the TOTAL MEMBERSHIP of your firm's Board of Directors?

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_____ members

9

Card 3 (1-8)

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4. Thinking about the resources used by your firm in the past year, please indicate HOW MANY of the following organizations/individuals provided some kind of essential resource to your firm. If your firm has not relied on any organization of a certain type, please write in a "0".

Banks or other lending institutions	10-11
Venture Capital Firms	12-13
State/Local Government Agencies	14-15
Universities/Colleges	16-17
Joint Venture Partners	18-19
Industrial/Commercial Customers	20-22
Federal Government Agencies	23-24
Raw Material/Component Suppliers	25-26
Dealers or Distributors of Products	27-28
Parent Firm or Holding Company	29
Others (Who?)	30-31

5. Using the scale below, rate the extent to which each of the following organizations or individuals are able to **EXERCISE INFLUENCE** over the way critical resources are used by your firm.

	NO INFLUENCE	1	2	3	4	5	6	STRONG INFLUENCE	
Banks/other lending Institutions		1	2	3	4	5	6		32
Venture Capital Firms		1	2	3	4	5	6		33
State/Local Government Agencie	es	1	2	3	4	5	6		34
Universities/Colleges		1	2	3	4	5	6		35
Joint Venture Partners		1	2	3	4	5	6		36
Industrial/Commercial Customer	rs	1	2	3	4	5	6		37
Federal Government Agencies.		1	2	3	4	5	6		38
Raw Material/Component Suppl	iers	1	2	3	4	5	6		39
Dealers or Distributors of Produ	ucts	1	2	3	4	5	6		40
Parent Firm or Holding Compar	ny	1	2	3	4 ·	5	6		41
Others (Who?)	1	2	3	4	5	6		42

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6. Please indicate the NUMBER OF INDIVIDUALS sitting on your firm's Board of Directors who are employees, members, or otherwise represent the following organizations or groups. If one or more of the following have no representation on your board please write in a "0".

Banks/other lending Institutions	43-44
Venture Capital Firms	45-46
State/Local Government Agencies	47-48
Universities/Colleges	49-50
Joint Venture Partners	51-52
Industrial/Commercial Customers	53-54
Federal Government Agencies	\$5-56
Raw Material/Component Suppliers	\$7-58
Dealers or Distributors of Products	59-60
Parent Firm or Holding Company	61-62
Others (Who?)	63-64

7. Please estimate the proportion (%) each functional area listed below CONTRIBUTES TO THE OVERALL SUCCESS of your firm.

PLEASE ENSURE THAT THE COLUMN TOTAL EQUALS 100%

General Administration		65-66
Accounting/Finance		67-68
Engineering/R&D		69 .70
Marketing/Sales		71-72
Personnel/Staffing		73-74
Production/Manufacturing		75-76
Public relations		77-78
TOTAL=	100%	

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8. Please estimate below, the **PERCENT OF CONTRIBUTION** to Overall Financing (revenues, as well as other sources of funding) made by each functional area of your firm. Do the same for the percent of knowledge contributed about customers or competitors, and for the proportion of technical or managerial expertise contributed by each functional area.

PLEASE ENSURE THAT EACH COLUMN TOTAL EQUALS 100 %

FUNCTIONAL AREAS:		PERCENT (%) OF RESPONSIBILITY FOR:					
		CONTRIBUTI TO OVERALI FINANCING	ONS ,	KNOWLED ABOUT CU /COMPETI	GE STOMERS TORS	TECHNICAL/ MANAGERIAI EXPERTISE	
General Administration			9 -10		23-24		37-38
Accounting/Finance			11-12		25-26		39-40
Engineering/R&D			13-14		27-28		41-42
Marketing/Sales			15-16		29-30	<u></u>	43-44
Personnel/Staffing			17-18	. <u></u>	31-32		45-46
Production/Manufacturing			19-20		33-34		47-4R
Public relations			21-22		35-36		49-50
	TOTAL=	100%		100%		100%	

9. Please rate the extent to which the actions of each functional area can INFLUENCE the activities of the other functional areas in your firm.

	DOES'T INFLUENCE OTHER AREAS					INFLUENCES OTHER AREAS			
	AT ALL	1	2	3	4	5	6	STRONGLY	
General Administration		I	2	3	4	5	6		51
Accounting/Finance		1	2	3	4	5	6		52
Engineering/R&D	•••••	1	2	3	4	5	6		53
Marketing/Sales		1	2	3	4	5	6		9
Personnel/Staffing		1	2	3	4	5	6		55
Production/Manufacturing		1	2	3	4	5	6		56
Public relations		I	2	3	4	5	6		57

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SECTION THREE

This section requests information which will allow the classification of your firm on the basis of financial and employment indicators.

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1. How many people were employees of your firm (both full and part time) at the end of the LAST FULL FISCAL YEAR?

2. How many people does your firm CURRENTLY EMPLOY? people stat 3. What is the FOUNDING DATE of your firm? (year) cco 4. What were the ANNUAL GROSS REVENUES of your firm at the close of the last yearly accounting period? (Please check the appropriate interval.) cco		people	58-60
3. What is the FOUNDING DATE of your firm? (year) #45 4. What were the ANNUAL GROSS REVENUES of your firm at the close of the last yearly accounting period? (Please check the appropriate interval.)	2 .	How many people does your firm CURRENTLY EMPLOY? people	61-63
 4. What were the ANNUAL GROSS REVENUES of your firm at the close of the last yearly accounting period? (Please check the appropriate interval.) 	3.	What is the FOUNDING DATE of your firm? (year)	64-65
	4.	What were the ANNUAL GROSS REVENUES of your firm at the close of the last yearly accounting period? (Please check the appropriate interval.)	
 2) \$250,001 to \$500,000 3) \$500,001 to \$750,000 4) \$750,001 to \$1,000,000 5) \$1,000,001 to \$2,500,000 6) \$2,500,001 to \$5,000,000 7) \$5,000,001 to \$7,000,000 9) \$10,000,001 to \$20,000,000 10) Over \$20,000,000 10) Over \$20,000,000 9) \$10,000,000 <l< td=""><td></td><td> 1) Under \$250,000</td><td></td></l<>		1) Under \$250,000	
3) \$5500.001 to \$750.000 4) \$750.001 to \$1,000,000 5) \$1,000.001 to \$2,500,000 6) \$2,500.001 to \$5,000,000 7) \$5,000.001 to \$10,000,000 9) \$10,000,001 to \$20,000,000 6. What was the PROFIT GROWTH RATE of your firm last year? Please calculate the rate as follows: PROFITS LAST FULL YEAR PROFITS LAST FULL YEAR PROFITS THE PREVIOUS YEAR 10.13 7. How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year? N:33 8. How many PATENTS does your firm or its principals hold?		2) \$250,001 to \$500,000	
 4) \$750,001 to \$1,000,000 5) \$1,000,001 to \$2,500,000 6) \$2,500,001 to \$5,000,000 7) \$5,000,001 to \$7,500,000 8) \$7,500,001 to \$10,000,000 9) \$10,000,001 to \$20,000,000 10) Over \$20,000,000 9) \$10,000,001 to \$10,000,000 9) \$10,000,001 to \$20,000,000 8) \$100 Ver \$20,000,000 8) \$100		3) \$500,001 to \$750.000	
 5) \$1,000,001 to \$2,500,000 6) \$2,500,001 to \$5,000,000 7) \$5,000,001 to \$10,000,000 9) \$10,000,001 to \$20,000,000 10) Over \$20,000,000 8) \$7,500,001 to \$20,000,000 8) \$7 Please calculate the rate as follows: REVENUES LAST FULL YEAR REVENUES THE PREVIOUS YEAR 6. What was the PROFIT GROWTH RATE of your firm last year? Please calculate the rate as follows: REVENUES THE PREVIOUS YEAR 6. What was the PROFIT GROWTH RATE of your firm last year? Please calculate the rate as follows: PROFITS LAST FULL YEAR Image: PROFITS LAST FULL YEAR Image: PROFITS THE PREVIOUS YEAR 7. How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year? 8. How many PATENTS does your firm or its principals hold?		4) \$750,001 to \$1,000,000	
 6 \$2,500,001 to \$2,000,000 7) \$5,000,001 to \$7,500,000 8) \$7,500,001 to \$10,000,000 9) \$10,000,001 to \$20,000,000 10) Over \$20,000,000 5. What was the REVENUE GROWTH RATE of your firm last year? Please calculate the rate as follows: REVENUES LAST FULL YEAR REVENUES THE PREVIOUS YEAR 6. What was the PROFIT GROWTH RATE of your firm last year? Please calculate the rate as follows: PROFITS LAST FULL YEAR PROFITS THE PREVIOUS YEAR 7. How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year? 8. How many PATENTS does your firm or its principals hold?		5) \$1,000,001 to \$2,500,000	
7) \$\$,000,001 to \$7,500,000 8) \$7,500,001 to \$20,000,000 9) \$10,000,001 to \$20,000,000 10) Over \$20,000,000 6. What was the REVENUE GROWTH RATE of your firm last year? Please calculate the rate as follows: REVENUES THE PREVIOUS YEAR 6. What was the PROFIT GROWTH RATE of your firm last year? Please calculate the rate as follows: PROFITS LAST FULL YEAR PROFITS LAST FULL YEAR Image: Provide the rate as follows: PROFITS LAST FULL YEAR Image: PROFITS THE PREVIOUS YEAR 7. How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year? 7. How many PATENTS does your firm or its principals hold?		6) \$2,500,001 to \$5,000,000	
		7) \$5,000,001 to \$7,500,000	
 9) \$10,000,000 to \$20,000,000 10) Over \$20,000,000 5. What was the REVENUE GROWTH RATE of your firm last year? Please calculate the rate as follows: <u>REVENUES THE PREVIOUS YEAR</u> (GROWTH RATE) 6. What was the PROFIT GROWTH RATE of your firm last year? Please calculate the rate as follows: <u>PROFITS LAST FULL YEAR</u> <u>PROFITS LAST FULL YEAR</u> (GROWTH RATE) 7. How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year? 8. How many PATENTS does your firm or its principals hold? 7272 		8) \$7,500,001 to \$10,000,000	
10) Over \$20,000,000 6657 5. What was the REVENUE GROWTH RATE of your firm last year? Please calculate the rate as follows: REVENUES LAST FULL YEAR		9) \$10,000,001 to \$20,000,000	
 5. What was the REVENUE GROWTH RATE of your firm last year? Please calculate the rate as follows: <u>REVENUES LAST FULL YEAR</u> <u>REVENUES THE PREVIOUS YEAR</u> 6. What was the PROFIT GROWTH RATE of your firm last year? Please calculate the rate as follows: <u>PROFITS LAST FULL YEAR</u> <u>PROFITS LAST FULL YEAR</u> <u>IPROFITS THE PREVIOUS YEAR</u> 7. How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year?		10) Over \$20,000,000	66-67
REVENUES LAST FULL YEAR (GROWTH RATE) REVENUES THE PREVIOUS YEAR (GROWTH RATE) 6. What was the PROFIT GROWTH RATE of your firm last year? Please calculate the rate as follows: PROFITS LAST FULL YEAR (GROWTH RATE) 7. How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year? 74.73 8. How many PATENTS does your firm or its principals hold? 76.77	5.	What was the REVENUE GROWTH RATE of your firm last year?	
REVENUES LAST FULL YEAR =(GROWTH RATE) 68.70 6. What was the PROFIT GROWTH RATE of your firm last year? Please calculate the rate as follows:		ricase calculate the faile as follows.	
REVENUES THE PREVIOUS YEAR 6. What was the PROFIT GROWTH RATE of your firm last year? Please calculate the rate as follows: PROFITS LAST FULL YEAR PROFITS THE PREVIOUS YEAR 7. How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year? 7. How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year? 7. How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year? 7. How many PATENTS does your firm or its principals hold?		REVENUES LAST FULL YEAR	(8.30
 6. What was the PROFIT GROWTH RATE of your firm last year? Please calculate the rate as follows: PROFITS LAST FULL YEAR PROFITS THE PREVIOUS YEAR 7. How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year? 74.73 8. How many PATENTS does your firm or its principals hold? 76.77 		REVENUES THE PREVIOUS YEAR	68-70
Please calculate the rate as follows:	6.	What was the PROFIT GROWTH RATE of your firm last year?	~.
PROFITS LAST FULL YEAR = (GROWTH RATE) 71.73 PROFITS THE PREVIOUS YEAR = (GROWTH RATE) 74.75 7. How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year? 74.75 8. How many PATENTS does your firm or its principals hold? 76.77		Please calculate the rate as follows:	
7. How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year? 74.75 8. How many PATENTS does your firm or its principals hold? 76.77		PROFITS LAST FULL YEAR	
7. How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year? 74.73 8. How many PATENTS does your firm or its principals hold? 76.77		PROFITS THE PREVIOUS YEAR	71-73
8. How many PATENTS does your firm or its principals hold? 76-77	7.	How many NEW PRODUCTS/PROCESSES did your firm INTRODUCE last year?	74-75
o. now many FAIENIS does your firm or its principals noid? 76-77	0	How more DATENTS door your firm on its principals hold?	.
	ð.	now many FAID 15 does your firm of its principals noid?	76-77

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13-14

9. What was the **INCOME** of your firm after taxes at the close of the last yearly accounting period? (Please check the appropriate interval)

119

- 1) Over \$1,000,000

 2) \$500,001 to \$1,000,000

 3) \$250,001 to \$500,000

 4) \$100,001 to \$250,000

 5) \$75,001 to \$100,000

 6) \$50,001 to \$75,000

 7) \$25,001 to \$50,000

 8) \$0 to \$25,000

 9) -\$1 to -\$25,000

 10) -\$25,001 to -\$50,000

 11) -\$50,001 to -\$75,000

 12) -\$75,001 to -\$100,000

 13) Loss exceeding \$100,000
- 10. What were the **TOTAL ASSETS** of your firm as of the last yearly accounting period? (Please check the appropriate interval.)
 - 1) Under \$25,000

 2) \$25,001 to \$50,000

 3) \$50,001 to \$75,000

 4) \$75,001 to \$100,000

 5) \$100,001 to \$250,000

 6) \$250,001 to \$500,000

 7) \$500,001 to \$750,000

 8) \$750,001 to \$1,000,000

 9) \$1,000,001 to \$,000,000

 10) \$5,000,001 to \$10,000,000

 11) Over \$10,000,000
- 11. What were the **TOTAL LIABILITIES** of your firm as of the last yearly accounting period? (Please check the appropriate interval.)

,

 1) Under \$25,000

 2) \$25,001 to \$50,000

 3) \$50,001 to \$75,000

 4) \$75,001 to \$100,000

 5) \$100,001 to \$250,000

 6) \$250,001 to \$500,000

 7) \$500,001 to \$750,000

 8) \$750,001 to \$,000,000

 9) \$1,000,001 to \$,000,000

 10) \$5,000,001 to \$10,000,000

 11) Over \$10,000,000

PLEASE CONTINUE ON THE NEXT PAGE

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12. About how much INTEREST ON OUTSTANDING DEBT did your firm pay last year? (Please check the appropriate interval.)

1) Under \$10,000
2) \$10,001 to \$25,000
3) \$25,001 to \$50,000
4) \$50,001 to \$75,000
5) Over \$75,000

13. What **PROPORTION** of your firm's **REVENUES** are derived from:

Sales of standardized products:	%	16-17
Sales of custom (or made to order) items:	%	18-19
Fees from contract research services:	%	20-21
Royalties from patents licensed to others:	<u> </u>	22-23
Other sources: What?:	%	24-25
:	%	26-27
TOTAL	100 %	

14. What PROPORTION of your firm's revenues occur:

Internationally:	%	34-35
Nationally:	%	32-33
Regionally (within a 300 mile radius):	%	30-31
Locally (within a 100 mile radius of your firm):	%	28-29

15. Approximately what percent (%) of your firm's revenues were spent supporting R&D activities last year?

	%	36-37
16. How many scientific and/or technical personnel were employed by your firm	m last year?	
	(people)	38-40

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Thank you for your cooperation. Please return this questionnaire as soon as possible.

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APPENDIX III.B



Eastern Michigan University

Ypsilanti, Michigan 48197

August, 1985

Dear President or Chief Operating Officer:

Your firm has been selected as a member of a sample of companies specializing in the commercialization of technology. As part of a research project which is partially funded by a grant from the National Federation of Independent Business, information concerning the stategic policies, operating resources, and performance characteristics of your firm is requested on the attached questionnaire.

The questionnaire has been designed so that you can complete it very quickly and easily. You need only check your answers or fill in blanks. A postpaid return envelope has been included for your convenience.

The information you provide will be respected as strictly confidential. Each questionnaire is coded only to allow follow-up mailings to nonrespondents. Your answers will be combined with those of other technology-based firms and used for aggregate statistical analyses. If you have any questions, you may direct them to me by mail, or by telephoning (313) 482-3323 or 487-0180.

Your participation in this survey is genuinely appreciated. The information you provide will contribute in a meaningful manner to existing knowledge about technology-based firms.

Please complete and return the questionnaire right away. Again, thank you for your help.

Sincerely,

G. Russell Merz, Assistant Professor Project Director

Department of Marketing (313) 487-3323

APPENDIX III.C



Eastern Michigan University

Dear President or Chief Operating Officer

Recently you were mailed a questionnaire asking for your participation in an important survey of technology - based firms.

If you have already returned the questionnaire, please consider this card a "Thank You" for your valuable help.

If you have not had a chance to do so as yet, may we ask you to return the completed form now? Your answers are important for increased understanding about the strategic activities of technology - based firms such as yours.

Sincerely,

G. Russell Merz Project Director

G. Russell Merz Department of Marketing Eastern Michigan University Ypsilanti, MI 48197

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CHAPTER IV

ANALYSIS OF RESULTS

Ιn this chapter the data generated by implementing the previously described methodology will be analyzed and summarized. The chapter consists of four parts. Part one contains a report of the survey responses, an assessment of the representative nature of the industry samples acquired, and an investigation of any nonresponse bias which may have occurred in the sampling process. Part two is devoted the development of resource dependence the and including checks intraorganizational power scales, for internal consistency (Cronbach's Alpha). Part three outlines the results of the factor analytic process used to generate the measures of the strategies pursued by the respondents, internal consistency of those measures. and the Lastly, four addresses the statistical analysis of part the three research hypotheses delineated in Chapter II.

ANALYSIS OF THE SAMPLES

Mail Survey Response Rate

Mailing lists (with each firm coded by number of employees) were purchased from a list broker for two technology-based industries which met the selection criteria of low concentration and sufficient size discussed in the previous chapter. The two industries chosen were, process

control instrument manufacturers (SIC 3823, N=980) and pharmaceutical preparations manufacturers (SIC 2834, N=668).

population members on the process control A11 980 manufacturers (SIC 3823) list instrument were sent questionnaires and 204 were returned. Of these, 101 were complete and usable, 37 were partially completed and were returned unanswered, and unusable, 28 38 were undeliverable. Additionally, 20 telephone interviews were conducted among a ramdomly selected sample of the nonrespondents. This yielded a total usable sample of 121 respondents (12.3% of the population) representing this industry.

pharmaceutical industry, 647 of the 668 In the population members were sent questionnaires since 21 of the members had inadequate addresses, were duplicates list or otherwise unsuitable. Only 90 were returned. Of these, 39 were returned fully complete and usable, 17 were partially completed but unusable, 12 were returned unanswered, and 23 were undeliverable. As in the previous case, 15 additional interviews were conducted telephone among randomly а selected sample of non-respondents. This yielded 54 respondents (8.2% of the population) representing this industry.

Representative Nature of the Samples

To evaluate whether the size distribution of respondent firms was similar to the size distribution of the industry population as a whole, a Chi-square test was performed comparing the respondent firms' size distribution with that of the population of firms in each industry list provided by the list broker (size was used because the list broker was able to provide only this information for each respondent).

The results, presented in Table 9, indicate that no significant difference exists between sample firms and population firms on the basis of firm size as measured bv the number of employees. Each firm in the population was coded according to number of employees by the list broker supplying the mailing lists. The percentage of population firms within each coded category was then compared against the percentage of respondent firms within each category and a Chi-square test statistic was derived.

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Analysis of Firm Size Distribution: Population vs. Respondents SIC 3823: Process Control Instrument Manufacturers

% of Population Firms	% of Respondent Firms
 د ۵	
0.9	7.0
6.0	3.1
25.8	25.0
14.6	14.0
31.8	34.4
14.9	15.6
100.0	100.0
N=980	n = 1 2 1
	<pre>% of Population Firms 6.9 6.0 25.8 14.6 31.8 14.9 100.0 N=980</pre>

Chi-square = 1.81 not significant

SIC 2834: Pharmaceutical Preparation Manufacturers

Size Classes # of Employees	% of Population Firms	% of Respondent Firms
		10 (
> 100	17.6	13.6
50-99	9.4	9.1
20-49	25.4	35.9
10-19	12.1	14.1
< 10	24.8	22.7
ave #	10.4	4.5
	100.0	100.0
	N = 668	n=58

Chi-square = 9.12 not significant

Non-Response Bias

To evaluate the extent, if any, of non-response bias which may have existed in the sampling process, follow-up telephone interviews were conducted among a small randomly sample within each industry selected group. Twelve variables of concern in this study were used to evaluate the extent of dissimilarity between the groups, and T-tests were made comparing the means. The results appear in Tables 10 and 11. The only significant difference was found among pharmaceutical (SIC 2834) respondents in regard to firm age. As can be seen in Table 11, telephone respondents tended to be older (and larger, though not significantly) than the firms responding to the mail questionnaire. Yet this age difference apparently had little or no relationship to their responses on the other key variables. The only explanation that can be offered to this difference is that in older (and larger) firms questionnaires are misplaced in the management hierarchy more easily. Based on these findings it was felt that the responses were sufficiently similar and could be treated as one homogeneous sample. Thus in all subsequent analyses the results obtained by mail and telephone collection are treated as one set of responses.

Table 10

Analysis of Non-response Bias Among Process Control Instument (SIC 3823) Firms

Comparison Variables	Ma Respo n=	ail ondents =101	il Telephone ndents Respondents 101 n=20			
	Mean	Std.Dev.	Mean	Std.Dev.	t 	
Financial Dependence	3.84	4.13	4.01	5.30	-1.12	
Information Dependence	5.36	5.74	5.13	6.09	-0.25	
Expertise Dependence	1.93	2.93	1.89	2.78	0.06	
Gen.Admin. IPl	1.32	1.10	1.62	2.66	-0.85	
Acc/Fin IP	1.14	1.20	1.12	1.41	0.07	
Eng/R&D IP	2.47	1.57	2.31	1.94	0.41	
Marketg/Sales IP	3.13	1.73	2.84	1.89	0.69	
Pers/Staff IP	0.59	0.69	0.55	0.74	0.24	
Prod/Mfrg IP	1.73	1.49	1.55	1.79	0.49	
Public Relations IP	0.22	0.37	0.16	0.33	0.69	
Current # Employees	48.43	76.21	47.11	75.83	0.07	
Age of Firm (Years)	14.25	13.26	15.95	17.09	-0.51	

Note: None of the means are significantly different at the .05 level.

1 Intraorganizational Power

Table ll

Analysis of Non-response Bias Among Pharmaceutical Preparation SIC 2834 Firms

Comparison Variables	Ma Respo n=	ail ondents =101	Tele Respo n=		
	Mean	Std.Dev.	Mean	Std.Dev.	t
Financial Dependence	9.28	7.61	8.37	7.85	0.40
Information Dependence	8.36	6.15	7.70	6.09	0.36
Expertise Dependence	4.23	6.03	3.53	4.89	0.41
Gen.Admin. IPl	1.60	1.13	1.68	1.53	-0.21
Acc/Fin IP	1.16	1.32	1.19	1.34	-0.08
Eng/R&D IP	1.65	1.03	1.30	1.09	1.11
Marketg/Sales IP	3.45	1.77	2.99	1.95	0.84
Pers/Staff IP	0.83	1.05	0.77	0.97	0.19
Prod/Mfrg IP	2.11	1.73	1.87	1.58	0.47
Public Relations IP	0.17	0.31	0.14	0.27	0.33
Current # Employees	83.85	123.62	132.57	230.83	-1.01
Age of Firm (Years)	29.24	17.89	43.40	33.19	-2.04*

* Significant at the p=.05 level

1 Intraorganizational Power

CALCULATION OF RESOURCE DEPENDENCE AND INTRAORGANIZATIONAL POWER MEASURES

Resource Dependence Measures

As described in the previous chapter, overall dependence scores for each type of resource are calculated for each respondent on the basis of four components, criticality (C), relative magnitude (RM), concentration (CON), and discretion (DIS). Table 12 provides the mean values for both industry groups of the criticality measures. A six point scale, from 1 (not at all important) to 6 (extremely important), was used to assess the relative importance of each resource type to the respondent firm's implementation of its strategies in the preceding year.

Table 12

Responses to Criticality Measures

Questionnaire Item	<u>Mean</u> <u>Re</u>	sponses
	<u>SIC 3823</u>	<u>SIC 2834</u>
Operating Capital.	4.87	5.17
Investment Capital.	2.68	3.13
Customer Information.	4.94	4.94
Competitor Information.	3.91	4.50**
Technological Expertise.	5.25	4.56**
Managerial Expertise.	4.58	5.15**
** significant at the P<.01 level		

The results of T-tests across the two samples show that of the six resources, half differed significantly across the industry samples in relative importance. The pharmaceutical firms felt that competitor information and managerial expertise was of greater importance, while process control firms favored technological expertise more highly.

Table 13 a comparison of the relative magnitude In of each resource type contributed by potential organization set presented. Generally it appears that in a11 members is three catagories of resources, pharmaceutical (SIC 2834) Process more dependent upon outside sources. firms are control (SIC 3823) firms on the other hand seem to be more reliant upon internally generated resources. The results indicate a greater reliance by pharmaceuticals also upon venture capital firms and joint venture partners to provide Further, critical resources. it appears that pharmaceuticals depend upon suppliers and distributors to provide market information to a greater extent than process firms, while process control firms depend control upon customers provide greater levels of to financing. may be necessary to cover developmental Presumably this costs associated with custom/made-to-order production or contract research work.

While Table 13 illustrates the variation in sources used by the two industries investigated, an examination of average concentration of alternative sources the reveals that between industries the relative concentration factors not significantly different. In Table 14 the average are concentration factors are presented. The findings show that the typical process control firm acquired financial

Table 13

	Mean <u>Finan</u> %	Responses cing	of: <u>Information</u> <u>Expertise</u> % %		ise	
Resource Suppliers	SIC ¹ 3823	SIC 2843	SIC 3823	SIC 2834	SIC 3823	SIC 2834
Banks/lending institutions	27.25	35.00	0.13	1.13*	1.43	0.57
Venture Capital Firms	0.00	6.51**	0.00	0.06**	0.00	1.70**
State/Local Government Agencies	3.36	2.83	2.97	1.53	0.23	1.04*
Universities /Colleges	0.94	0.00	3.25	2.17	4.19	3.72
Joint Venture Partners	1.51	0.83	0.25	4.15**	0.43	8.11**
Industrial /Commercial Customers	7.32	1.04**	33.17	29.66	7.60	5.91
Federal Government (e.g.,DOD,SBA)	1.34	1.42	2.85	3.74	0.23	1.51**
Raw Material /Component Suppliers	4.12	1.75	5.22	9 . 85**	4.00	4.38
Dealers/ Distributors of Products	3.65	6.32	18.82	26 . 75*	5.18	5.74
Parent Firm/ Holding Company	5.92	12.17*	1.31	0.09	1.04	1.89
Internally Generated	43.91	28.74 [*]	30.76	17.09**	74.96	64.89*
Others	1.18	3.40	1.69	3.77	0.87	0.57
	1	00 %	1	.00 %	1	00 %

Proportion(%) of Resources Contributed by Suppliers

* p≤.05 ** p≤.01
1 Note: SIC 3823=Process Control Instrument Manufacturers
 SIC 2834=Pharmaceutical Manufacturers

from 1.75 (computed by dividing l

by .57)

alternative types of sources, while the typical pharmaceutical interacted with 1.63 (1/.61) types of outside sources. It should be noted that this measure only captures the number of organization set types and not the actual number of different firms within each type. Therefore this is a very conservative indicator and may serve to overstate the extent of dependence experienced by some firms.

Table 14

Concentration of Alternative Resource Suppliers Within the Firms' Organization Sets

	Average Concentration Factor				
Resource Type	SIC 3823	SIC 2834			
Financing	0.57	0.61			
Information	0.41	0.40			
Expertise	0.40	0.40			

Discretion (DIS), the final component of dependence, consists of two sub-components, perceived power (PcP) and potential power (PtP). The data collected for each are in Tables 15 and 16. displayed Table 15 presents the perceived influence ratings of the average potential organizational set members. Again, a six point scale was used with 1 representing No Influence and 6 representing Further. T-tests were conducted Strong Influence. to evaluate whether significant differences existed between Table industry groups. 15 shows that significant differences exist between the industries for eight of the

resources

eleven organization set types examined. Pharmaceuticals (SIC 2834) perceived venture capital firms, state/local government agencies, universities/colleges, joint venture partners, Federal government agencies, suppliers, and parent firms as having greater influence over the use of resources supplied than the process control (SIC 3823) Ιn firms. contrast, process control firms perceive industrial/ commercial customers as exercising higher levels of influence. These results are consistent with the findings reported earlier with regard to the summary values of relative magnitude .

Table 15

Perceived Influence Ratings of Organization Set Members

	A vera ge Degree SIC 3823 ¹	of Influence: SIC 2834
Banks/lending Institutions.	2.42	2.32
Venture Capital Firms.	1.03	1.54**
State/Local Government Agencies.	1.62	2.52**
Universities/Colleges.	1.23	1.50*
Joint Venture Partners.	1.27	2.00**
Industrial/Commercial Customers.	4.15	3.26**
Federal Government Agencies.	2.18	3.20**
Raw Material/Component Suppliers.	2.59	3.28**
Dealers/Distributors of Products.	2.91	3.26
Parent Firm/Holding Company.	1.74	2.63**
Others.	2.02	1.78

* p< .05 ** p< .01

¹ Note: SIC 3823=Process Control Instrument Manufacturers SIC 2834=Pharmaceutical Manufacturers Table 16 presents a summary of the data collected to provide a measure of potential power (PtP). The values shown are the average number of outside directors sitting on the boards of respondent firms representing the various organization set members. Also provided is the average size of the Board of Directors for both industry groups.

Table 16

Average Number of Outside Directors Representing Organization Set Members

	SIC 3823 ¹	SIC 2834
Banks/lending Institutions.	0.02	0.02
Venture Capital Firms.	0.02	0.37**
State/Local Government Agencies.	0.00	0.04*
Universities/Colleges.	0.05	0.20*
Joint Venture Partners.	0.05	0.12
Industrial/Commercial Customers.	0.09	0.00
Federal Government Agencies.	0.00	0.00
Raw Material/Component Suppliers.	0.03	0.10*
Dealers/Distributors of Products.	0.08	0.04
Parent Firm/Holding Company.	0.38	0.96*
Others. Total:	$\frac{1\cdot 21}{1\cdot 93}$	$\frac{1.61}{3.46}$
Average Size of Board of Directors:	4.22	5.29**

* p< .05 ** p< .01

¹ Note: SIC 3823=Process Control Instrument Manufacturers SIC 2834=Pharmaceutical Manufacturers

Again the results presented in Table 16 seem consistent with the values of the other dependence components discussed above. Pharmaceutical firms (SIC 2834) have significantly greater representation on their boards of directors by venture capital firms, state/local government agencies, universities and colleges, suppliers, and parent firms. While on the average they have larger boards of directors, the percentage of outside representation is greater among pharmaceuticals than among process control manufacturers (3.46/5.29 = 65.4% to 1.93/4.22 = 45.7%).

Finally, the overall dependence (DEP) scores are Table 17. These dependence values presented in are composite measures derived from the previously discussed components according to the formula presented in Chapter III. As such they serve to summarize the previous information and combine it according to the theoretical notions of Pfeffer and Salancik. For each resource type significant differences exist in the dependence scores across industries with the pharmaceutical firms exhibiting higher levels of dependence.

Table 17

Average Resource-Dependence Scores

Resource Type	Mean DEP Scores For: SIC 3823 ¹ SIC 2834		
Financial	3.87	 9.02**	
Information	5.33	8.18**	
Expertise	1.92	4.03**	

* p≤ .05 ** p≤ .01 1 Note: SIC 3823=Process Control Instrument Manufacturers SIC 2834=Pharmaceutical Manufacturers

The greater levels of dependence among pharmaceuticals is consistent with previous findings of Pfeffer and Salancik (1978. pp.124-125) concerning the inverse-U shaped dependence levels relationship between and industry concentration ratios. The pharmaceutical industry according 1982 Census of Manufacturers the possesses to а 91%, while the process control concentration ratio of instrument manufacturer industry has a ratio of 81%. Thus, observation of а direct and positive relationship the between concentration ratio and level of dependence in this study supports а fundamental postulate of resource dependence theory.

To assess the internal consistency of the scales used deriving the overall dependence scores Cronbach's alpha in coefficient was computed for the overal1 resource criticality scores (computed as the average the two criticality measures for each resource) and the combination of resource relative magnitude scales, and discretion over the use scales for each organization set member in both industries. In the second case, each alpha value assessed internal reliability of five separate scales (three the relative magnitude scales and two potential power scales for organization set member) that were combined to form a each fundamental part of the dependence scores. The results are presented in Table 18.

Examination of the alpha coefficients shows some low levels of reliability. While the reliabilities are mostly in the acceptable range (>0.7) for the organization set

Table 18

Cronbach's Alpha Coefficient for Resource Criticality Measures, and for the Relative Magnitude and Discretion Scales Combined for Both Industries

	SIC	38231	SIC	2834
	Alpha	Standard Alpha	Alpha	Standard Alpha
Financial Criticality.	.3406	.3569	.5798	.6372
Information Criticality.	.4456	.4555	.3373	.3401
Expertise Criticality.	.2348	.2348	.7552	.7554
Banks/lending Institutions.	.7076	.7186	.1996	.7397
Venture Capital Firms.	.7065	.7213	.4822	.5772
State/Local Government Agencies.	.7052	.7615	.1256	.3228
Universities/Colleges.	.7055	.7611	.2920	.3667
Joint Venture Partners.	.7096	.7920	.4481	.6599
Industrial/Commercial Customers.	.7028	.7061	.2948	.4826
Federal Government Agencies.	.7055	.7128	.2928	.4273
Raw Material/Component Suppliers.	.7042	.6943	.3755	.4836
Dealers/Distributors of Products.	.7116	.7180	.5353	.6108
Parent Firm/Holding Company.	.7047	.7277	.3434	.6946
Internal.	.8201	.8443	.7027	.7055
Others.	.7060	.6539	.2986	.4072

1 Note: SIC 3823=Process Control Instrument Manufacturers SIC 2934=Pharmaceutical Manufacturers scales in the process control instrument manufacturer sample, those for the pharmaceutical manufacturers are somewhat lower. Closer examination of the data revealed some inconsistency in the correlations between the variables. Since the scales appear to be reasonably reliable within the process control manufacturers industry, this inconsistency was probably exacerbated within the pharmaceutical industry by its smaller sample size and some extreme and inconsistent responses given by a few outliers.

Intraorganizational Power Measures

As discussed in Chapter III, the overall intraorganizational power (IP) scores for each respondent were calculated from three different ratings of each functional area within the firm; the substitutability of each functional area, the ability of each functional area to cope with uncertainty, , and the pervasiveness of each.

The substitutability of a functional area was captured asking respondents to rate each functional area bv on a constant sum scale according to the extent it (the functional area) contributed to the overall success of the firm. Table 19 presents the average ratings for each industry.

Table 19

Functional Area	Average % SIC 3823 ¹	Average % SIC 2834
General Administration.	9.50	9.30
Accounting/Finance.	10.00	9.08
Engineering/R&D.	26.78	14.98**
Marketing/Sales.	24.36	25.80
Personnel/Staffing.	8.45	12.04*
Production/Manufacturing.	18.23	25.40**
Public Relations.	3.31	4.00
	TOTAL = 10	00 %

Average Contribution of Functional Areas to Success of Firm

* p≤ .05 ** p≤ .01 1 Note: SIC 3823=Process Control Instrument Manufacturers SIC 2834=Pharmaceutical Manufacturers

The substitutability ratings indicate that process control manufacturers (SIC 3823) rate the engineering/R&D functional area as contributing more to the overall success of the firm, while pharmaceuticals rate the personnel/staffing and production/manufacturing functions more highly. The ratings for all other functional areas were not significantly different.

The information needed to determine the ability of a functional area to deal with uncertainty was also collected by the use of a constant sum scale. Table 20 presents the average percent of contribution to financing, information acquisition, and expertise made by each functional area.

Table 20

Percent of Contribution to Resource Acquisition Made by Each Functional Area

	Mean Finan	Contribut: <u>cing</u>	ion % of <u>Inform</u>	: ation	Expert	ise
Functional Areas	SIC 38231	SIC 2843	SIC 3823	SIC 2834	SIC 3823	SIC 2834
General Administration.	18.14	30.71**	13.58	11.08	14.96	18.63
Accounting/ Finance.	20.51	21.00	3.45	8.82**	5.96	4.22
Engineering/ R&D.	11.00	5.45**	19.54	12.25**	33.74	28.63
Marketing/ Sales.	26.23	28.82	49.82	57.45	20.66	20.78
Personnel/ Staffing.	2.67	1.86	5.54	3.82	7.56	7.94
Production/ Manufacturing.	21.43	11.27**	6.47	6.18	16.10	19.51
Public Relations.	0.95	0.88	1.70	0.39*	1.01	0.59
	1	00 %	1	00 %		00 %

* p< .05 ** p< .01

¹ Note: SIC 3823=Process Control Instrument Manufacturers SIC 2834=Pharmaceutical Manufacturers

T-tests applied to the findings presented in Table 20 show that six significant differences could be identified industry groups. Process control (SIC 3823) firms across rated the engineering/R&D and production/manufacturing functional areas higher contributors to overall as financing, while pharmaceuticals rated the general administration functional area more highly. In information acquisition, process control firms rated the engineering/R&D

and public relations functional areas significantly higher, and pharmaceuticals consider the accounting/finance functional area more important. No significant differences were found in functional contributions to expertise.

The mean ratings of functional area pervasiveness across industries are reported in Table 21. Each functional area was rated on an influence scale from 1 (doesn't influence other areas at all) to 6 (influences other area strongly).

Table 21

Functional Area:	Average Degree SIC 38231	of Influence: SIC 2834
General Administration.	4.33	4.57
Accounting/Finance.	3.78	4.42**
Engineering/R&D.	4.58	4.15*
Marketing/Sales.	4.82	4.98
Personnel/Staffing.	3.07	3.79**
Production/Manufacturing.	3.87	4.53**
Public Relations.	2.36	2.00

Perceived Influence Ratings of Functional Areas

* p≤ .05 ** p≤ .01 ¹ Note: SIC 3823=Process Control Instrument Manufacturers SIC 2834=Pharmaceutical Manufacturers

The results in Table 21 show significant differences in four functional area consistent with industries across previous findings. Pharmaceuticals on the average rated the accounting/ finance, personnel/ staffing, and production/ manufacturing functional areas as more influencial, while control firms rated engineering/ process R&D more influential.

Table 22 Finally, presents the mean overal1 Intraorganizational Power (IP) scores for each functional area across industries. Like the previously discussed Dependence (DEP) scores, the IP scores are composites calculated from the components presented above. An inspection of the IP scores reveals that within industry groups a great deal of variation exists across functional areas. The scores for process control firms range from а low value of 0.21 for the public relations function to а high value of 3.08 for the marketing/sales function. The same functional areas represent the low and high values for pharmaceuticals, however between the extremes the rankings the other functional areas vary (see Table 22 for of the rankings).

As in the case of the dependence scores, Cronbach's alpha coefficients were derived for the scales used in calculating the overall intraorganizational power scores. The results are displayed in Table 23. All of the scales met the minimum (>0.7) reliability level recommended for exploratory research.

Functional Area:	Mean IP Scores For: SIC 3823				
	Rank		Rank		
General Administration.	(4)	1.37	(3)	1.62	
Accounting/Finance.	(5)	1.14	(5)	1.17	
Engineering/R&D.	(2)	2.44	(4)	1.55**	
Marketing/Sales.	(1)	3.08	(1)	3.32	
Personnel/Staffing.	(6)	0.58	(6)	0.81	
Production/Manufacturing.	(3)	1.70	(2)	2.04	
Public Relations.	(7)	0.21	(7)	0.16	

Average Intraorganizational Power (IP) Scores

Table 22

Table 23

Cronbach's Alpha Coefficients for the Intraorganizational Power Scales in Both Industries

Cronbach's Alpha

Eurotional Area	SIC	38231 Standard	SIC	SIC 2834		
runctional Area	Alpha	Alpha	Alpha	Alpha		
General Administration.	.7943	.7663	.7236	.7338		
Accounting/Finance.	.7921	.7303	.7334	.7217		
Engineering/R&D.	.7967	.8031	.7247	.6607		
Marketing/Sales.	.7938	.7843	.7425	.7570		
Personnel/Staffing.	.7950	.7433	.7316	.7347		
Production/Manufacturing.	.7936	.7882	.7328	.7607		
Public Relations.	.7943	.7268	.7319	.7413		

For both Tables: * $p \leq .05$ ** $p \leq .01$ 1 Note: SIC 3823=Process Control Instrument Manufacturers SIC 2834=Pharmaceutical Manufacturers

DEVELOPMENT OF STRATEGY MEASURES

Factor Analysis Procedure

То facilitate the testing of the research hypotheses, separate strategy questions (see Appendix III.A at the 34 end of previous chapter for a complete listing) were the reduced to a smaller number of composite variables by a common factor analysis procedure, SPSS PA2 with Quartimax rotation. Quartimax rotation was selected so that the rows simplified rather than the columns of the factor be would matrix; in other words it was desired that variables load as high as possible on one factor and as low as possible on all other factors (Hair et al 1979 p.230, and Nie et al 1975, pp.484-485). The two objectives of the factor analysis rouapart from data reduction, were to tine assist in identifying the underlying composite strategies that the respondents were pursuing, and to create factor scores for case measuring the degree to which a case pursues each the particular strategy represented by the factor.

The procedure used requires several iterations of deriving a factor structure, elimination of variables with factor loadings less than .50, and/or elimination of factors with eigenvalues less than 1.0, and then repeating the procedure until a suitable terminal solution is reached (see Hair et al 1979 pp.218-249 for explanation of procedure). This procedure was done on each industry group separately to determine the underlying strategies in each industry sample. The terminal factor structures thus derived are portrayed in Tables 24 and 25.

Table 24

Strategy Statement #	Factor 1	Factor 2	Factor 3	Factor 4
2 4 15 16 17	0.6980 0.5809 0.8149 0.5690 0.7585			
27 30 33		0.6921 -0.6788 0.6025		
7 8			0.5657 0.9631	
19 23 25				0.6862 0.6685 0.5275
Cronbach's Alpha:	0.8055	0.7365	0.7114	0.6700
Standardized Item Alpha:	0.8096	0.7530	0.7114	0.6713
<u>Factor</u> <u>#</u>	Eig enval ue	<pre>% of Common Variance</pre>		<u>% of Total</u> <u>Variance</u>
1 2 3 4 Total	3.4396 1.3277 1.2123 1.1074	48. 18. 17. <u>15.</u> 100.	5 7 1 <u>6</u> 0	26.5 10.2 9.3 <u>8.5</u> 54.5

Terminal Factor Structure for Strategy Measures in Process Control Instrument Manufacturing Industry Sample (SIC 3823)

Note: Only variables loadings of .50 or greater are shown.

Table 24 displays the underlying factor structure for the process control instrument manufacturing firms (SIC 3823) after the iterative process described above. The final structure retains only 13 of the original 34 statements resulting in 4 factors explaining 54.5% of the total variation. The resulting factors were subjectively labeled as representing the following underlying composite strategies:

> Factor 1: State-of-the-Art Research Factor 2: Marketing Innovation Factor 3: Sequential Development Factor 4: Low Cost, Low Price

The labels are summarizations of the strategic statements loading highly on each factor.

Additionally, to test for the internal consistency of the items shown in Table 24 loading highly on each factor, Cronbach's Coefficient Alpha was computed (see Table 24). According to Nunnally (1978, pp.229-230), the Coefficient Alpha is an appropriate reliability measure to use when new phenomena are developed. For measures of exploratory research Nunnally feels that a reliability measure of .70 or higher is adequate (p.245). In Table 24 it can be seen that three of the item sets exceed Nunnally's minimum (Factor set 1, 2 and 3) and can be considered relatively free of measurement bias. Factor set 4 is slightly below the standard but considering that the scale is derived with only three variables, 0.67 seems acceptable.

Ιn the terminal factor structure for Table 25 the pharmaceutical industry sample shows that 6 factors were extracted explaining 76.5% of the total variation, and utilizing 21 of the 34 strategy statements (note: 7 factors were actually extracted however the seventh factor did not possess an eigenvalue greater than l and had no

Strategy Statement #	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
3 5 8 12 13 20	0.7718 0.5086 -0.5526 0.8834 0.8742 0.5136					
2 7 11 30		-0.7972 0.8535 0.6949 0.6992				
21 32 33			0.6865 0.9192 0.7616			
8 22 34				0.6351 0.7340 0.7964		
18 24					-0.8028 0.9439	
5 10 27 31						0.6125 0.6153 0.6985 0.5990
Cronbach's Alph a:	0.8128	0.7960	0.7801	0.7148	0.7081	0.6666
Standardized Item Alpha:	0.8206	0.8111	0.7966	0.7464	0.8585	0.6869
<u>Factor</u> <u>#</u>	Eigenv	alue	<u>% of C</u> Vari	ommon ance	<u>% c</u> <u>V</u> a	of <u>Total</u> riance
1 2 3 4 5 6 Total	4.19 3.73 2.73 2.07 1.58 1.04	75 80 26 99 24 88	25 23 16 12 9 <u>6</u> 100	.9 .0 .8 .8 .8 .8 .5 .0		20.6 19.2 13.4 10.3 7.8 5.3 76.5
Note: Only	variable	loadings	of .5	0 or	greater	are shown.

Terminal Factor Structure for All Strategy Measures in Pharmaceutical Manufacturing Industry Sample (SIC 2834)

Table 25

significantly loaded variables, therefore it was not retained). Again these factors were assigned labels according to the strategy statements loading highly on each factor. Each factor represents the following strategic orientations in the Pharmaceutical sample:

Factor 1: Flexible Innovation

Factor 2: Systematic R&D Specialization
Factor 3: Mass-Media Promotion Orientation
Factor 4: Buffered Personal Sales Orientation
Factor 5: Broad Product/Service Offerings

Factor 6: Product Management/Marketing Innovation

Again as in the process control instrument industry sample, Coefficient Alpha's were computed for each factor set of items loading highly. Five of the factor sets attained Alpha's in excess of the .70 standard. Factor set 6 was slightly below the standard at 0.67.

Using the factor analysis described above, factor scores were developed for each respondent firm indicating to which it pursued a particular the extent strategy These factor scores were then used as variables composite. of regression analyses which allowed the in series а evaluation of the hypothetical model developed in Chapter II.

HYPOTHESIS TEST RESULTS

In the following sections each of the three hypotheses developed in Chapter II are evaluated (see Figure 4 below for abbreviated conceptual model). Each of the hypotheses involve relationships between resource dependence variables, intraorganizational power variables, the strategy scores, or certain performance indicators. The resource dependence and intraorganizational power variables used in the tests discussed below, were calculated in accordance with the formulations outlined in Chapter III.





The Resource Dependence Model of Strategy and Performance

Hypothesis One

The evaluation of the first hypothesis tests whether the ability of resource dependence (DEP) scores and functional intraorganizational power (IP) scores are systematically related to the composite strategy variables derived from the factor analytic procedure described above. Furthermore, it is concerned with whether the strength of the relationship varies directly as the level of resource dependence varies.

H1: The greater the level of resource dependence, the greater the ability of resource dependence measures in conjunction with intraorganizational power measures to explain dependence avoidance / environmental modification strategies.

test Hypothesis One a forward selecting stepwise Τo multiple regression analysis was conducted with the entire set of dependence scores (FIN-DEP, INFO-DEP and EXP-DEP) and functional intraorganizational power scores (GEN AD-IP, FIN/ACC-IP, ENG/R&D-IP, MKT/SALES-IP, PERS/STAFF-IP, PROD/MFR-IP, PUB/PR-IP) acting as independent variables, and each strategy score treated as the dependent variables. F-score of 1.5 was used as the inclusion criterion. An Since more than one strategy was uncovered in each industry, it was necessary to conduct several regressions using the same independent variable set regressed against different factor scores as dependent variables. The regression models thus developed are presented in Tables 26 and 27.

industry samples the regression results Within both show that for each of the strategies, the independent variable set explains a significant amount of the variation (as indicated by the \mathbb{R}^2 values). Additionally, the amount of variation explained varies in accordance with the predictions of resource dependence theory. Recalling an earlier discussion in this chapter (see Table 17) concerning the relationship between dependence and industry
Regression Results of Composite Strategy Scores for Process Control Instrument Manufacturers (SIC 3823) with DEP and IP variables

Criter	terion Variables: Factor Scores						
Factor State-o the-Art Researc	1: of- t ch	Factor Market Innova	2: ing tion	Factor Sequen Develo	3: atial opment	Factor Cost/P Leader	4: rice ship
В	t	В	t	В	t	В	t
0.742		981		0.211		0.827	
				174	-1.70		
0.172	1.88						
237	-2.61**					158	-2.10*
0.101	1.51						
 156	-2.62**	113	-1.56	118	-1.43		
		274	-3.46**				
0.146	2.19*	0.293	3. 83**	348	-4.06**		
368	-5.78**						
112	-1.40	164	-1.79	494	-4.67**	0.263	2.81**
0.213	2.73**	-1.53	-1.75				
0.4	402 **	0.	227**	0.	269 **	0.	102**
	Criter: Factor State-o the-Art Researd 0.742 0.172 237 0.101 156 0.146 368 112 0.213	Criterion Variat Factor 1: State-of- the-Art Research B t 0.742 0.172 1.88 237 -2.61** 0.101 1.51 156 -2.62** 0.146 2.19* 368 -5.78** 112 -1.40 0.213 2.73** 0.402**	Criterion Variables: Factor 1: State-of- the-Art Research B t B 0.742981 0.172 1.88 237 -2.61** 0.101 1.51 156 -2.62**113 274 0.146 2.19* 0.293 368 -5.78** 112 -1.40164 0.213 2.73** -1.53 0.402^{**} 0.	Criterion Variables: Factor Score Factor 1: Factor 2: Marketing the-Art Innovation B t B t 0.742981 0.172 1.88 237 -2.61** 0.101 1.51 156 -2.62**113 -1.56 $274 -3.46^{**}$ 0.146 2.19* 0.293 3.83** 368 -5.78** 112 -1.40164 -1.79 0.213 2.73** -1.53 -1.75 0.402** 0.227**	Criterion Variables: Factor Scores Factor 1: Factor 2: Factor Sequent Innovation Develor B t B t B t B 0.742981 0.211 174 0.172 1.88 237 -2.61** 0.101 1.51 156 -2.62**113 -1.56118 $274 -3.46^{**}$ 0.146 2.19* 0.293 3.83**348 368 -5.78** 112 -1.40164 -1.79494 0.213 2.73** -1.53 -1.75 0.402** 0.227** 0.	Criterion Variables: Factor Scores Factor 1: State-of- the-Art Research B t B t B t B t 0.742981 0.211 174 -1.70 0.172 1.88 237 -2.61** 0.101 1.51 156 -2.62**113 -1.56118 -1.43 274 -3.46** 0.146 2.19* 0.293 3.83**348 -4.06** 368 -5.78** 112 -1.40164 -1.79494 -4.67** 0.213 2.73** -1.53 -1.75 0.402** 0.227** 0.269**	Criterion Variables: Factor Scores Factor 1: Factor 2: Sequential Cost/P Marketing Development Cost/P Leader B t B t B t B t B t B 0.742981 0.211 0.827 174 -1.70 0.172 1.88 237 -2.61**113 -1.56118 -1.43 274 -3.46** 0.146 2.19* 0.293 3.83**348 -4.06** 368 -5.78** 112 -1.40164 -1.79494 -4.67** 0.263 0.213 2.73** -1.53 -1.75 0.402** 0.227** 0.269** 0.

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Regression Results of Composite Strategy Scores for Pharmaceutical Manufacturers (SIC 2834) with DEP and IP variables

Predictor Variables	Criterion Variables: Factor Scores								
	Factor Flexib Innova	l: le tion	Factor System R&D Sp izatio	Factor 2: Systematic R&D Special- ization		Factor 3: Mass-Media Promotion		Factor 4: Buffered Personal Sales	
	В	t	В	t	В	t	В	t	
Constant	0.182		0.551		292		0.208		
FIN-DEP	0.750	4.75 ^{**}	704	-3.05**			161	-1.32	
INFO-DEP	608	-4.03**					279	-2.00	
EXP-DEP	0.706	4.56**	0.298	1.61	369	-3.22**	0.316	2.43*	
GEN AD-IP	447	-3.26 ^{**}			0.231	1.90	634	-5.14**	
FIN/ACC-IP			0.996	2.58*					
ENG/R&D-IP	915	-3.94**	0.138	3.79 ^{**}					
MKT/SALES-IP							254	-2.01*	
PERS/STF-IP	587	-4.43 **			0.655	4.95**			
PROD/MFR-IP							0.872	3.87**	
PUB/PR-IP	0.563	4.05**	313	-1.73	547	-3.91**	434	-4.11**	
R ²	0.	558 **	0.5	03**	0.4	46 **	0.6	31**	

•

* P<0.05 ** P<0.01

Table 27 (Continued)

Regression Results of Composite Strategy Scores for Pharmaceutical Manufacturers (SIC 2834) with DEP and IP variables

·

Predictor Variables	Criterion Variables: Factor Scores						
Variabies	Factor 5: Broad Product/ Service Offerings		Factor 6: Product Mgmt/ Marketing Innovation				
	В	t	В	t			
Constant	0.646		496				
FIN-DEP	116	-5.41 ^{**}	0.654	3. 38**			
INFO-DEP	0.441	3.13*	454	-2.38*			
EXP-DEP	303	-1.48	0.743	4.17**			
GEN AD-IP	703	-3.58**	456	-2.73 **			
FIN/ACC-IP	0.654	1.62					
ENG/R&D-IP	0.746	2.36*	245	-8.82 ^{**}			
MKT/SALES-IP	909	-0.42					
PERS/STF-IP							
PROD/MFR-IP	0.103	2.63*	408	-1.34			
PUB/PR-IP	571	-3.56**					
R ²	0.	654**	0.	723**			

* P<0.05 ** P<0.01

concentration, it was shown that the levels of resource dependence were significantly lower for process control instrument manufacturers than for pharmaceuticals. Thus. strategv since the amount of variation in the scores explained by the DEP and IP measures ranges from a low of 10.2% to a high of 40.2% within the process control manufacturers industry (see Table 26), while among pharmaceuticals the range is from a low of 44.6% to a high of 72.3% (see Table 27), the findings appear to support the hypothesis.

To evaluate the level of multicollinearity a Pearson product moment correlation was performed on the independent variable sets. An examination of the correlation matrices reveals that some degree of multicollinearity does exist between the variables in both industry groups (see Tables 28 and 29). However, less than 20% of the pairwise correlations are significant and most of them are at fairly levels (.35 or less). Only four of the pairwise low correlations exceed .50 with the highest at .72. Thus the is relatively free of extreme multicolinearity and data is well below the danger rule of thumb of .90 expressed bv Green and Tull (1978, p334).

Pearson Product Moment Correlations of Dependence and Intraorganizational Power Variables in Process Control Instrument Industry (SIC 3823)

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10)

- (1) FIN-DEP 1.0000
- (2) INFO-DEP .1080 1.0000 (.24)
- (3) EXP-DEP .0003 .7214 1.0000 (.99) (.00)*
- (4) GEN.AD. .1034 .0096 .1421 1.0000 IP (.27) (.92) (.13)
- (5) FIN/ACC .0647 -.0981 -.0940 -.0050 1.0000 IP (.49) (.30) (.32) (.96)
- (6) ENG/R&D .1188 .1788 .1216 .0096 -.0962 1.0000 IP (.21) (.06) (.20) (.92) (.30)
- (7) MKT/SLS .0124 .0546 .0339 -.3453 .0530 .1205 1.0000 IP (.90) (.56) (.72) (.00)* (.57) (.20)
- (8) PERS/SF -.1365 -.0287 .0488 -.0554 -.0865 -.2405 .0948 1.0000 IP (.15) (.76) (.61) (.55) (.36) (.01)* (.31)
- (9) PROD/MFR -.0130 .1546 .0650 .0587 -.0738 -.2056 -.2972 -.0033 1.0000 IP (.89) (.10) (.49) (.53) (.43) (.03)* (.00)* (.97)
- (10) PUB/PR .0021 .0137 -.0913 -.2675 -.1057 .1212 .2537 .2872 -.2418 1.0000 IP (.98) (.89) (.34) (.00)* (.26) (.20) (.01)* (.00)* (.01)*

.

* Significant Intercorrelations

Pearson Product Moment Correlations of Dependence and Intraorganizational Power Variables in Pharmaceutical Industry (SIC 2834)

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10)

- (1) FIN-DEP 1.0000
- (2) INFO-DEP .3838 1.0000 (.00)*
- (3) EXP-DEP -.0165 .5326 1.0000 (.91) (.00)*
- (4) GEN.AD. -.3172 -.2589 .1448 1.0000 IP (.02)*(.06) (.30)
- (5) FIN/ACC .2090 -.0224 -.1953 -.0043 1.0000 IP (.13) (.87) (.16) (.98)
- (6) ENG/R&D .5048 .2088 .1262 -.1711 -.0664 1.0000 IP (.00)* (.13) (.36) (.22) (.63)
- (7) MKT/SLS -.0243 .1201 -.1729 -.3635 -.2399 .2167 1.0000 IP (.86) (.39) (.21) (.01)* (.08) (.12)
- (8) PERS/SF -.1817 -.0503 .0424 -.0791 -.0649 -.1435 -.2117 1.0000 IP (.19) (.72) (.76) (.57) (.64) (.30) (.12)
- (9) PROD/MFR -.1474 -.2386 -.0288 -.0070 -.2854 -.2682 .1153 -.1122 1.0000 IP (.29) (.08) (.84) (.96) (.04)* (.05)* (.41) (.42)
- (10) PUB/PR -.2728 -.2160 -.1403 .2119 -.1274 -.1155 -.2313 .5315 .0020 1.0000IP (.05)*(.12) (.31) (.12) (.36) (.41) (.09) (.00)*(.99)
- Significant Intercorrelations

Hypothesis Two

The evaluation of hypothesis two will test the extent to which the DEP and IP variables explain the performance characteristics of STBFs and whether that explanatory ability varies across environmental contexts in accordance with the predictions of resource dependence theory.

The second hypothesis states:

H2: The greater the level of resource dependence, the greater the ability of resource dependence measures in with intraorganizational conjunction power measures to explain firm performance.

To test this hypothesis the employment, revenue, profit measures (criterion variables) and innovativeness were against the DEP and IP scores (predictor regressed variables) using the same multiple regression procedure described earlier. The results are displayed in Tables 30 and 31.

both industry groups the results show that Across for each growth performance measure (employment, revenues, and profit) the independent variable set explains a significant the variation. Additionally, once again amount of in accordance with the predictions of resource dependence theory, the amount of variation explained appears to be directly related to the level of dependence experienced by firms. For the three growth criterion the respondant the amount of variation explained ranges between variables 6.5% 30.4% (Table to for instrument manufacturers 30). compared to 51.7% to 80.9% for pharmaceuticals (Table 31).

Regression Results of Performance Indicators with DEP and IP Variables in the Process Control Instrument Manufacturers Industry (SIC 3823)

Predictor Variables:	Criter: Variabl	ion les:						
Environmental Factors	Perform	Performance in						
	Employn Growt	Employment Growth		Revenues Growth		Profits Growth		
	В	t	В	t	В	t		
Constant	0.224		684		0.159			
FIN-DEP								
INFO-DEP								
EXP-DEP								
GEN AD-IP								
FIN/ACC-IP			143	-1.49				
ENG/R&D-IP	232	-2.48*						
MKT/SALES-IP	0.215	2.35*						
PERS/STF-IP			0.201	2.10*	0.228	2.53*		
PROD/MFR-IP	247	-2.24*			0.369	3.29 **		
PUB/PR-IP	0.374	3.65**						
R ²	0.3	304 **	0	.065*	0.	149 **		

Table 30 (Continue)

Regression Results of Performance Indicators with DEP and IP Variables in the Process Control Instrument Manufacturers Industry (SIC 3823)

Predictor Variables:	Criteri Variabl	lon .es:						
Environmental Factors	Perform	Performance in						
	% Reve r Supportin	% Revenues Supporting R&D		Number of Tech Personnel		Commercialization Effectiveness		
	В	t	В	t	В	t		
Constant	023				282			
FIN-DEP								
INFO-DEP								
EXP-DEP	157	-2.11*						
GEN AD-IP								
FIN/ACC-IP	0.370	4.95**			0.352	2.05*		
ENG/R&D-IP	0.364	4 . 79 **						
MKT/SALES-IP					854	-4.78**		
PERS/STF-IP								
PROD/MFR-IP					0.457	2.11*		
PUB/PR-IP	0.240	3.22 **						
R ²	0.3	355 **	(No Ma Could ba	odel e Formed)	0	. 258 ^{**}		

Regression Results of Performance Indicators with DEP and IP Variables in the Pharmaceutical Manufacturers Industry (SIC 2834)

Predictor Variables:	Criteri Variabl	lon les:					
Environmental Factors	Perform	nance in					
	Employn Growt	Employment Growth		Revenues Growth		Profits Growth	
	В	t	В	t	В	t	
Constant	0.189		0.205		112		
FIN-DEP	0.786	6.08**	654	-3.66**	280	-3.79**	
INFO-DEP	577	-3.67**	593	-0.367			
EXP-DEP	0.265	1.94	489	-2.96**	0.168	2.38*	
GEN AD-IP							
FIN/ACC-IP							
ENG/R&D-IP			0.101	4.14**			
MKT/SALES-IP			335	-2.26 *			
PERS/STF-IP	0.117	1.04	0.254	1.92			
PROD/MFR-IP	410	-1.64			740	-5.26**	
PUB/PR-IP			599	-4.01**	714	-9.59 **	
R ²	0.5	51 7**	0.	523 **	0.	809 **	

Table 31 (Continue)

Regression Results of Performance Indicators with DEP and IP Variables in the Pharmaceutical Manufacturers Industry (SIC 2834)

Predictor Variables:	Criter Variab	ion les:						
Environmental Factors	Perfor	Performance in						
	% of Revenues Number of Tech Supporting R&D Personnel		Commer Effect:	cialization iveness				
	В	t	В	t	В	t		
Constant	027				0.436			
FIN-DEP	285	-2 . 65*						
INFO-DEP	277	-3.04**						
EXP-DEP								
GEN AD-IP								
FIN/ACC-IP	241	-2.77**			1.462	3.03**		
ENG/R&D-IP	0.570	5.82 ^{**}						
MKT/SALES-IP								
PERS/STF-IP	0.667	6.78 ^{**}						
PROD/MFR-IP								
PUB/PR-IP	630	-6.22 **						
R ²	0.	681 **	(No m could	od el be forme	0. d)	160 **		

The situation is equivocal with respect to the other performance indicators. In both industries a similar pattern is observed in that the independent variable set is able to explain a significant amount of the variation in two of the dependent innovativeness variables (percent of revenues supporting R&D, and commercialization effectiveness index) but unable to explain any of the variation in the number of scientific/technical personnel. Furthermore, while the amount of variation explained in percent of revenues supporting R&D is consistent with theoretical prediction industries, the opposite effect is observed with across regard to the commercialization effectiveness index (see Tables 30 and 31).

In general, it can be concluded that hypothesis two is supported with respect to performance in employment, sales and profit growth and the innovation measure, percent of revenues supporting R&D. While the DEP and IP variables can explain significant amounts of in variation the commercialization effectiveness index, its relationship to DEP and IP variables is opposite to that expected across industries.

Hypothesis Three

The test of hypothesis three allows an evaluation of the extent to which the strategies followed by STBFs are related to performance measures. Since it is presumed that the strategies are at least partially related to DEP and IP variables then it is expected that their ability to explain

firm performance will vary across the two industries sampled directly with the variation in resource dependence.

The third hypothesis states:

H3: The higher the level of resource dependence, the greater the ability of dependence avoidance / environmental modification strategies to explain firm performance.

Тο test this hypothesis. the factor scores strategies were used representing the various as the predictor variables with measures of employment growth. revenue growth, profit growth, percent of revenue supporting R&D, number of scientific and technical personnel, and an index of commercialization effectiveness acting as criterion variables. Again multiple regression analysis was performed as described previously.

While it is not possible to know if certain strategies were pursued with certain objectives in mind. the between strategy relationship content and performance outcomes is a fundamental assumption. This analysis allows evaluation of the relationships between the composite an strategies pursued in the industries sampled, and the performance indicators. More importantly, because of the multiplicity of strategies uncovered, this analysis also allows a comparative evaluation of the ability of each strategy to explain various measures of performance. The results of the regressions against the six performance indicators in each industry group are presented in Tables 32 and 33.

Regression Results of Performance Indicators with Composite Strategy Scores in the Process Control Manufacturer Industry (SIC 3823)

Predictor Variables:	Criterion Variables:						
Strategy	Growth Performance in						
Scores	Employme	ent	Revenue	es	Profits		
	В	t	В	t	В	t	
Constant	0.264		0.230		0.385		
State-of-the- Art Research					495	-4.17**	
Marketing Innovation	0.232	1.89					
Sequential Development							
Cost/Price Leadership			0.194	1.60	0.243	2.22*	
R ²	0.03	33	0.02	24	0.	188 **	

Table 32 (Continue)

Regression Results of Performance Indicators with Composite Strategy Scores in the Process Control Manufacturer Industry (SIC 3823)

Predictor Variables:	Criteri Variabl	lon Les:						
Strategic	Indicators of Innovation							
3001 65	% Revenues Supporting R&D		Number o Perso	Number of Tech Personnel		Innovation Index		
	В	t	В	t	В	t		
Constant	013		0.010		294			
State-of-the- Art Research	0.404	4.39**						
Marketing Innovation					815	-3.88**		
Sequential Development			0.215	2.54**				
Cost/Price Leadership			432	-4.24**				
R ²	0.1	148**	0.1	77 **	0.1	19**		

Regression Results of Performance Indicators with Composite Strategy Scores in the Pharmaceutical Industry (SIC 2834)

Predictor Variables:	Criterion Variables:								
Strategic	Growth Perform	Growth Performance in							
orientations	Employment	Revenues	6	Profits					
	B t	В	t	В	t				
Constant		367		0.112					
Flexible Innovation				355	-2.92**				
Systematic R&D Specialization		187 -1	.74	0.391	4 . 29 ^{**}				
Mass-Media Promotion				0.152	1.23				
Buffered Per- sonal sales		0.192 1	.34	0.484	3.93**				
Broad Product/ Service Offering:	S	0.370	8.66**						
Product Mgmt/ Mktg Innovation		246 -2	2.31*	0.368	4.08**				
R ²	(no model could be developed)	0.392	2**	0.	588 **				
* P <u><</u> 0.05 ** P <u><</u> 0	0.01								

Table 33 (Continue)

Regression Results of Performance Indicators with Composite Strategy Scores in the Pharmaceutical Industry (SIC 2834)

Predictor Variables:	Criterion Variables:						
Strategic	Indicat	ors of I	nnovation				
3001 85	% Rever Supportin	nues ng R&D	Number o Perso	Number of Tech Personnel		Innovation Index	
	В	t	В	t	В	t	
Constant	018		579		0.472		
Flexible Innovation			275	-2.26*	-1.412	-4.04**	
Systematic R&D Specialization	0.232	2.86**			1.186	3.92**	
Mass-Media Promotion	0.361	3.28**					
Buffered Per- sonal sales	0.440	3.76**			1.049	2.75**	
Broad Product/ Service Offerings					-1.228	-4.31**	
Product Mgmt/ Mktg Innovation					1.143	3.88**	
R ²	0.3	71**	0.	089 *	0.5	87 **	

* P<0.05 ** P<0.01

In the twelve models developed across both industries, nine explained a significant amount of the variation in the criterion variables. Within the process control instrument manufacturing industry the strategy scores accounted for $(P \le 0.01)$ of the variation in profit growth exhibited 18.8% in the sample. by firms The strategy scores failed to explain a significant amount of the variation in either employment growth or revenue growth. However, the strategy did explain a significant amount of the variation in scores three indicators of innovative performance. In a11 the pharmaceutical industry (see Table 33) the strategy scores explained a significant amount of the variation in both revenue growth (39.2%) and profit growth (58.8%) and a11 three innovativeness indicators. Furthermore, except for the criterion variables, employment growth and number of technical personnel, the amount of variation explained varies directly and positively with the change in overall resource dependence level, thus conforming with theoretical predictions and supporting the hypothesis.

APPENDIX IV

APPENDIX IV

STRATEGY INDICATORS

Mean Responses and Cross Industry Comparisons

Listed in Table 34 are the 34 strategy statements used in the factor analysis process described in this chapter for developing the composite strategy scores. As explained in Chapter II, each statement was scaled from 1 (describes тy firm not at all) to 6 (describes my firm perfectly). The differences across industry means for each statement were by a T-test and significant differences are evaluated indicated by an asterisk. Fully 17 of the 34 (50%) items showed a significant difference at the p=.05 level or less of 34 were significantly different at p=.01 level (16 or less).

Table 34

Mean Responses Across Industries on Strategy Indicators

Questionnaire Item	<u>Mean Responses</u>		
	<u>SIC 3823</u>	<u>SIC 2834</u>	
1. The task of the R&D activities pursued by my firm is to discover and evaluate alternative solutions to defined problems.	4.60	4.21	
2. Technical personnel in my firm are always informed about the overall objectives being pursued by my firm.	4.67	4.15	
3. It is the policy of this firm to allow technical personnel freedom for individual initiative rather than assigning them to specific parts of a well			
defined solution.	4.25	3.88	

Table 38 (Continue)

4. The R&D project portfolio of my firm is continuously revised to accomodate competitive actions, or other in-house research results which may obsolete a project.	4.71	4.42
5. Innovation is highly prized by my firm, even if it raises overall operating costs.	3.66	3.43
6. In my firm, the R&D task is to reduce available alternatives to a single problem solution for implementation.	3.70	2.89**
7. The R&D personnel in my firm have specific tasks to perform and shouldn't be involved in the work of others.	2.25	3.41**
8. In my firm there are certain sequences of R&D tasks which must be adhered to in order to realize the greatest amount of efficiency.	2.67	4.03**
9. In my firm it is common that senior executives be given managerial responsibilities in more than one functional area.	4.55	4.86
10. Project/product managers are often used in my firm to coordinate development, production, and marketing of our products and services.	4.19	5.05**
11. In my firm, joint product/service planning by R&D, production, and marketing personnel is required for all market of- ferings.	4.32	4.68
12. The planning and control processes in my firm are very flexible because change occurs rapidly in this industry.	4.79	3.80**
13. My firm values the ability to respond quickly to market changes even at incre- mentally higher levels of cost.	4.39	4.32
14. Planning in my firm is usually se- quential, that is, detailed R&D is com- pleted before the manufacturing and marke- ting planning is begun.	2.33	3.44**
15. The managers of my firm are expected to keep up to date on the significant technological events occurring in this industry.	5.07	4.42**

Table 38(Continue)

16. The competitive product improvements or changes occurring in this industry can be foretold with confidence and planned for by my firm.	3.47	2.32**
17. My firm continuously engages in new product/service development procedures.	4.71	4.10**
18. Customer complaints receive the attention of the top managers in my firm.	5.46	5.17*
19. My firm operates very efficiently (at low cost) because of continuous improve- ments in our production processes.	3.96	3.70
20. The level of product/service quality is supervised directly by the top manage-ment of my firm.	5.42	4.96**
21. When hiring new management for my firm, it is not important that they have experience in this industry.	2.66	2.78
22. For my firm to compete effectively it is necessary to maintain high inventory levels.	2.38	3.37**
23. In general my firm's prices are the among the lowest in the industry.	3.39	3.80
24 My firm attempts to offer a broad range of product/service lines, rather than specializing in a particular product/service line exclusively.	2.60	2.68
25. In order to defer the cost of developing new products/services, my firm attempts to improve or refine existing products/services first.	4.01	4.20
26. It is important to the success of my firm that its trademark(s) or brandnames be instantly recognizable by potential end users.	3.05	3.81**
27. Being innovative and creative in mar- keting is more important to my firm than innovation in product/service development.	2.30	3.25**
28. My firm relies on established distri- butors to sell its products/services, rather than distributing directly to end-	2 51	1 76**
	L I L	T • / U

Table 38 (Continue)

29. My firm possesses steady and reliable sources of raw materials or components.	4.54	5.30**
30. My firm seeks out and attempts to serve highly specialized markets with its products/services, rather than serving a number of diverse markets with the same products/services.	4.19	4.72
31. The products/services my firm pro- duces and markets are used mostly in the production processes of other firms.	4.30	1.47**
32. My firm depends very heavily on ad- vertising to make a sale.	2.10	2.16
33. To compete successfully, my firm must attract publicity about our products or services either through trade journals, newspapers or broadcast media.	2.66	2.32
34. The salesforce of my company is so effective that it convinces potential customers to purchase our products/ser- vices within the first few contacts.	2.94	3.02

In general the results indicate that process control instrument manufacturers (SIC 3823) are more likely than pharmaceutical preparation manufacturers (SIC 2834) to:

-utilize R&D to reduce alternatives to a single problem solution for implementation.

-utilize flexible planning and control processes because of perceived rapid changes in the industry.

-expect their managers to keep up to date on significant technological events occurring in the industry.

-forecast with confidence and plan for competitive product improvements.

-continuously engage in new product/service development procedures.

-give top management attention to customer complaints.

-give direct top management supervision toward the level of product/service quality.

-produce and market products/services used mostly in the production processes of other firms.

On the other hand, Pharmaceuticals are more likely to:

-keep R&D personnel assigned to specific tasks and to minimize their contact with the work of other functional personnel.

-organize R&D tasks into sequential procedures for greatest efficiency.

-use project/product managers for coordinating the develop ment, production, and marketing of products/services.

-use sequential planning processes, completing a detailed R&D plan before manufacturing and marketing plans are begun.

-maintain high inventory levels.

-value the recognizability of trademarks/brandnames as a success factor.

-consider innovation in marketing as more important than innovation in product/service development.

-rely on established distributors to sell products/services, rather than distributing directly to end users.

-possess steady and reliable sources of raw materials or components.

PERFORMANCE MEASURES

Table 35 presents the performance information and compares it across industry groups.

From the data presented in Table 35, significant differences are apparent in four of the indicators. The pharmaceutical firms sampled indicated declines in both numbers of people employed and in profits. They also tended to employ greater numbers of scientific and technical personnel while spending a lower percentage of revenues in support of R&D activities.

No significant differences were found across industries revenue growth, number of new products/processes in introduced, or in the number of patents held. (Note: The latter two indicators were used to develop the commercialization effectiveness index used in the earlier regression analyses, i.e., commercialization effectiveness index = number of new products/processes divided by the number of patents held).

Table 35

Summary of Performance Indicators by Industry

Performance Indicators:	Mean Performance SIC 3823	Values for: SIC 2834
Revenue Growth Rate	0.29	0.38
Profit Growth Rate	0.49	-0.11**
Employment Growth Rate	0.05	-0.02**
# New Products/Processes Introduced Last Year	3.05	3.55
# Patents Held	3.32	2.33
% Revenues Spent to Support R&D	15.78	7.21**
<pre># Scientific/Technical Personnel Employed</pre>	9.10	28.26*

* p≤ .05 ** p≤ .01

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

apparent sensitivity of The small technology-based firms to environmental factors, and the commonly held belief factors constrain and shape the strategies that such and STBFs. characterisitics of provided the performance situational background and impetus for this study. Theoretical contributions from four streams of organizational research were integrated into a conceptual model which was evaluated for its ability to predict relationships between measures of external and internal resource related environmental factors, firm strategy and Measures of environmental factors performance. such as resource dependence and functional intraorganizational power were found capable of explaining the variation in the strategies and performance characteristics exhibited by a sample of STBFs collected from two industries in accordance with theoretical predictions. The findings possess implications for further theory development and provide direction for future research.

This chapter consists of three parts. Part one contains a summary and discussion of the findings as they relate to the conceptual model and hypotheses stated in Chapter II. The second part provides the general conclusions

reached from the findings of the study. Finally, part three outlines the theoretical and managerial implications of the results and suggests directions for future research.

SUMMARY AND DISCUSSION OF FINDINGS

Theoretical Overview

As was discussed at length in Chapter II. STBFs are upon outside institutions to seen as dependent provide needed resources, and is often implied that it these dependencies somehow affect the behaviors and performances the firms (Lamont 1971; Braden 1977,1982; Brophy 1982; of and others). Unfortunately little empirical evidence exists verifying these hypotheses, and that which does is devoid of adequate theoretical framework for explaining the an observations. The state-of-the-art in research related to STBFs is still descriptive in nature.

Ιn this study an attempt is made to develop a theoretical framework by integrating approaches from four streams of research concerned with organizational response to environments with particular emphasis upon resource environments. The intent of this integrative process was to approaches which are useful for explaining why find STBFs exhibit resource interdependencies and how these dependencies are related to STBF strategies and performance characteristics. From this theory base, three hypotheses were derived to test empirical observations of environment strategy, environment \rightarrow performance, and strategy \rightarrow > performance linkages against theoretical predictions.

The core of the conceptual framework is Pfeffer and Salancik's (1978) resource dependence theory which posits that organizations are not self sufficient and thus depend organizations to supply needed resources. on other This state of dependence is a major source of environmental uncertainty. Ιt is Pfeffer and Salancik's view that this uncertainty acts as a major motivator for organizational action because organizations will either comply to the demands of external organizations controlling needed resources or attempt to pro-actively avoid those demands. In this regard, Pfeffer and Salancik conceptualized four groups of pro-active strategies depending on the object of avoidance (i.e., avoiding dependence or avoiding control) the method of avoidance (i.e., either by adapting to and environment, or by modifying the environment) (see Table 6 Figure 5 below). Consistent with this perspective, and Schermerhorn (1975) suggests that resource related organizational interdependencies may result in three potential costs to the organization: a loss of decisionmaking autonomy, unfavorable ramifications for organizational image or identity, and the direct expenditure of scarce organizational resources to maintain the linkages.

Additionally, Pfeffer and Salancik hypothesize that the extent to which organizations respond to resource dependence situations is directly related to the degree of concentration within industries. They found that as the concentration ratio increased to some intermediate level, its ability to predict intraindustry mergers increased.

Past the intermediate level of concentration, its ability to explain firm behavior decreased (Pfeffer and Salancik 1978, pp.124-125).





A Classification of Strategic Options to Resource Dependence

Thus resource dependence theory provided two postulates useful for attaining the research objectives of this study. First. environmental uncertainty is grounded that in resource dependencies and that these dependencies motivate organizations to take action. Secondly, the extent to which those actions are explainable by resource related factors varies across industries with respect to their concentration levels.

While dependence resource provided the theory fundamental conceptualization useful for examining the external environmental influences and strategy on

performance, other approaches provided concepts useful for measuring and evaluating internal environments, strategies and performance characteristics. The strategic contingencies model of intraorganizational power (Hickson, 1971) was used for guidance et al in evaluating how dependence reflected in the internal resource was environment of the organization. Porter (1980), from the industrial organization economics perspective, and Ansoff Stewart (1967) and Goldman (1982), representing and the policy perspective, made contributions the business to conceptualization and measurement of the strategy construct. Lastly, guidance concerning performance measurement was found in the work of Friedlander and Pickel (1968) and Robinson (1983), from the contingency theory school.

Summary and Discussion of Hypothesis Tests

Hypothesis One

The first hypothesis expressed the nature of the relationship between resource dependence measures and intraorganizational power measures as independent variables, and measures of strategy, as dependent variables, that was expected from the theoretical perspective discussed above.

The first hypothesis stated:

H1: The greater the level of resource dependence, the the greater ability of resource dependence measures in with intraorganizational conjunction power measures to dependence / environmental modification explain avoid strategies.

As discussed in Chapter IV, the regression of the resource dependence (DEP) and intraorganizational power (IP)

variables against the latent strategy scores developed from а common factor analytic process showed that significant relationships occurred for each of the strategies pursued within the two samples (see Table 36 and 37 for a summary). Furthermore, in accordance with theoretical prediction, the amount of the variation explainable in the process control instrument industry was noticably lower than that in the pharmaceutical industry. This finding is consistent with theoretical prediction the overall because resource dependence values for the instrument manufacturers were significantly lower than pharmaceuticals (see Table 17) and concentration ratio for instrument manufacturers was the also lower at each level (i.e. 4,8,20 and 50 firm levels).

Thus, the test of hypothesis one allows two conclusions drawn. First, the resource dependence (DEP) to be and power variables (IP) as intraorganizational thev are explain significant amounts conceptualized can of the variation in the strategies pursued by the sample STBFs. Second, the ability of resource dependence to explain strategy increases both as the level of dependence and industry concentration ratio increase.

These findings indicate that the conceptual model developed this study is capable of in explaining environmental modification strategies that seek to avoid dependence (see Table 6, cell 2 and Figure 5). Furthermore, ability to explain this type of strategy is enhanced as its industry concentration levels increase. Interpretation of these results suggest technology-based that among

Summary of Significant Relationships for the Environment -> Strategy Linkage and the Environment -> Performance Linkage in the Process Control Instrument Industry (SIC 3823)

Predi Varia	ctor bles									
Envir	onmenta	al Fact	ors							
Exter FIN DEP	nal: INFO DEP	EXP DEP	Inter GEN AD	rnal:(I FIN/ ACC	ntraorg ENG/ R&D	anization MKTG/ SALES	nal Power PERS/ STF	r) PROD/ MFR	PUB/ PR	% of Variance
						++			+++	40.2%
						+++				22.7%
										26.9%
								+++		10.2%
						++			+++	30.4%
							++			6.5%
							++	+++		14.9%
				+++	+++				+++	35.5%
										none
				++				++		25.8%
	Predi Varia Envir Exter FIN DEP	Predictor Variables Environmenta External: FIN INFO DEP DEP	Predictor Variables Environmental Fact External: FIN INFO EXP DEP DEP DEP 	Predictor Variables Environmental Factors External: Inter FIN INFO EXP GEN DEP DEP DEP AD 	Predictor Variables Environmental Factors External: Internal:(I FIN INFO EXP GEN FIN/ DEP DEP DEP AD ACC 	Predictor Variables Environmental Factors External: Internal:(Intraorg, FIN INFO EXP GEN FIN/ ENG/ DEP DEP DEP AD ACC R&D 	Predictor Variables Environmental Factors External: Internal:(Intraorganization FIN INFO EXP GEN FIN/ ENC/ MKTG/ DEP DEP DEP AD ACC R&D SALES ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++	Predictor Variables Environmental Factors External: Internal:(Intraorganizational Power FIN INFO EXP GEN FIN/ ENG/ MKTG/ PERS/ DEP DEP DEP AD ACC R&D SALES STF ++ ++ ++ ++ ++ ++ ++ ++ ++ +++ +++	Predictor Variables Environmental Factors External: Internal:(Intraorganizational Power) FIN INFO EXP GEN FIN/ ENG/ MKTG/ PERS/ DEP DEP DEP AD ACC R&D SALES STF ++ ++ ++ ++ +++ +++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++ ++	Predictor Variables Environmental Factors External: Internal:(Intraorganizational Power) FIN INFO EXP GEN FIN/ External: Internal:(Intraorganizational Power) FIN Internal:(Intraorganizational Power) FIN INFO EXP GEN FIN Internal:(Intraorganizational Power) Internal: Internal:(Interacower)

Key: ---/+++ $P \leq .01$ --/++ $P \leq .05$ +=positive -=negative

Summary of Significant Relationships for the Environment -> Strategy Linkage and the Environment -> Performance Linkage in the Pharmaceutical Industry (SIC 2834)

Criterion : Variables :	Pred: Varia	ictor ables											
:	Environmental Factors												
Strategies: (% of Tot-: al vari- : ance) :	Exter FIN DEP	rnal: INFO DEP	EXP DEP	Inte GEN AD	rnal:(I FIN/ ACC	ntraorg ENG/ R&D	anization MKTG/ SALES	nal Powe PERS/ STF	r) PROD/ MFR	PUB/ PR	% of Variance		
Flexible Innovation (20.6%)	+++		+++							+++	55.8%		
Systematic R&D Special (19.2%)					++	+++					50.3%		
Mass Media Promotion (13.4%)								+++			44.6%		
Buffered Pers. Sales (10.3%)			++						+++		63.1%		
Broad Prod/ Service Off. (7.8%)		++				++			++		65.4%		
Product Mgt/ Mktg Innov. (5.3%)	+++		+++								72.3%		

.

Key: ---/+++ P≤.01 ` --/++ P≤.05 +=positive -=negative

Table 37 (Continued)

Summary of Significant Relationships for the Environment -> Strategy Linkage and the Environment -> Performance Linkage in the Pharmaceutical Industry (SIC 2834)

Criterion : Variables : : Perfor- : mance : Indicators:	Pred: Varia Envi	Predictor Variables												
	Exte FIN DEP	rnal: INFO DEP	EXP DEP	Inte GEN AD	rnal:(I FIN/ ACC	intraorg ENG/ R&D	anizatio MKTG/ SALES	nal Powe PERS/ STF	r) PROD/ MFR	PUB/ PR	% of Variance			
Employment Growth	+++										51.7%			
Revenue Growth						+++					52.3%			
Profit Growth			++								80.9%			
% of Rev. Supporting R&D						+++		+++			68.1%			
<pre># of Sci/ Technical Personnel</pre>											none			
Commercial Index					+++						16.0%			

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Key: ---/+++ $P \leq .01$ --/++ $P \leq .05$ +=positive -=negative

industries, as concentration ratios increase, competition for scarce resources increases, and firms develop higher levels of dependence upon certain resources and suppliers. a result they are more likely to attempt to avoid As this dependence by pursuing one of the types of of broad state environmental management strategies outlined in Table 6 or The results of this study indicate that since in Figure 5. STBFs are technology-based they are more likely to attempt to modify their environment through innovation or technology driven type strategies. This finding explains much of the anecdota1 observations about STBFs. common and is consistent with other conceptual work (Ansoff and Stewart 1967, and Goldman 1982).

What is unexplained by these results are the specific relationships between the variables observed in the data. For instance, within the instrument industry only expertise dependence is significantly associated with any of the strategies. Whereas, amoung pharmaceuticals all three types dependence show significant associations (see Tables 36 of 37). is partially accounted for by theory and This as discussed above. however the theory cannot explain why one type of dependency would be more strongly associated than another with strategy. This same observation also applies the intraorganizational power variables. One possible to explanation is related to the issue of comparability οf The manner in which strategies across industries. the strategy construct is operationalized prevents comparison of the strategies across industries. Thus the "State-of-the-
Art" strategy in the instrument manufacturing industry has no directly comparable counterpart among the pharmaceuticals. This methodological weakness hinders theory development at the level of the firm.

Hypothesis Two

The test of the second research hypothesis was concerned with evaluating evidence for a theoretical link between the resource related environmental factors and performance indicators of STBFs. As in the case of the environment -> strategy linkage, existing beliefs and some empirical work (Brophy 1982) posited that resource availability constrained and influenced STBF performance. Furthermore, resource dependence theory views organizational representative of attempts growth as to cope with problematic resources (Pfeffer and Salancik 1978, p.131).

The second hypothesis stated:

H₂: The greater the level of resource dependence, the greater the ability of resource dependence measures in conjunction with intraorganizational power measures to explain firm performance.

results of hypothesis two The test indicate that. except for the number of technical/scientific personnel, the resource dependence and intraorganizational power variables explain significant amounts of variation in the performance indicators (see Tables 36 and 37). Additionally, the variation explained conforms amount of to theoretical only for the growth variables and the prediction, but "percent of revenue supporting R&D" variable. No model was found for the "number of scientific/technical personnel" performance indicator. And, while significant amounts of variation were explained in the commercialization index, the amount explained decreased as resource dependence increased.

The conclusions that can be drawn from these results are that the independent variable set can explain significant amounts of the variation in the predicted but only for the growth indicators as direction group. а result is consistent with Pfeffer and Salancik's view This that dependence can have a direct effect on organizational The mixed findings in regard to the innovativeness growth. measures may reflect lag effects that were not captured in Furthermore, it may be the survey instrument. possible that there are no direct effects between resource dependence and intraorganizational power variables and the innovativeness measures. Their influence may be suppressed or moderated by an intervening construct like strategy. for this conclusion is derived from the Support number of intraorganizational power variables which help explain the variance in the equations.

Again, as in the case of hypothesis one, the question of why some predictor variables are related to the criterion variables in industry but not in the other one can be raised. However, unlike the environment -> strategy case, the models are comparable. One explanation for now this is the existence of an intervening construct observation (such as strategy) which alters the relationships, thus preventing direct cross industry comparisons. Another

explanation, which is equally applicable for the environment -> strategy case, is that the two industries used in this study can only be compared on the basis of magnitude differences in the variables of concern not in terms of interrelationships. A study investigating their the similarity in interrelationships must be accomplished across industries with similar concentration ratios and equality across the predictor and criterion variables. Τo do otherwise would be analogous to comparing apples and The environmental contexts are different and thus oranges. the relationships must by definition be different. What is important is whether the observed differences can more be other industries facing similar replicated across (as evidenced competitive environments bv their ratios) levels of dependence. concentration and An alternative validation approach would be to use a split halves technique. Unfortunately the sample sizes in this study precluded the use of such a procedure.

Hypothesis Three

The test of hypothesis three reveals whether the strategies developed in response to resource dependence will vary in their ability to explain firm performance as the levels of resource dependence and the concentration ratios is a logical extension This hypothesis to the change. previous two hyptheses even though resource dependence theory does not address this relationship.

The third hypothesis stated:

H₃: The higher the level of resource dependence, the greater the ability of dependence avoidance / environmental modification type strategies to explain firm performance.

Ιn order to test hypothesis three, the composite strategy scores were treated as the predictor variables, and the performance measures acted as criterion variables. The results of this test were equivocal (see summary in Table 38). In the case of employment growth, no significant amounts of variation were explained in either industry. This result can be contrasted with the results obtained from the test of hypothesis two which showed significant amounts variation in employment growth explained by the DEP of and IP Evidently the "avoid dependence/modify variables. environment" type strategies investigated in this study play Other strategies, role in employment growth of STBFs. no such as intraindustry mergers and acquisitions, and crossdiversifications are more industry likely related tο employment growth as a performance indicator (see Pfeffer and Salancik 1978, pp.130-139). Thus, since the DEP and IP measures showed significant relationships with employment growth, the lack of strategy measures in the other groups of strategy options (Figure 5) prevents thorough understanding of any intervening relationships.

With regard to the other two growth measures, some of the variation (39.2%) in revenue growth was significantly explained by the strategy scores in the pharmaceutical industry sample. However, significant no amount of variation could be explained in the process control

instrument industry. Even though no significant amount of the variation was explained in the instrument industry, this result is consistent with the theoretical predictions. Furthermore the contrast with the findings of the previous hypothesis test are explainable in the same manner as the results for employment growth.

The relationships with the profit indicator, percent of revenue supporting R&D, and the commercialization index were in accordance with theoretical prediction. a11 Onlv the scientific and technical personnel number of failed to conform to theoretical predictions. This result coupled with the results regarding this performance indicator in the previous hypothesis test, suggests that the variable mav not be an appropriate performance indicator since it behaves independent of dependence and competitive in а manner influences.

Additional insights as to the ability of environment and strategy to explain performance within each industry can be gained by examining the differences in the variation explained for each performance indicator as a result of environmental predictors versus strategy predictors (see Table 39).

Table 38

Summary of Significant Relationships for the Strategy -> Performance Linkage in both the Process Control Instrument Industry (SIC 3823) and the Pharmaceutical Industry (SIC 2834)

Predictor Criterio Variables:	n Variables: Performance Indicators					
SIC 3823 Strategies:	Employ- ment Growth	Revenue Growth	Profit Growth	% Revenue Supporting R&D	Number of Sci/Tech Personnel	Conmercial- ization Index
State-of-the-Art (26.5% of Var.)				+++		
Marketing Innovation (10.2% of Var.)	n/s					
Sequential Development (9.3% of Var.)					+++	
Cost/Price Leadership (8.5% of Var.)		n/s	++			
Total % Var iation Explained	3.3%	2.4%	18.8% **	14.8% **	17.7% **	11.9% **
SIC 2834 Strategies:						
Flexible Innovation (20.6% of Var.)						
Systematic R&D Spec. (19.2% of Var.)		n/s	+++	+++		+++
Mass Media Promo. (13.4% of Var.)			n/s	+++		
Buffered Per. Sales (10.3% of Var.)		n/s	+++	+++		+++
Broad Pro/Serv Offrg (7.8% of Var.)		+++				
Prod Mgt/Mkt Innov. (5.3% of Var.)			+++			+++
Total % Variation Explained	no model	39.2% **	58.8% **	37.1% **	8.9% *	58.7% **

•

Key: ---/+++/** P≤.01 --/++/* P≤.05 +=positive -=negative

Table 39

A Comparison of the Relative Abilities of Environmental and Strategy Predictors to Explain Performance Variations Within and Across Industries Performance : % Variation Explained by: :Direction of Indicators :Change: Same : Strategy (Industry) :or Different : Environmental Predictors Predictors :Across : S --> P : $Env \rightarrow P$:Industries Employment Growth 3823 30.4 -- less --> 3.3 2834 51.7 -- less --> 0.0 Same Revenue Growth 6.5 -- less --> 2.4 3823 2834 52.3 -- less --> 39.2 Same Profit Growth 3823 14.9 -- more --> 18.8 2834 80.9 -- less --> 58.8 Different %Rev/R&d 3823 35.5 -- less --> 14.8 2834 68.1 -- less --> 37.1 Same #Sci/Tech Personnel 3823 0.0 -- more --> 17.7 2834 0.0 -- more --> 8.9 Same Commercial Index 3823 25.8 -- less --> 11.9 2834 16.0 -- more --> 58.7 Different

examination of Table 39 reveals that, in eight An of the twelve linkages, the amount of variation explained in performance the indicator is less with strategy the predictors. This predictor than with the environmental relationship holds across industries for four of the six performance indicators. Apparently, this stronger

predictive relationship in the environment --> performance linkage suggests that since environmental variables are unlikely to influence performance outcomes directly, other factors not measured in this study are influencing performance outcomes in addition to the strategies investigated.

Summary of Findings

As a result of the research described and discussed above, five conclusions can be drawn about how external and internal environmental factors are related to the strategies and performance characteristics of small technology-based firms.

First, in accordance with resource dependence theory, the levels of dependence exhibited by respondant STBFs across two technology-based industries varied directly and positively with the variation in concentration ratios across those industries.

Second, with regard to the environment --> strategy linkage, the research results show that the environmental variables were able to explain significant amounts of variation in the strategy measures across both industries. Futhermore, the amount of variation explained increased as the level of dependence and the concentration ratio increased.

Third, concerning the environment --> performance linkage, the findings show that in accordance with theoretical predictions, significant amounts of variation are explained in the growth performance indicators in an increasing manner across the industry samples. The innovativeness measures show mixed relationships with environmental predictors, one showing a relationship consistent with theory, one showing no relationship, and one showing an inverse relationship.

Fourth. the investigation of strategy --> the "avoid the performance linkage. shows that dependence/modify environment" type strategies can explain significant amounts of variation across industries in the for four (two desired direction growth and two innovativeness indicators) of the performance measures. For one indicator there was no relationship, and for the other an inverse relationship was found.

And fifth, comparisons of predictive strength show that the models of the environment --> performance linkage explain a greater amount of the variation in performance than models reflecting the strategy --> performance linkage.

Discussions of each of these findings offered a rationale for the results listed above.

CONCLUSIONS

Based on the empirical findings reported in this study and summarized above, four general conclusions can be drawn.

First, the results of this study demonstrate that external and internal resource related constructs can explain significant amounts of variation in the strategies pursued by STBFs to avoid dependence through modification of their environments.

Second, the results show that external and internal resource related constructs can explain significant amounts of variation in the growth and innovativeness performance characteristics exhibited by STBFs.

Third, the results demonstrate that the avoid dependence/ environment modification strategies can explain a significant amount of the variation in the growth and innovativeness measures of performance.

Fourth, cross industry differences in terms of resource dependence levels and concentration ratios influence the amount of variation explained in the strategies and performance characteristics examined.

Therefore it can be concluded that the findings provide affirmative answer to the two research questions framing an this study. However. caution must be exercised in interpreting the results of this study. While demonstrating the existence of an association between the variables does not justify a conclusion of causation, it does recognize a relationship between the phenomena observed in the data. Furthermore. the association is compatible with the of structure the conceptual model in the sense that independence among the variables would constitute evidence contradictory to the model. Although not sufficient to validate the model, the associations would be necessary for it to be valid.

IMPLICATIONS

Theoretical Implications

This research contributes to theory in two ways. First the findings demonstrate that the resource dependence model of strategy and performance possesses the capability to explain the variations in STBF strategies and performance characteristics as a result of industry differences in overall dependence levels and concentration ratios. Thus. results represent a first step toward the creation of the knowledge about the influences STBF theory-based upon most activities and performance. Until now. of the research in this area has been descriptive and contributed little to understanding or explaining why STBFs behaved and performed as they do.

study also contributes to resource dependence This theory because the analyses conducted extend research based the resource dependence theory to areas beyond on that traditionally accomplished by organizational sociologists. For instance. investigations based most on resource theory center on investigations of dependence either compliance activities or on strategies concerned with the avoidance of control. This research investigates the ability of the theory to explain strategies related to the avoidance of dependence. Moreover, this research evaluates ability of dependence and intraorganizational the power variables to explain various types of performance indicators, an approach not investigated before.

Public Policy Implications

The results additionally reveal some insights about the nature of STBFs (albeit a small segment of STBFs) that may provide guidelines useful at the public policy level for the evaluation and development of economic development initiatives.

In general it appears that the best rule to follow is: the lower the level of resource dependence experienced by STBFs, the better. The evidence supporting this conclusion can be found in Tables 36 and 37 where it can be seen that most dependence measures are inversely related to performance indicators. In addition, the results of this study suggest that all STBFs cannot be treated as though they needed the same types of assistance. From Table 17 it can be seen that significant differences in the degree of dependence occurred across the two industries sampled. Furthermore, the extent to which the sample STBFs were dependent, varied with the variation in competitive activity in the industry, as captured in the concentration ratios of the industries.

Thus, in making needs assessments, public policy makers should consider cross industry evaluations using a methodology designed to consider criticality of resources, number of suppliers available to provide the resource, the and relative magnitude of the resources supplied by the them, as well as the amount of discretion the suppliers possess over the use and disposition of the resource. This information could then be coupled with an organizational activity of public policy interest (e.g., basic research into super conductors) to determine whether the degree of dependence is adversely related to the desired level of activity performance. If dependence is affecting the output negatively, then policy makers can develop programs targeted toward the components of dependence (i.e., decrease

criticality of an input, increasing the availability of suppliers, etc.)

LIMITATIONS

The interpretation of the findings, conclusions and implications of the research outlined in this chapter are subject to a number of additional limitations not previously discussed:

- This study investigated a limited number of resources and strategic activities in developing the dependence, intraorganizational power, and composite strategy scores.

- The data was collected from firms in two technology based industries. Validating the conclusions requires additional study across greater variation in environmental context either in terms of four digit Standard Industrial Classification codes or some other measure.

- While most of the scales possessed acceptable levels of internal consistency, some problems were apparent within the pharmaceutical sample.

- The response rate to the mail survey instrument was low and thus the overall sample sizes may not allow for a high enough confidence level on the parameters estimated.

- The predictive validity of the model was not assessed because no objective outside measures were available to compare against predicted values.

- The construct validity of the model was not assessed because no global measure of the dependence and intraorganizational power variables were included on the questionnaire.

DIRECTIONS FOR FUTURE RESEARCH

While the model is sufficient to explain the cross industry differences in the relationships between external internal resource related constructs, strategies, and and characteristics, it does not allow for useful performance predictions at the level of the firm except at very broad levels. For instance, if a firm possesses a certain profile with regard to the resource dependence and intraorganizational power scores, the model cannot predict The best that can be done at this firm performance. point is to suggest hypothetically that within fragmented industries with low concentration ratios, firms possessing low levels of financial, expertise and technical dependence, combination with strong marketing/sales and publicity/PR in functional areas are likely to experience higher than average employment growth rates (information derived from table 36).

results of this study provide Thus. the numerous hypotheses that can be evaluated with an improved sampling (especially with plan. improved measures regard to strategies), and better evaluative methodologies (such as path analysis, or structural equation models).

In addition, greater consideration of potential lag effects need to be considered. For instance the effects of dependence upon strategy may be manifested within a relatively short period, however the effects of dependence on performance or of strategy on performance are better measured at some future time. This possibility suggests that improved measures or longitudinal research designs can be used to capture lag effects within industries. BIBLIOGRAPHY

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