PERFORMANCE PREDICTORS FOR ENTREPRENEURIAL MANUFACTURING

FIRMS: AN EMPIRICAL STUDY OF PSYCHOLOGICAL,

BACKGROUND AND ENVIRONMENTAL

SCANNING ATTRIBUTES

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Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
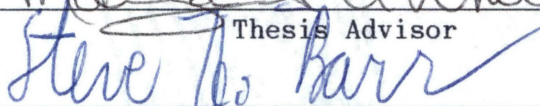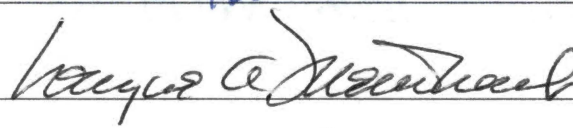DOCTOR OF PHILOSOPHY
July, 1991

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PREFACE

This dissertation was written to attempt to answer, in part, a question that has bothered the author for more than twenty years; "Why are some manufacturing firms more successful than others?" Long ago, as a blue collar ironworker, I watched as many close friends lost their jobs and occasionally their lives as a result of working for not-so-successful firms. Much later I had the opportunity to participate in the start-up of several firms. More often than not, we were successful although none of us on the start-up teams could articulate the reasons for our success.

In any case, this dissertation was a result of long years of wondering about a topic that seems to be of some importance in today's dynamic economy. In an attempt to limit the scope of the research, the study focuses on start-up (entrepreneurial) manufacturing firms in one geographical region during the decade of the 80s.

Potential predictors of performance of new manufacturing firms were assessed by mail survey in the Tulsa M.S.A. during the Summer of 1989. Performance was quantified as average annual growth in employment and average annual growth in revenue. Bivariate correlations indicate that certain psychological, background and information-gathering characteristics of entrepreneurs are significantly related to one of the firm performance measures. Moderated linear regression suggests that strategic orientation (the linear combination of six psychological, background and information-gathering characteristics of the entrepre-

neur) is moderated by industry dynamism in its relationship with performance.

The exploratory aspects of this research project extend existing theory by providing a contingency model of entrepreneurial firm performance. In the final model approximately half of the variance in firm performance is explained.

This dissertation would never have been possible without the substantial guidance, patience and help of Dr. Margaret White, Dr. Steve Barr, Dr. Wayne Meinhart and Dr. Robert Hisrich. To them, and indeed to all the faculty and staff at OSU, I am deeply indebted. Other friends, mentors and associates played an important role in my education and in my research. Special thanks are due Dr. James Cagley, Dr. Gene Woolsey, Dr. Scott Sink, Dr. Tom Cook, Ms. Mimi Jones and Mr. Warren Miller.

Finally, to my wife, Barbara, and children, Anne-Louise, Valerie and Tommy, my sincere thanks for your support and love.

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CHAPTER I

INTRODUCTION

Manufacturing involves the mechanical or chemical transformation of materials or substances into new products (U.S. Department of Commerce, 1989). Manufacturing firms, those with a principal Standard Industrial Code (S.I.C.) between 2000 and 3999 (U.S. Bureau of the Census, 1988), are an important segment of the United States' Gross National Product (G.N.P.). In 1986, measured in constant 1982 dollars, manufacturing accounted for twenty-two percent of the $3.7 trillion G.N.P. (U.S. Bureau of the Census, 1988). To put the size of the manufacturing segment of G.N.P. in perspective, one can consider that it is larger than the individual G.N.P.s of all nations on Earth but three: The United States, Russia, and Japan (U.S. Bureau of the Census, 1988). Why some new manufacturing firms exhibit better performance than others is a question of major concern to these firm's stakeholders and is the focus of this research. Manufacturing industries have suffered substantial job losses and slumping productivity since the 1970s (Hayes & Wheelright, 1984; Richetto, 1988). American manufacturers have lost market share to foreign competitors in a variety of significant industrial segments of the G.N.P. (Dertouzos, Lester & Solow, 1989; Hayes & Wheelright, 1984; Thurow, 1980). Although changes in the technical, structural and geographic forms of industrial firms have always been a feature of American industry, the pace of the changes has accelerated at a more rapid rate in the last three decades (Richetto, 1988).

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One measure of the structural change in manufacturing is the shift that is occurring in firm size and employment levels at individual facilities. Small manufacturing firms (those employing less than 100 people) accounted for nineteen percent of manufacturing employment in 1980 and twenty-four percent in 1986. Large firms (those employing 500 or more) dropped from sixty-seven percent to sixty-three percent of total manufacturing employment during the same time period (U.S. Small Business Administration, 1988). One tentative conclusion from these recent changes in manufacturing employment is people are "migrating" from large firms to small firms in the manufacturing sector. Reasons for this shift in manufacturing employment are not completely clear. However, the inability to compete internationally in some important sectors of the economy has led to reductions in employment at large firms in the same sectors (Thurow, 1980). It is important to understand how new manufacturing firms grow and why some perform better than others if the United States is to cope with and adjust to the recent shifts in manufacturing employment. Empirical research into the performance factors specific to small, new manufacturing firms is an important priority. However, little research has been done in this area.

This research will explore certain potential predictors and moderators of firm performance for the purpose of beginning to build a theory of small firm performance. This research is essentially explor-atory although it does extend existing research in the entrepreneurial area in two important ways First, many previous research studies of new firm success (for example, Collins & Moore, 1970; Hoad & Rosko, 1964) have been "fine-grained" case studies (Harrigan, 1983) or compilations of descriptive statistics surveying one group of variables presumed to

affect new firm performance. This study will test literature-based hypotheses regarding firm performance with <u>three groups</u> of potential predictor variables (psychology of the entrepreneur, background charac- teristics and information-gathering practices) in a contingency frame- work. Second, most previous research studies in the area have employed simple, bivariate correlations as the statistical measure of relation- ship. This research study will test a model of small firm growth and performance similar to one suggested by Keats and Bracker (1988).

Importance of New Business Ventures

Research into performance factors for new, small manufacturing firms fits into the much broader and currently popular area of new venture performance. Performance of new business ventures (entrepreneur- ial firms) touches on policy issues, business strategies, and the individual differences of successful entrepreneurs. For example, much national attention has recently been directed at the issue of job creation as an attribute of new venture creation. Birch (1987) argued that new, small businesses are responsible for sixty-six percent of the job growth in the American economy. Others (Sexton, 1986; Stevenson & Sahlman, 1986) claim that entrepreneurship (broadly defined as the creation of new, growth-oriented firms) is critical to the economic health of the United States. The importance of, and interest in, entrepreneurship can be inferred from many sources. The number of self-employed workers has increased by twenty percent between 1970 and 1980 (U.S. Bureau of the Census, 1988). Many of the self-employed are the founders of new, growth-oriented firms. Smaller firms seem to be much more innovative than larger firms - perhaps by as much as 250%

(Stevenson & Sahlman, 1986). Newspapers and magazines devote considerable coverage to "media stars" like Steve Jobs (founder of both Apple Computer and Next, Inc.) and Mitch Kapor (founder of Lotus Development Corporation). New magazines devoted to various aspects of entrepreneurship continue to appear and are apparently successful.

Colleges and universities are offering more courses in entrepreneurship (Vesper, 1983). Academic researchers introduced the Journal of Business Venturing in 1986 and publication of entrepreneurship articles in the more established journals has risen in the past few years (Vesper, 1988). The Academy of Management accorded the original Entrepreneurship Interest Group full Division status in 1986. The Association of Collegiate Entrepreneurs (A.C.E.) has grown from twenty collegiate entrepreneurship chapters in 1984 to more than 300 clubs representing forty different countries (Birch, 1987). The ACE 100 (top-performing businesses headed by ACE members under the age of thirty) had combined revenues of more than $3 billion in 1988.

Politicians, too, have begun to understand that entrepreneurs are an important constituency. Former President Reagan recently said:

> "I urge the Congress to listen to the small business owners who have increased overall employment so dramatically, who have produced a disproportionate share of innovations, and who make our economy different from, and more lively than, that of other nations."
>
> A Report of the President
> (U.S. Small Business Administration, 1988)

This accolade from a conservative president who had seriously considered eliminating funding for the Small Business Administration seems to emphasize the awareness of the economic importance of new, small, growth-oriented firms.

In Oklahoma there were 3910 manufacturing plants, employing
171,391 people in 1985 (Center for Economic and Management Research,
1988). The total payroll for manufacturing in Oklahoma in 1985 exceeded
the total payroll for every other major industry group by a substantial
margin. In the Tulsa Metropolitan Statistical Area approximately sixteen
percent of the wage and salary earners were employed in manufacturing
firms at the end of calendar year 1987 (Economic Development Information
Center, 1988). There has been a decrease in both percentage of total
employment and absolute employment in manufacturing in Tulsa since 1981
when the percentage was slightly over twenty-one percent and the
absolute employment stood at 68,300 (Economic Development Information
Center, 1988). Mirroring the absolute decline in manufacturing employ-
ment in Tulsa since the early 1980s are four trends of some importance:

    (1)   The precipitous decline in sales, profits and employment in
           the oil industry since 1982.

    (2)   Reductions in total employment in oil industry-related
           manufacturing firms.

    (3)   The growing awareness that Tulsa must diversify its economic
           base.

    (4)   The rise in the number of new, small manufacturing firms
           that are not related to the oil industry.

More than 200 existing, small manufacturing firms have been founded in
the Tulsa Metropolitan Statistical Area since 1980 (Oklahoma Department
of Commerce, 1988). Tulsa represents a microcosm of the nationwide
trends. People are migrating from employment in large manufacturing
firms to employment in small, new manufacturing firms. The majority of
these new manufacturing firms are unrelated to the oil industry and
represent, perhaps, the first wave of economic diversification in a
metropolitan area long dependent on the oil industry.
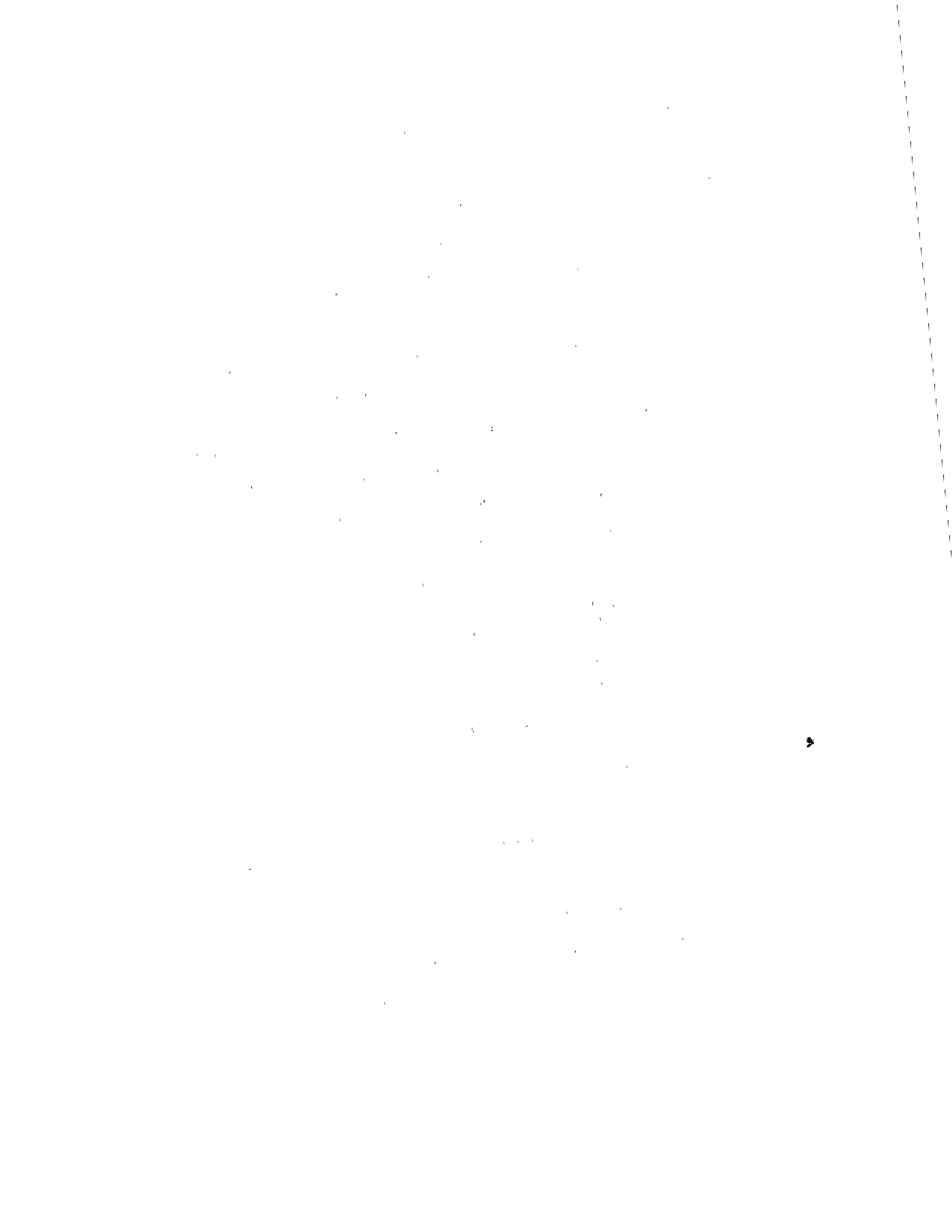
Previous research which attempted to identify common performance factors for small, new manufacturing firms has yielded conflicting results. For example, a multi-disciplinary investigation team at Western Reserve University found that successful entrepreneurs in the metalworking industry in Ohio were well-educated, technical experts with a high need for achievement and a willingness to undertake formal training in functional areas outside their own field so as to understand other areas of the business (Morrison, 1973). Hoad and Rosko (1964) tracked the performance of ninety-five small, new manufacturing firms in Michigan for a three-year time period, beginning in 1960. They concluded that the principal causes for failure among the ninety-five were a lack of marketing initiative and a lack of "drive" on the part of the owner-managers. Successful firms - about one third of the sample - had experienced, well-educated managers and were frequently managed by several persons with differing functional skills and experience. Collins and Moore (1970), on the other hand, found that successful manufacturing entrepreneurs were almost always from a lower socio-economic class, had very little formal education and seemed to be strongly motivated by a need for achievement (McClelland, 1961). Sandberg (1984) was unable to find any significant relationship between managerial demographics or background and firm performance. Steiner and Solem (1988), in a study of twenty-two small manufacturing firms in northern Wisconsin found that successful firms employed newer technology (in the transformation process) and tended to exploit competitive advantages. These conflicting results must be addressed if a better understanding of performance factors for small, new manufacturing firms is to be developed.

Objectives of the Research

This research will have three broad objectives. One is to determine why some new manufacturing firms exhibit higher performance than others. The importance of this question to the owners of small manufacturing firms, venture capitalists, and other investors is obvious. A better understanding of those factors which contribute to higher levels of performance should lead to better strategic decision-making and improved investment decision-making. The failure rate of small business attests to the broad need for this understanding. Birley (1986) reports that between thirty percent and fifty percent of all small firms fail within four years of start-up. In a study of new manufacturing firms in Michigan, Hoad and Rosko (1964) found a forty-three percent failure rate within three years of start-up.

A second research objective is to provide some information to policy decision-makers who are actively involved in developing programs to generate new jobs. Many cities and states have programs to encourage entrepreneurs and to facilitate the creation of new jobs (Miller, 1988; Sexton, 1986). Some of these programs have been successful and others have not. No consistent body of knowledge exists that helps in the policy-making decision process for screening and selecting which programs to install and which entrepreneurs to support. This research should provide some useful information for policy-makers who are interested in job creation through the mechanism of entrepreneurship.

The third research objective is to begin the arduous task of creating a relevant, contingency model of small firm performance. Much previous research in the entrepreneurial area has focused on single

perspectives to attempt to explain performance. Although helpful in preparing the theory ground for later conceptual development, the single perspective approach limits the utility of any theory that emerges from subsequent empirical work. The third objective is an attempt to advance the earlier conceptual work of Keats and Bracker (1988) and the empirical work of Covin and Slevin (1989).

Organization of the Dissertation

Chapter One presented an overview and the objectives of this study. Chapter Two includes a discussion and integration of prior research in five related areas: psychological differences between entrepreneurs, background differences of entrepreneurs, environmental scanning practices of entrepreneurs, industry structure and firm performance. In addition, Chapter Two presents a conceptual model of the hypothesized relationships between the variables and concludes with a list of testable hypotheses related to the model and the previous research in this area. The methodology to be employed in this research study will be explained in Chapter Three. Results found in this research study will be presented in Chapter Four. Chapter Five will discuss the findings regarding the relationship between the variables and the implications of these findings for practitioners engaged in funding, starting and operating new manufacturing firms. Chapter Five will conclude with suggestions and observations related to future research that might be conducted in the area of new manufacturing firms.

CHAPTER II

LITERATURE REVIEW AND HYPOTHESES

INTRODUCTION

This dissertation is principally concerned with identifying the
possible effects of three groups of variables (i.e. psychological
differences, background characteristics and environmental scanning
characteristics) of the entrepreneur on the success of new manufacturing
firms. Second a contingency model of firm success will be developed and
tested because no such model, that is uniformly accepted, exists in the
present literature base (Keats & Bracker, 1988).

Empirical research on the individual difference characteristics of
entrepreneurs has focused heavily on two measures: need for Achievement
(nAch) (McClelland, 1961) and Locus of Control (LOC) (Rotter, 1966).
These two attributes of personality have strong face validity with
respect to the kind of personality that it might take to be successful
in starting and growing a new manufacturing firm. A strong desire to
achieve significant results in the face of moderate risk (nAch) coupled
with the firm conviction that outcomes are the result of individual
action and not chance (LOC) would, one assumes, be characteristics of
successful business people in general and entrepreneurs specifically.

The backgrounds of successful and unsuccessful entrepreneurs have
been heavily researched and the overall results are generally consistent
(Cooper, 1982). Entrepreneurs whose firms exhibit high performance have

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similar ages, education and work experience. It is possible that performance (measured on the basis of growth in revenue and employment) is contingent upon the entrepreneur having achieved some minimum threshold level of age, education and work experience.

Little empirical research has been conducted on the environmental scanning (information-gathering) practices of entrepreneurs. One reason for this lack of empirical research may be that there is no consensus on how one should measure environmental scanning practices. Only two research studies (Covin & Slevin, 1989; Khan & Manopichetwattana, 1989) have considered the effects of environmental scanning practices on entrepreneurial performance. However, it is logical that the methods and practices used to gather information about the task and remote environments could have significant influence on such key managerial tasks as decision-making, long-range planning and strategic control. Thus, measures of environmental scanning practices will be considered together with psychological differences and background characteristics as potential predictors of entrepreneurial firm performance.

No consensus model of entrepreneurial firm success exists; however Keats and Bracker (1988) proposed a conceptual model of this process that suggests that entrepreneurial intensity (ie. the constellation of drives, needs and personality that prompts one to be an entrepreneur) manifests itself in task motivation and perceptions of environmental influence that lead to some level of strategic behavior. This strategic behavior, on the part of the entrepreneur, when modified by a certain cognitive sophistication (based on experience) and external environmental factors leads to a level of firm performance.

This dissertation proposes to test a model of entrepreneurial firm

performance that parallels the conceptual model of Keats and Bracker (1988). The model to be tested suggests that psychological differences, background characteristics and environmental scanning practices (defined, in the aggregate, for the purpose of this research as "strategic orientation") of the entrepreneur moderated by the environment results in some pattern of firm performance. This exploratory model is shown, in block diagram form, in Figure 1.

Definitions of an Entrepreneur

The term "entrepreneur" is literally translated as "betweentaker" or "go-between". In the Middle Ages, the term described managers of large projects--frequently clerics responsible for the construction of cathedrals, public buildings and castles (Hisrich, 1989). Eighteenth century economists (Cantillon, Beaudreau, and Jean Baptiste Say) suggested that entrepreneurs were those who bore the risk of business failure but who were not suppliers of capital. The willingness to tolerate risky business situations was understood as an entrepreneurial attitude by these early economists and continues to be understood, by some, as an entrepreneurial attitude today (Miller, Kets de Vries & Toulouse, 1982). However, risk is often an individual perception. What appears to be a risky situation to some may be viewed as essentially a risk-free situation by others. Attitudes, social learning, prior experiences and information gathering-practices may all affect how one views a particular situation. In this dissertation, risk-orientation will not be measured directly but, rather, those individual characteristics of entrepreneurs that may lead to a particular risk-
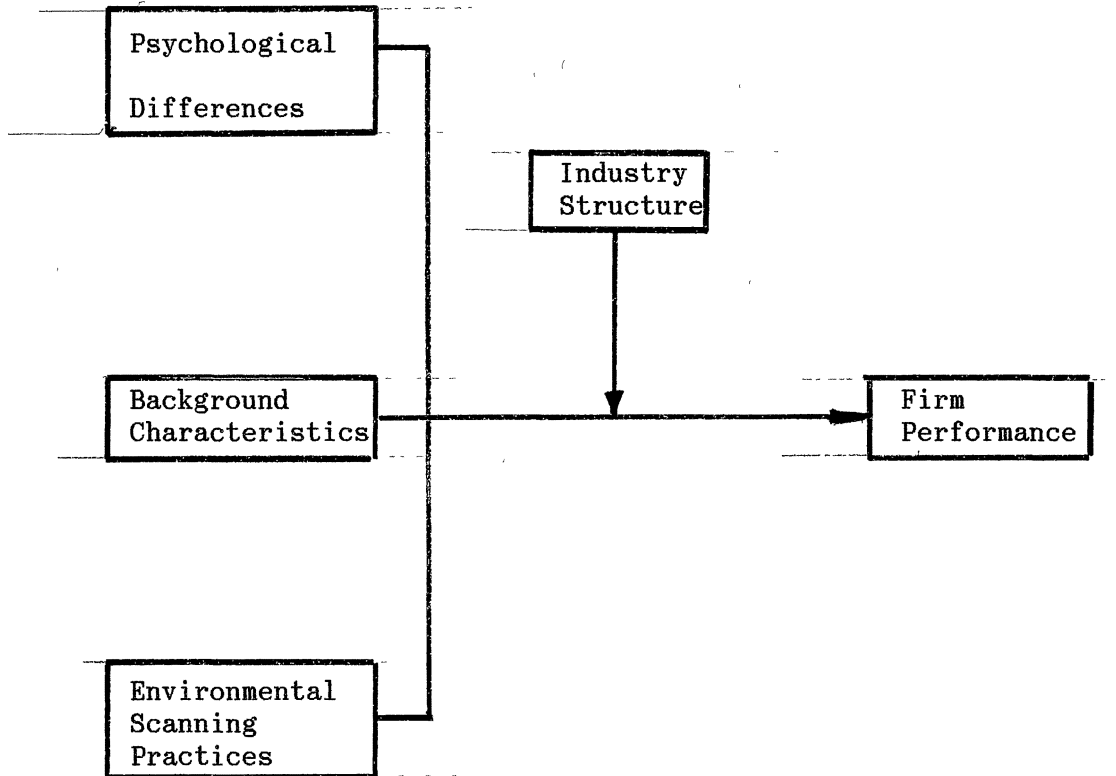
Figure 1. A Conceptual Model

orientation, as part of the realized strategy of the entrepreneur, will be the focus.

Schumpeter (1936) defined an entrepreneur as one who innovated and developed untried technology. Later writers (Drucker, 1985; McClelland, 1961; Vesper, 1983) described entrepreneurs as moderate risk-takers who take initiative, organize some social-economic mechanisms, maximize business opportunities and accept the risk of failure. Hisrich (1986) describes the process of entrepreneurship as:

> ..creating something different with value by devoting the necessary time and effort, assuming the accompanying financial, psychological and social risks, and receiving the resulting rewards of monetary and personal satisfaction.

The leader of a new enterprise - the entrepreneur - is an individual of importance in today's American economy. Research has shown that entre-preneurs (those who own and manage entrepreneurial firms) help create substantial new employment, spur innovations and facilitate economic development (Birch, 1987; Hisrich & Brush, 1986; Sexton, 1986). Since smaller firms are the most rapidly growing segment of the economy, a clearer understanding of the characteristics, experience and psychologi-cal differences of entrepreneurs is needed to encourage innovation and facilitate job creation.

In this dissertation, entrepreneurs are defined as the chief executive officers (CEOs) and founders of their firms. The importance of the CEO to the performance of manufacturing and entrepreneurial firms has been well-demonstrated in empirical research (Collins & Moore, 1970; Daft, Sormunen, & Park, 1988; Miller & Toulouse, 1986). In many cases, particularly early in the firm's history, the entrepreneur may well be the only manager in the firm. Hence, it is likely that those psycholog-

ical, background and information-gathering (environmental scanning) characteristics associated with performance for CEOs in general will be of importance in the performance of entrepreneurial firms.

Strategic Orientation

Strategy has been defined in many ways and the bulk of previous research focuses almost exclusively on large firms. Mintzberg (1978) defines strategy as, "a pattern in a stream of decisions". Pearce and Robinson (1988) view strategy as "large scale, future oriented plans for interacting with the competitive environment to optimize achievement of organizational objectives". Ansoff (1988) argues that strategic decisions are externally-focussed and primarily concerned with the selection of product mix and target market. In the small firm area, the definition of strategy seems even less certain. Miller and Toulouse (1986) acknowledge that small firm strategy is tightly constrained and quite different than large firm strategy. Others have suggested that small firm strategy is basically the result of environmental variables acting on firm characteristics (Covin & Slevin, (1989).

In any case, this research contends that background, psychological and scanning characteristics of the entrepreneur (labeled for descriptive convenience as "strategic orientation") may be affected by certain environmental variables that contribute to contingency effects in firm performance.

Industry Effects on Strategic Orientation

William Sandberg (1984) demonstrated that there is a strong relationship between characteristics of the industry (industry structure)

and firm performance. Covin and Slevin (1989) have shown that environ-
mental hostility and industry dynamism can affect small firm perfor-
mance. Miller, Kets de Vries and Toulouse (1982) demonstrated that
industry dynamism can affect firm performance. This research will
evaluate the effect that industry dynamism and environmental hostility
have on the performance of firms in the sample. Figure 1 presents a
conceptual model of the variables to be tested in this study.

<div align="center">Psychological Differences</div>

One of the key determinants of strategic orientation is the psycho-
logical differences among individuals (Covin & Slevin, 1989). Psycho-
logical differences, or, individual difference psychology has histori-
cally considered such issues as intelligence, creativity, motivation,
assessment and group differences (Schackelton & Fletcher, 1984). Two
aspects of individual difference psychology concerned with predicting
performance differences between entrepreneurs are need for Achievement
(nAch) (McClelland, 1961) and Locus of Control (LOC) (Rotter, 1966).

Need for Achievement

Researchers (Hermans, 1970; Morris & Snyder, 1979; Steers, 1975a;
Steers, 1975b; Steers & Braunstein, 1976) have explored the relationship
between an individual's nAch and various measures of job performance. A
common finding is that those individuals with a high need for achieve-
ment will generate better performance in a variety of organizational
settings. The importance of these findings in the area of entrepreneur-
ship is substantial. Since the entrepreneur (the CEO of entrepreneurial
firms) is often the only decision-maker in the firm, a high need for

Achievement is expected to be positively related to a firm's success.

An entrepreneur's nAch could act as an independent, predictor variable, affecting firm performance directly or nAch could moderate the relationship between other predictors and firm performance. Some conflicting evidence exists as to the moderating effect of nAch on various outcomes. Johnson and Stinson (1975) found that nAch moderated the relationship between role perception and job performance. However, Stone, Mowday and Porter (1977) found that nAch was a better independent predictor of performance than it was a moderator of the relationship between job scope and job performance.

Utilizing a larger sample than Johnson and Stinson (1975) and testing for the moderating effects of nAch on twenty role perception - outcome relationships, Morris and Snyder (1979) found the additional interaction term to be statistically significant for only one pair. This technique involves comparing the differences in percentage of variance explained by first using nAch as an interaction variable and then using it as an independent predictor. The argument is that if a significantly greater F-ratio occurs with nAch as an interaction variable, then nAch is a moderator rather than a predictor. The Morris and Snyder (1979) results strongly suggest that nAch be treated as a predictor variable in future research.

Some early studies of nAch (Steers, 1975a; Steers, 1975b; Steers & Braunstein, 1976) focused on the relationship between workers' (not entrepreneurs' or managers') nAch and performance on the job. However these studies all suggest a correlation between nAch and performance in a variety of settings. Steers (1975a) found that individual performance was significantly related to job satisfaction and job involvement for

high achievers but not for low achievers. For job satisfaction/high nAch the correlation was 0.32 (p<.01) and for job involvement/high nAch the correlation was 0.19 (p<.05). In a related study, Steers (1975b) found that specificity of goals and performance feedback were positively and significantly related to performance for high nAch subjects at p<.05. For the low nAch group only participation was significantly correlated with goal effort and overall performance - both at p<.01. Steers and Braunstein (1976), utilizing the Manifest Needs Questionnaire (MNQ), determined that for high nAch subjects there was a positive relationship between enriched jobs and individual performance. Many researchers in entrepreneurship have utilized nAch as one of the psychological measures of the entrepreneurial personality. McClelland (1965) found that those who scored high on nAch during their college careers were found to have entered entrepreneurial occupations to a much larger degree than those who scored low on nAch. Hornaday and Bunker (1970) and Hornaday and Aboud (1971) found that entrepreneurs routinely score higher on nAch measures than the general population. Miller and Droege (1986) found that the CEO's nAch was strongly related to all measures of organizational structure in small, young (entrepreneurial) firms. Sineath and Hand (1987), comparing the performance of thirty five student teams engaged in an entrepreneurial business simulation game, found that high and low team performance could be differentiated on the basis of the team's average nAch. In addition, high performance teams had higher average nAch than low performance teams. Tucker (1988) utilizing surrogate entrepreneurs and non-entrepreneurs found convincing evidence that entrepreneurs had higher nAch than non-entrepreneurs.

Despite the evidence that nAch distinguishes between entrepreneurs

and the population as a whole, some researchers (Brockhaus, 1982; Khan & Manopichetwattana, 1989) question the idea that a high nAch predicts entrepreneurial success. Brockhaus (1982) argues that, "many small business owners available for inclusion in a study are successful and this success may contribute to a high need for achievement rather than the reverse". Brockhaus's concern with nAch as a precursor to entrepreneurial performance is valid if one accepts his broad definition of success; that is, mere survival of a business over a period of several years. However, if performance is more rigorously defined as growth in employment and revenue above a median level of comparable firms, the nAch is likely to be an independent predictor of future performance for entrepreneurial firms.

The importance of psychological difference measures as potential determinants of performance is supported by Gartner (1985) who stated that nAch and LOC "... may have some validity in differentiating among types of entrepreneurs."

Locus of Control (LOC)

Prior research indicates a significant relationship between a general manager's LOC and firm performance (Govindarajan, 1988; Miller & Toulouse, 1986; Miller, Kets de Vries & Toulouse, 1982; Sineath & Hand, 1987). Internals (those who score low on Rotter's original scale) are more alert to information about the environment and place great value on achievement. Externals (those who score high on Rotter's original scale) are more complacent, do less environmental scanning and do not exhibit strong achievement motives (Shackleton & Fletcher, 1984).

It has been shown that top executives' LOC is significantly related

to innovation in production and service methods, risk-taking, and proactiveness in small firms (Miller, Kets de Vries & Toulouse, 1982). For the top executives, innovation correlated -.47 (p<.05) with LOC; risk-taking correlated -.69 (p<.01) and proactiveness correlated -.72 (p<.01). These traits are important to success in strategic implementation in many small firms that face uncertainty and are necessarily "locked in" to a generic focus strategy (Porter, 1980).

In addition to being linked to the actions that are important for achieving success, LOC has been shown to be significantly correlated with actual firm performance. In a study of ninety-seven small firms, CEO's LOC was significantly correlated with a variety of performance measures. For firms operating in a dynamic environment, CEO's with an internal LOC generated substantially better firm performance in relative profitability and relative sales growth than firms operating in a non-dynamic environment. For firms in a dynamic environment, LOC correlated -0.39 (p<.05) with relative profitability and -0.49 (p<.01) with relative sales growth (Miller & Toulouse, 1986). Conflicting and non-significant results were found for firms operating in non-dynamic environments. Student teams operating businesses in a simulation exhibit similar findings. Regardless of scope (large or small share strategy), those teams with an internal LOC consistently outperformed teams with an external LOC (Sineath & Hand, 1987).

CEO's LOC may be an important competitive weapon in some environments and with some strategies. Miller and Toulouse (1986) found that an internal LOC was related to success for firms operating in dynamic environments. In a survey of 145 SBU general managers Govindarajan (1988) found that an internal LOC was significantly correlated with high

firm performance. The above research on nAch and LOC suggests that some factors of the entrepreneur's personality are related to firm success. The following hypotheses are proposed.

H1:   Entrepreneur's n Ach is positively correlated with firm performance.

H2:   Entrepreneur's LOC is negatively correlated with firm performance when LOC is measured so that an internal orientation results in a low score.

Background Characteristics

Background characteristics - such as age, level of education, job skills and experience with similar firms have long been used by discerning personnel managers to screen job applicants. Knowledge, skills and ability are powerful predictors of later performance for managerial, clerical, operative and administrative jobs (Child, 1972). Therefore, the background characteristics of entrepreneurs should significantly impact the performance of firms that they found.

Age and Education

Small, new firms have a high mortality rate (Birley, 1986). Hoad and Rosko (1964) found a 43 per cent failure rate within three years in Michigan and Birch (1979) showed that 32 per cent of firms which go out of business are between zero and four years of age. Inadequate resources (a paucity of organizational slack), serious errors of judgement and inadequate education have been identified as reasons for small business failures (Hay & Ross, 1989; Vesper, 1990). As a result of life experiences and education, one builds a knowledge base that facilitates decision making at greater levels of abstraction and complexity.

Experiences in business tend to contribute to a store of knowledge which can be called upon to address current problems. There is some face validity in the notion that experienced, well-educated individuals should exhibit better performance than inexperienced, poorly-educated individuals in starting and running a new business.

Numerous studies (Birley & Norburn, 1987; Hisrich & Brush, 1984; Hoad & Rosko, 1964; Neiswander & Dollinger, 1986) have demonstrated that education and age at which entrepreneurs found their firms are related to performance of the firm. Venture capitalists are reported to use age and education as screening devices in deciding when to fund a venture (Sandberg, 1984; Vesper, 1990).

One of the components of entrepreneurial background - education - has undergone a shift in focus as one compares early research results to later studies. Early researchers (Collins & Moore, 1970) found that successful entrepreneurs had roughly the same level of formal education as the population as a whole and far less than business managers of the time. More recently researchers (Birley & Norburn, 1987; Cooper, Woo & Dunkelberg, 1989; Hisrich & Brush, 1984; Neiswander & Dollinger, 1986) have found just the opposite. Successful entrepreneurs have more education than the population as a whole. This potentially troublesome paradigm shift may well be the result of changes in industry rather than changes in the essential issues involved in successful entrepreneurship. Modern industry is "information-based" (Tofler, 1980) and requires a "systems perspective" (Simon, 1965). The demands placed upon entrepreneurs attempting to cope with rapid change in technology and markets may well require more years of formal education than was required for success forty years ago.

In a classic study of 150 entrepreneurs in light manufacturing, some of whom started their firms as early as the 1940s, Collins and Moore (1970) found that level of education for the entrepreneurs in their study was less than business leaders in non-entrepreneurial firms and only slightly better than the population as a whole. In this study which emphasized psychological assessment and sociological field studies, entrepreneurs were found to be primarily of lower socio-economic background, blocked from promotion in "normal" organizations at some point in their careers, resistant to many forms of authority and well-trained or heavily experienced in a skilled trade or functional specialty. The researchers expressed the opinion (as an explanation of the rather limited formal education of many of the entrepreneurs) that higher education was inadequate to the task of training successful entrepreneurs.

Others have found that the entrepreneur's combination of formal education and managerial experience is related to firm performance for new, small firms. Hoad & Rosko (1964) studied ninety-five new manufacturing firms in Michigan over a three year time period beginning in 1960. At the end of three years (1963) thirty seven firms were classified as successful, thirty-three had failed and the remaining twenty were classified as marginally successful or dormant. Although the research was primarily descriptive, managerial experience and years of formal education (for the owner/managers) seemed to be important predictors of success. Thirty-seven percent of the well-educated but inexperienced managers succeeded. Thirty-three percent of the experienced but not well-educated managers succeeded. Sixty-nine percent of the well-educated and experienced managers succeeded. Since

the acquisition of managerial experience is, in part, related to the work experiences and amount of time spent working in various roles, it is reasonable to suppose that relatively older individuals would have better success starting and running new firms than younger individuals.

Recent research (Birley & Norburn, 1987; Cooper & Dunkelberg, 1987; Dunkelberg, Cooper, Woo & Dennis, 1987; Hay & Ross, 1989; Hisrich & Brush, 1984; Neiswander & Dollinger, 1986) suggests that successful entrepreneurs are older than the median United States population and have more formal education. The median age of the United States population has increased from 29.4 years in 1940 to 32.1 years in 1987 (Bureau of the Census, 1989). In 1940, the median school years completed by all persons over twenty five years of age was 8.6. By 1987 that number had increased to 12.7. However, even in 1987 among white males over the age of twenty five (the group most likely to start new businesses), only 37.7 % had some college while 62.3% had twelve or fewer years of formal education (U.S. Bureau of the Census, 1989).

Birley and Norburn (1987) compared educational background and previous experience for a sample of Venture Magazine's" Fast Track 100" with Fortune 500 managers and a sample of Dun and Bradstreet managers from five different industries. The "Fast Track 100" are considered to be extraordinarily successful entrepreneurs. Their formal education was greater than businessmen in either of the other two groups. They were, on average, 37.7 years of age when they founded their firms. In an exploratory study of manufacturing entrepreneurs in the southwest, Box and Box, (1990) found that very successful entrepreneurs were older (40.7 years at founding) and better educated (15 years of formal education) than less-successful entrepreneurs. In a mail survey of 890

founders of small businesses, Cooper and Dunkleberg (1987) found that sixty-six percent of the sample had more than a high school education. In a longitudinal study of 1178 small firms, Dunkleberg, Cooper, Woo and Dennis (1987) found that sixty-four percent of the founders had more than twelve years of formal education.

On a national basis, the years of formal education completed by all persons twenty five years old and over has been increasing for the last thirty years. In 1960, the median years completed was 10.6; in 1970, 12.1; and in 1980, 12.5 (Bureau of the Census, 1987).

Hay and Ross (1989) conducted a three-year, longitudinal study of non-urban, Small Business Development Center start-up clients and found that amount of formal education distinguished between successful and unsuccessful firms. Hisrich and Brush (1984) found that the majority of female entrepreneurs were between thirty-five and forty-five years of age when they founded their firm. Fifty-five percent of the sample had more than twelve years of formal education - a far higher percentage than the population in general. In a study of sixty-two successful entrepreneurs in northeast Ohio, Neiswander and Dollinger (1986) found that successful manufacturing entrepreneurs had an average of fourteen years of business experience, most commonly in general management rather than a technical field. Founders of manufacturing firms were, on average, thirty-seven years old when they founded their businesses and seventy-four percent had at least a baccalaureate degree.

The above research suggests that years of formal education and age at founding are positively related to performance in entrepreneurial firms. The following hypotheses are proposed:

H3:   Entrepreneur's years of formal education
       is positively correlated with firm performance.

H4:   Entrepreneur's age at founding is positively correlated with
       firm performance.

Functional Experience

Functional experience is defined as the number of years that an individual has worked in a specific business function such as marketing, engineering, production, etc. It is likely that the functional experience of an entrepreneur has some impact on the strategic choices made by the entrepreneur as a new business is being started (Hambrick & Mason, 1984). In many new ventures the entrepreneur is the only decision-maker in the firm for some period of time, hence it is likely that functional experience of the entrepreneur will contribute substantially to the strategic orientation of the firm.

Research in the large firm area (Gupta & Govindarajan, 1984; Hitt & Ireland, 1985; Hitt & Ireland, 1986; Hitt, Ireland & Palia, 1982; Hitt, Ireland & Stadter, 1982; Snow & Hrebiniak, 1980) suggests that functional experience and distinctive competencies are related to firm performance through a variety of mechanisms. Gupta and Govindarajan (1984) found that for firms employing a "build" strategy, that is, those attempting to grow by taking market share from their competitors, functional experience in marketing and sales was related to greater effectiveness in strategy implementation.

Generalizing from large firm results to entrepreneurial (small, new) firms might be questionable except for the fact that there is no clear dichotomy between large and small firms. Even the Small Business Administration uses a variety of definitions for "small business" -

ranging from twenty to 500 employees, depending on the purpose for the small business definition. Some previous small firm research, for instance Miller and Toulouse (1986), with a mean employment size of 384, included firms that certainly approach "large" in some definitions. In that this research is intended to be exploratory, it is not felt that testing results that have been found in large firm research will jeopardize the expected end result of attempting to build toward a theory of small firm performance.

In a series of studies conducted in the 1980s, Hitt and colleagues (Hitt & Ireland, 1985; Hitt & Ireland, 1986; Hitt, Ireland & Palia, 1982; Hitt, Ireland & Stadter, 1982) found that functional experience and distinctive competencies were related to strategy and firm performance. The studies collected data from samples of industrial firms in the Fortune 1000 and entailed the consistent use of a taxonomy of functional backgrounds which facilitates comparisons made between the studies. Hitt, Ireland and Palia (1982) found that for firms pursuing an internal growth policy (the kind of growth policy one would expect to see in an entrepreneurial manufacturing firm), general administrative experience (GENA) was more consistently related to high performance than any other functional background. For manufacturing firms following an internal growth policy, the production (PROD) function was more important (Hitt, Ireland & Stadter, 1982).

It seems reasonable to infer that substantial functional experience by the entrepreneur would be positively related to distinctive competence in the specific area of experience. Distinctive competence has been shown to be related to firm performance when moderated by industry type and grand strategy employed (Hitt & Ireland, 1985; Hitt &

Ireland, 1986).

Based on empirical observation, Miles and Snow (1978) defined a taxonomy of strategic orientations of four different industries. Prospectors, in the Miles and Snow taxonomy, are those firms that proactively search for new product/market opportunities and are quick to change in the face of competition. It is reasonable to assume that Prospectors need functional expertise in the area of marketing and sales and are probably engaged in relatively frequent environmental scanning for the purpose of identifying new product/market opportunities. Prospectors have been found to have distinctive competence in areas like general management, product research and development, marketing research and basic engineering (Snow & Hrebiniak, 1980). These results suggest that entrepreneurial firms operating in a dynamic environment would enhance the probability of success if the entrepreneur had significant experience in various aspects of marketing and production.

A few studies in the small business/entrepreneurial literature suggest that there is a relationship between functional background of the entrepreneur and firm performance. It has been shown that small, successful metal-working plants in Ohio were founded by executives with a good awareness of customer needs, market potential and an appreciation for the service element of the marketing mix (Morrison, 1973). Although the specific functional backgrounds of the executives was not reported, they seemed to fit the description of Prospectors in the Miles and Snow (1978) hierarchy and this suggests specific experience in the marketing function. It has also been shown that manufacturing executives in northeast Ohio, who founded successful firms, were likely to have had substantial experience in general management as opposed to the technical

fields (Neiswander & Dollinger, 1986). Steiner and Solem (1988) found that the ability to adjust product mix and to change production technology were attributes of successful manufacturing entrepreneurs in northern Wisconsin. A study of forty-six small businesses indicates that an emphasis on product quality and service relates to firm success (Steiner, 1988). Both of these studies suggest that a background in production and marketing may be related to success in new manufacturing firms. Hoad and Rosko (1963) examined entrepreneurial manufacturing firms in Michigan and found a positive relationship between marketing capabilities and firm success. Collins and Moore (1970) suggest that strong customer orientation (emphasis on certain aspects of marketing) and distinctive competence in technical areas (production) were associated with success in a study of entrepreneurs engaged in light manufacturing.

Based on Vesper's (1980) framework of key ingredients required for a successful start-up, Gartner (1984) enumerated the entrepreneur's most difficult problems. Marketing/Selling was the most serious problem for thirty-seven percent of the firms. Financial Management was the most difficult problem for twenty-eight percent of the firms and General Management, Design-Development and Production were each the major problem for ten percent of the firms.

Slevin and Covin (1987) found that there were significant differences between the strategies employed by entrepreneurs in high versus low tech industries. Perhaps reflecting the marketing sophistication of the high tech entrepreneurs, those firms "tend to attack the environment, adopt a proactive, aggressive, innovative, focused and future-oriented strategic posture." The low tech firms were found to be more

mechanistic, structured and standardized. Slevin and Covin's high tech entrepreneurs exemplify the Miles and Snow (1978) Prospector category.

The above research generally supports the notion that functional experience in marketing, production and general management is related to performance for entrepreneurial firms and the following hypotheses are proposed.

> H5: Years of general management experience prior to start-up will be positively correlated with firm performance.
>
> H6: Years of marketing/selling experience prior to start-up will be positively correlated with firm performance.
>
> H7: Years of production/service experience prior to start-up will be positively correlated with firm performance.

Entrepreneurial Experience

Prior experience as an entrepreneur should contribute to the success of small, new businesses. However, very few studies have examined the important question, "Do entrepreneurs who have experience in previous entrepreneurial ventures achieve better performance that those who are engaged in their first entrepreneurial venture?" Because the special problems of fledgling businesses can be different than the type of problems experienced by managers in large, established businesses, entrepreneurial experience may be critical to performance for new manufacturing firms. In an established business, systems and procedures have usually developed over the years to facilitate decision-making in myriad of operating situations. On the other hand, new businesses must develop needed systems and procedures while, at the same time, coping with the demands of the marketplace. It is reasonable to assume that specific entrepreneurial experience would contribute greatly to the

performance characteristics of new businesses. Business people, generally, attach considerable importance to relevant experience in both hiring and promotional decisions. Venture capitalists use previous entrepreneurial experience as a criteria in the funding decisions for new ventures. Finally, conventional thinking for years has held to the idea that, "Experience is a good teacher". All of the preceding lends face validity to the idea that prior entrepreneurial experience may have some positive impact on the relative success of small, new manufacturing firms.

Only two prior research studies have directly addressed the importance of prior entrepreneurial experience (Lamont, 1972; Ronstadt, 1988). In an examination of high-tech start-ups, it was shown that second generation entrepreneurs differed appreciably from first-generation founders in that they were able to employ larger initial capitalization, were much further "down the road" in terms of product development and had larger first-year profit levels. Experienced (second-generation) entrepreneurs also understood the importance of functional experience in that they employed more knowledgeable help in functional areas outside their own background area (Lamont, 1972). Although no statistical tests were reported by the author, in the Lamont study, data is available in the paper to construct a simple Chi-square test for independence on first-year sales performance (split at $100,000) and shows significant results with a test statistic of 10.971 ($p < .01$).

Evidence exists that some entrepreneurs found a series of companies rather than focussing on just one company. Obvious examples of this phenomenon would be Steve Jobs-one of the original founders of Apple

Computing and later the founder of Next, Inc and Ray Kroc - the founder
of a series of new ventures including McDonald's. Ronstadt (1988)
describes the multiple-firm start-up scenario as the "Corridor Prin-
ciple". The Corridor Principle explains the motivation to found
multiple start-ups as deriving from the special opportunities that
present themselves to entrepreneurs after they have actually founded one
new firm. The special opportunities available to multiple firm founders
are, presumably, neither obvious nor available to those who have not
previously founded a new firm. Utilizing data from the National
Entrepreneurship Study, which included 1,537 independent practicing
entrepreneurs and ex-entrepreneurs, Ronstadt (1988) found that longer,
more successful, entrepreneurial careers are a function of earlier
career starts and involvement in multiple ventures. The above studies
suggest that experience as an entrepreneur may be positively correlated
with firm performance. The following hypotheses are proposed:

H8:   The number of previous entrepreneurial start ups will be
        positively correlated with firm performance.

H9:   The number of years of entrepreneurial top management expe-
        rience will be positively correlated with firm performance.

Environmental Scanning Activities

Environmental scanning is the collection, analysis and dissemi-
nation of information about the environment and is one of the principal
inputs to the process of strategy formulation (Certo & Peter, 1988).
Although research is somewhat limited, it is clear that environmental
scanning can have substantial impact on firm performance. Daft,
Sormunen, and Park (1988) state, "the environment, perhaps more than any
other factor, affects organizational structure, internal processes and

managerial decision-making".

Environmental scanning should be particularly important to small firms operating in dynamic environments. Research has shown that successful entrepreneurial firms operating in dynamic environments are likely to be innovative, risk-oriented and organically-structured (Covin & Slevin, 1989; Miller & Toulouse, 1986). To successfully innovate, a firm must possess a clear understanding of product/market characteristics, environmental impacts and the likely response of its competitors to the firm's tactical and strategic moves. The collection, analysis and dissemination of information in many entrepreneurial firms would be a principal responsibility of the entrepreneur (Sexton, 1986). Under a different label, environmental scanning has been an important tool for improving organizational effectiveness for a long period of time. Military philosophers and practitioners of the art of warfare have recognized the importance of understanding the environment since the time of Sun Tzu's "The Art of War" (Wing, 1988). The ancient Greeks, the samurai, von Clausewitz and many others have consistently emphasized the same basic theme. Success in combat entails adequate intelligence for the purpose of making good tactical and strategic decisions.

Environmental scanning is related to Locus of Control. Internals engage in more environmental scanning than externals (Miller, Kets de Vries, & Toulouse, 1982). An entrepreneurial strategic orientation implies an internal Locus of Control; hence, it would be expected that successful entrepreneurs in small, new, manufacturing firms would engage in more frequent environmental scanning than less successful entrepreneurs.

In addition, the environmental scanning practices of some small

firms is different than large firms. In the small firms, managers rely heavily on market information and top management is involved extensively in environmental scanning (Aguilar, 1967). It has also been shown that there is a strong relationship between acquisition of power, environmental scanning practices and strategy. Hambrick (1981) found that executives who scanned the appropriate sector of the environment as defined by their strategy had the greatest power in their organizations. This result seems to generally support the observation of Miller, Kets de Vries and Toulouse (1982) that there is an observable congruence between elements of CEO personality, strategy, structure and environment.

Environmental scanning has become an integral part of strategy formulation and implementation in some large firms. In a case study description of the evolution of environmental scanning at Monsanto, Stroup (1988) seems to echo the comments of Engledow and Lenz (1985) who found that environmental scanning units were being absorbed into those business units most concerned with long range planning and strategy. Environmental scanning at Monsanto started, prior to 1984, as a separate department mostly involved with the identification of key issues for the consideration of top management. In 1984, the function changed to evaluation and presentation of strategic planning premises for the strategy planning effort at the corporate level. In 1986, the function was introduced to divisional management and at this point environmental scanning at Monsanto became a key element in business level strategic planning.

Two research studies have recently demonstrated the importance of environmental scanning in small to medium-sized manufacturing firms.

Daft, Sormunen and Park (1988) examined the scanning practices of CEOs in fifty Texas manufacturing firms to determine the frequency of scanning and the sectors of the environment being scanned. Successful CEOs scanned elements of both the task and remote environment. The greatest uncertainty (in the environment) was found in the customer, economic and competitor sectors. The principal finding of this research was that CEOs of high-performing companies scanned the environment more broadly (scanned a greater number of sectors) and scanned with greater frequency than CEOs of low-performing companies. Khan and Manopi-chetwattana (1989) demonstrated that innovative, small manufacturing firms - those that would cluster near the "entrepreneurial" end of the strategic posture continuum - employ significantly more environmental scanning than the non- innovative (and less successful) firms.

Based on the research above, the following hypothesis is proposed:

H10:   Scanning intensity is positively related to
       firm performance.

Research Questions

In addition to the hypotheses suggested by prior research in the area of new manufacturing firm performance, three research questions regarding firm performance will also be explored that relate to the performance of new manufacturing firms.

Industry Experience

Evidence previously cited (Gupta & Govindarajan, 1984; Steiner & Solem, 1988; Ronstadt, 1988) suggests that such things as specific

functional experience and entrepreneurial experience in general may have an influence on the performance of new manufacturing firms. However, one aspect of experience - industry-specific experience - has not been empirically examined to determine its effect on entrepreneurial manufacturing firms.

There is some face validity to the idea that an entrepreneur starting a new manufacturing firm in a specific industry would benefit, in terms of firm performance, by having had prior experience in that industry. This notion is supported by the fact that venture capitalists routinely use industry-specific experience as a screening device in the evaluation of business plans for new ventures (Gladstone, 1988; Vesper, 1990).

The above suggests that there may be a relationship between prior industry-specific experience and firm performance. This yields the following research question:

> Research Question 1: What is the relationship between the entrepreneur's industry-specific experience and the performance of the firm?

Industry Structure

Theorists have shown that there is a relationship between environmental influences and organizational structure (Burns & Stalker, 1961; Lawrence & Lorsch, 1967; Thompson, 1967). Others have shown that environment and strategy are linked (Miller & Friesen, 1983; Mintzberg, 1973). One central purpose of this research study is to explore the possibility that the dynamics of the industry in which a firm competes and the level of hostility in the environment affect the relationship between strategic orientation and firm performance.

An industry's structural characteristics shape the level of competition within that industry (Porter, 1980). The level of competition within an industry is the most important environmental influence felt by a firm (Miller & Toulouse, 1986). Hence, it would seem reasonable to consider how industry structure affects the nature of the relationship between entrepreneurial strategic orientation and firm performance. Recent research (Covin & Slevin, 1989; Hambrick, 1983; Johnson & Thomas, 1989; Kim & Lim, 1988; Sandberg, 1984) has been directed at the relationship between industry structure, strategy and firm performance and has generally shown that among many factors, environmental hostility and industry dynamism influence the relationship between strategy and firm performance.

The level of competition, one aspect of industry dynamism, varies considerably as a function of where a firm is positioned on the Product Life Cycle (PLC). Examining the strategy employed by 1,234 industrial products manufacturing firms, Anderson and Zeithaml (1984) found that the stage of PLC was a powerful contingency factor that moderated the effect of enacted strategy on firm performance. This result suggests that competitive intensity moderates the relationship between strategic orientation and firm performance.

Covin and Slevin (1989) found that environmental hostility moderated the relationship between firm strategy and firm performance for a sample of 161 single-industry, independently owned, manufacturing firms located in the western Pennsylvania area. Small firms with high strategic posture indices (innovative, proactive and risk-taking) generally perform better in hostile environments. On the other hand, conservative firms (those with a low strategic posture index) perform

best in more benign (non-hostile) environments.

Hambrick (1983) examined the strategy and performance of 164 manufacturers of industrial products in two industrial settings which differed primarily on the basis of dynamism. Disciplined capital goods makers had an environment that was characterized by infrequently purchased products, above average export levels and stable market shares. Aggressive makers of complex capital goods operate in an environment that is similar to the other group on the first two characteristics but differs on the characteristic of market share stability. Market shares are not stable for the second group and this results in a high degree of dynamism. Utilizing PIMS data and surveys, Hambrick found support for the efficacy of the typical Porter (1980) generic strategies and the Miles and Snow (1978) Prospector and Defender strategies. Also support for the proposition that there were differences between the high and low profit clusters in each industry group was found. In other words, not all strategies worked equally well in all types of environments. These findings support the idea that industry dynamism functions as a moderator to the relationship between strategic posture and firm performance.

In general, a firm's strategy must be consistent with the unique characteristics of the industry in which it competes. In a recent paper investigating patterns of diversification in the brewing industry in the United Kingdom, Johnson and Thomas (1989) found that ".. the regional, more focused type of diversification strategy is valued because it matches firm and environmental characteristics very closely". Their findings suggest that firm characteristics, particularly strategy, must be matched with environmental factors to achieve success.

In an investigation of the effects of environment and strategy on performance in the Korean electronic industry, Kim and Lim (1988) found that industry dynamism and bargaining power within the industry determined eighty six percent of the variance in performance within the industry. Results indicate that multiple perceptions of the industry exist and that high performers employ quite different generic strategies than low performers within the same industry.

Prior research has not precisely defined how industry dynamism and environmental hostility moderate the effects of strategic orientation variables on firm performance. However, Miller and Toulouse (1986) found some evidence to suggest that industry dynamism affects the relationship between the CEO's LOC and firm performance. In dynamic industries, CEOs with an internal (low) LOC are associated with firms exhibiting high performance (in relative sales growth) at $p < .005$. There is no significant relationship for CEO's LOC and performance in stable industries.

Covin and Slevin's (1989) research involving a group of Pittsburg-area manufacturing firms found that entrepreneurs who actively attempt to predict trends (those who would be most likely to have a high scanning intensity score) perform significantly better ($p < .05$) than entrepreneurs who do not predict trends in hostile environments. In benign environments no such relationship was found.

Little empirical research has addressed the determination of what type of moderator is represented by environmental impacts on the relationship between strategy variables and firm performance. However, one study, Prescott (1986), explored the form and strength of environments on relationships between strategy variables and performance.

Utilizing a sample of 1638 firms from the PIMS database, he found indications that environment acts as a homologizer, merely affecting the strength, but not the form of the effects of various strategy subsets within particular environments. However, the Miller and Toulouse (1986) and Covin and Slevin (1989) research, described above, suggest that industry dynamism and environmental hostility pure moderators, not homoligizers.

The above research supports the general proposition that the environment, and in particular, industry structure plays an important role in firm success. The following research questions are proposed:

Research Question 2: Can a parsimonious set of predictor variables be determined that in a linear combination relates significantly to measures of firm performance? Does the set of predictor variables generally agree with the initial, conceptual model of firm performance described in Chapter II.

Research Question 3: Given that a linear combination of variables significantly related to firm performance can be defined, is the relationship modified by industry dynamism or environmental hostility?

Firm Performance

The majority of empirical research and conceptual writings in the field of strategic management are concerned with firm performance. However, there is little agreement on how firm performance should be measured (Cameron & Whetten, 1983). Some, perhaps discouraged by the general lack of agreement on the measurement issue, have suggested that the performance construct be abandoned altogether (Hannan & Freeman, 1977). However, practicing managers need outcome assessments that are meaningful. Practicing managers use a variety of outcome (performance) measures to assess the results of strategic and tactical changes.

Investors gauge the impact of their investment decisions on the basis of outcome measures and society in general attributes utility to organizations that grow, survive and provide employment for members of society. Realistically, the broad need for outcome (performance) measurement can not be avoided and the only question is what measure or measures can and should be used by researchers.

Many researchers have identified the problems attendant to performance measurement. These problems seem to fall into one of three categories: lack of agreement on what the important measures are; lack of primary data; and an unwillingness (particularly in small firms) to provide sensitive data. There are, unfortunately, an almost infinite number of approaches used to determine organizational performance (White, 1987). Chakravarthy (1986) points out that each category of performance measurement has certain difficulties: accounting and financial measurements are essentially historical, maximizing shareholder wealth ignores the reality of other stakeholders, ability to adapt to environmental change is difficult to measure. Even multiple measurement, for example that employed by Peters and Waterman (1980), is subject to uncertainty and error.

In an attempt to define the general problem of measurement of business performance in strategy research, Venkatraman and Ramanujam (1984) propose a classification matrix of methods that compares data sources to types of performance indicators. Among other things, they argue that operational data as opposed to financial data from primary sources enjoys the benefit of being less likely to be influenced by confidentiality and sensitivity concerns. This observation echoes the concerns of Fiorito and LaForge (1986) who state that small firms with respect to

financial data are "notorious for their inability and unwillingness to provide desired information."

Small firms that are privately-held provide two additional difficulties with respect to gathering meaningful financial data. There is no accurate, easily-accessible, public record of financial data to provide a check of firm's self-reporting. Additionally, accounting conventions and tax laws are interpreted broadly enough among small firms that direct comparisons of income statements and balance sheet information is difficult, if not impossible, in many cases. The net result of the above described difficulties is that there are compelling reasons for assessing performance on the basis of something other than primary financial or accounting measures. Addressing the imperatives of other stake-holders, society particularly has an interest in firm performance. Much interest has been expressed in recent years regarding the role that small business plays in job creation (Birch, 1987; Dertouzos, Lester & Solow, 1989; Kent, Sexton & Vesper, 1982; Solomon, 1986). The financial press routinely reports unemployment statistics. In addition, politicians campaign on promises of economic development and job creation. Vast sums of taxpayer money are being spent by governmental and quasi- governmental bodies in "hot pursuit" of new jobs in communities across America. A better understanding of what leads to positive firm performance and employment growth might contribute to more effective utilization of taxpayer dollars.

Growth in employment has been used as a measure of firm performance for entrepreneurial firms (Daviddson, 1989; Hisrich, 1984). In this research, growth in employment and growth in revenue will be used to assess firm performance. Each hypothesis will be tested separately with

two criterion variables - growth in employment and growth in revenue.

Summary

This chapter has described previous research showing the relationship between psychological differences, demographic differences, experiential and scanning practices differences and firm performance. The possible moderating effects of certain characteristics of the environment and specific outcome measures have been delineated.   A summary of hypotheses with separation by performance measure is provided in Table I. A conceptual model (Figure 2) has been provided which links the independent, moderating and dependent variables of interest. Although a review of the model might suggest implied causal relationships, that is not the intent of this research. Chapter III will explain the methods used to quantify the variables and the research methodology to be employed in this investigation.

TABLE I

SUMMARY OF HYPOTHESIZED RELATIONSHIPS

PREDICTOR VARIABLE	HYPOTHESIZED RELATIONSHIP	PERFORMANCE VARIABLE
1. Entrepreneur's n Ach	+ +	Growth in Revenue Growth in Emp.
2. Entrepreneur's LOC	− −	Growth in Revenue Growth in Emp.
3. Years of Formal Education	+ +	Growth in Revenue Growth in Emp.
4. Age at Founding	+ +	Growth in Revenue Growth in Emp.
5. Years of General Management experience	+ +	Growth in Revenue Growth in Emp.
6. Years of Marketing Experience	+ +	Growth in Revenue Growth in Emp.
7. Years of Manufacturing Experience	+ +	Growth in Revenue Growth in Emp.
8. Number of Previous Start-ups	+ +	Growth in Revenue Growth in Emp.
9. Years of Entrepre- neurial experience	+ +	Growth in Revenue Growth in Emp.
10. Scanning Intensity	+ +	Growth in Revenue Growth in Emp.
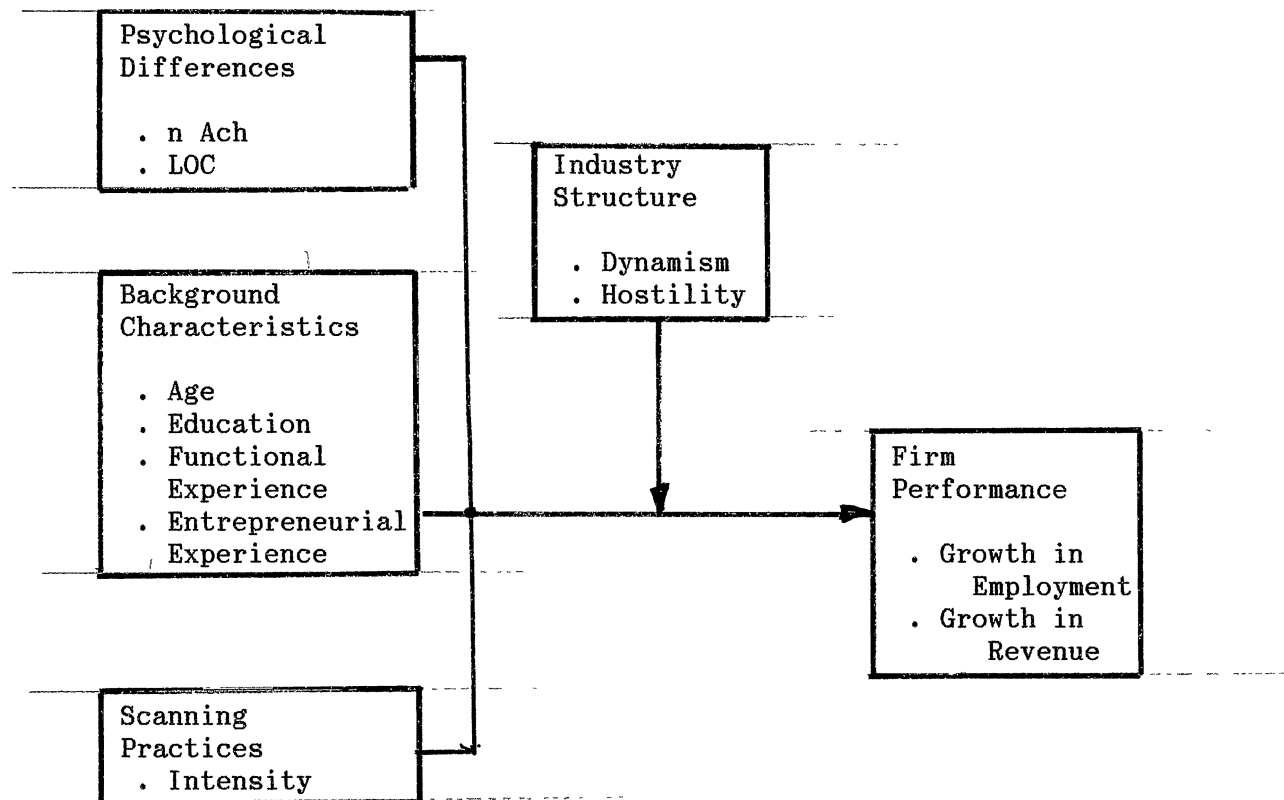
Figure 2: A Conceptual Model of Variable Relationships

CHAPTER III

SAMPLE AND RESEARCH METHODOLOGY

This chapter describes the sample population, the variables in the
study, the data collection methods and the statistical methods to be
used in testing of hypotheses and exploration of the research questions.
This study is exploratory in the sense that little previous research has
been conducted in the area of entrepreneurial manufacturing firms and no
strong theory of firm performance is known to exist for these firms.

The Sample

The unit of analysis is the entrepreneurial manufacturing firm.
All firms included in the study will be manufacturing firms (SIC codes
between 2000 and 3999), which are located in the Tulsa Metropolitan
Statistical Area (MSA), are independently-owned, and were either founded
or acquired in 1980 or later. The reason for selecting firms which were
founded subsequent to 1980 is to restrict the study to firms that would
generally fit the category of "entrepreneurial firms" (McDougall &
Robinson, 1987). These are new, small firms that do not have extensive
experience in a particular industry nor a dominant position within their
industry. These firms are typically run by a single entrepreneur and
have a relatively small number of employees. A previous study of
similar firms in the City of Tulsa discovered that mean total employment
in 1989 was twenty five full-time employees (Box & Box, 1990).

The Tulsa MSA includes the contiguous counties of Tulsa, Creek,

Osage, Rogers, and Waggoner. This five-county area has a population (1985) of 733,200 people, is the second-largest MSA in Oklahoma, and is generally recognized as a center of manufacturing within the State of Oklahoma (Center for Economic and Management Research, 1986).

Firms included in the study will be independently owned to avoid the contaminating effects of corporate involvement in such areas as goal-setting, resource allocation, and strategy implementation. Although certain aspects of this study relate to the personal character- istics of the entrepreneurs who started the firms, the unit of analysis is the firm and not the entrepreneur. The dependent variables to be evaluated are measures of firm performance.

The population to be sampled will be chosen from the Oklahoma Directory of Manufacturers and Processors: 1988-89 (ODM&P) (Oklahoma Department of Commerce, 1989). The ODM&P lists firm name, address, phone number, four-digit SIC code, employment level and year founded. Each firm chosen will be contacted by phone to verify correct address, phone number, year of founding and ownership characteristics (i.e., meaning that the firm must be independently-owned and domiciled within the MSA). Subsequent to a compilation of a preliminary list of firms, as described above, economic development officers for each of the major cities in the five-county MSA will be asked to review the list for their areas to identify any firms which do not appear in the ODM&P. Firms so identified will be contacted and added to the population if they meet the criteria of independence, industry and year of founding.

Data Collection

The data collection method will be a mail survey which has the

advantage of great versatility at low cost (Green & Tull, 1978). The mail survey will be conducted in accordance with commonly-used survey practices (Dillman, 1978). The survey questionnaire will be pretested with a small group of entrepreneurs (not included in the population) and will also be reviewed by four university professors whose areas of expertise include strategic management and entrepreneurship. The first mailing will include a cover letter describing the study, the research questionnaire and a stamped, self-addressed return envelope. The second mailing will be a combination "thank you" and reminder post card. The purpose of the second mailing will be to generate additional responses from previously-mailed questionnaires. The third mailing will include a cover letter, replacement questionnaire and return envelope. The third mailing will be sent only to non-respondents and will be sent approximately three weeks after the first mailing.

Mail surveys have been used in previous research in entrepreneurship and have yielded response rates above thirty percent (Paulin, Coffey & Spaulding, 1982). The difficulties involved in other interview methods, particularly in large geographical areas with widely-dispersed populations, make a mail survey an efficient and cost-effective data collection technique for this research. The Tulsa MSA is a 6000 square mile region in northeastern Oklahoma and the population of firms fitting the parameters of the study appears to be approximately 300.

Two principal concerns attendant to the use of mail surveys are response rate and non-respondent bias (Kerlinger, 1986). In this research the potential problem of low response rate will be addressed by pretesting the questionnaire, as described above, and utilizing a second mailing to non-respondents. It is contemplated that the use of these

methods will result in a response rate of between twenty five and thirty

five percent - placing this research study at the "high end" of typical

response rates in entrepreneurial research (Hisrich, 1989). After the

second set of surveys has been returned, a statistical comparison will

be made between respondent and non-respondent two-digit SIC code

category utilizing durable and non-durable categories to test for the

possibility of non-respondent bias. Independent data on the population

is available for SIC code category (State of Oklahoma, 1989). A

Chi-square test for association with a test statistic set at ten percent

will be utilized to test for a significant difference between the sample

and the population. If the sample is not significantly different from

the population in terms of durable and non-durable SIC code category,

the sample will be judged to be representative for industry group, thus

mitigating some of the concern for non-respondent bias. The dissolution

rate of the population will be compared to similar research (Birley,

1986) as an additional check on the representativeness of the sample.

Finally, the net, usable response rate will be calculated as a percent-

age and if that percentage exceeds 25%, the sample will be considered

representative on the basis of response as compared to other, similar

entrepreneurial research (Hisrich, 1989).

Measures and Operationalizations

The dependent variables for this study will be average annual

increase in employment and average annual revenue growth. Independent

variables will be psychological differences (Need for Achievement and

Locus of Control), background characteristics (age, education, years of

functional experience, and entrepreneurial experience), and a measure of

environmental scanning practices (scanning intensity). Moderator
variables will be environmental hostility and industry dynamism.

Dependent Variables

No uniformly-accepted measure of manufacturing firm performance
exists. The essential difficulty lies in the answer to the question,
"Successful in whose opinion?". All firms have a multiplicity of
stakeholders (those with a vested interest in the firm). Stakeholders
include not only members of the firm but customers, suppliers, competi-
tors and various elements of society in general (Bedeian, 1988).

Society in general and political subdivisions, in particular, are
much more interested in job creation than they are in financial measures
of performance for individual firms (Birch, 1980; Miner, Smith &
Bracker, 1989). The reasons for this interest are twofold: firms that
are growing generally pay more property tax than firms that are not
growing and, as a result of increasing employment, pay greater payroll
taxes and have a tendency to reduce the welfare burden for a community.

In an attempt to address the needs of different stakeholders and
the problem of multiple definitions of firm performance, this research
study will employ two different measures of firm performance. Average
annual growth in revenue will be used in conjunction with average annual
growth in employment to define firm performance. Average annual growth
in employment will be computed by subtracting total employment for the
first year of operations from total employment for 1989 to yield
absolute increase in employment. Absolute increase in employment will be
divided by the number of full years of operation to yield annual
increase (or, possibly, decrease).

It has been shown that entrepreneurs are unwilling and frequently unable to supply year-to-year accounting measures of firm performance (Fiorito & LaForge, 1986; Miner, Smith & Bracker, 1989). Also, the reporting practices of entrepreneurs make firm-to-firm comparisons difficult to interpret. Recognizing these difficulties, the respondents in this study will simply be asked to report average annual percentage change in revenue between the first full year of operation and 1989. A pretest of percentage growth measures versus actual accounting information was conducted with a group of nine entrepreneurs not involved in this study and, as expected, the entrepreneurs were much more willing to supply percentage data than specific accounting data.

Independent Variables

The independent variables to be used in this study are the psychological differences of entrepreneurs (operationalized as need for achievement and locus of control), background differences (age, education, functional and entrepreneurial experience) and environmental scanning practices. Wherever possible, previously validated measures will be used to operationalize the variables.

Psychological Difference Variables. The psychological difference variables to be included in this study are need for achievement (nAch) (McClelland, 1961) and locus of control (LOC) (Rotter, 1966). McClelland (1961) utilized the Thematic Apperception Test - a projective technique which requires interpretation by a trained psychologist to assess nAch. In previous entrepreneurial research, a variety of self-report questionnaires has been used to measure nAch. Hornaday and

Bunker (1970) and Hornaday and Aboud (1971) employed Kuder's (1968)

Occupational Interest Survey, Gordon's (1960) Survey of Interpersonal

Values and the Edward's (1959) Personal Preference Scale. Brockhaus

(1982) also used the Edward's scale and Homives (1972) used Gordon's

scale. As a result of the lack of directly-comparable nAch studies, no

single test has emerged as the test of choice for nAch.

Since this research proposes to use a mail survey as the primary

data collection method, the Thematic Apperception Test (TAT) is inappro-

priate. Steers and Braunstein (1976) developed the Manifest Needs

Questionnaire (MNQ) which will be used in this research to determine

nAch. Need for achievement on the MNQ consists of five items which are

scored on seven-point Likert scales with a value of 1 indicating

"never" and a 7 indicating "always". The questions are as follows:

    (1) I do my best work when my job assignments are
        fairly difficult.

    (2) I try very hard to improve on my past performance
        at work.

    (3) I take moderate risks and stick my neck out to get
        ahead at work.

**   (4) I try to avoid any added responsibilities on my
        job.

    (5) I try to perform better than my competitors.

    ** This item is reverse scored.

The instrument has demonstrated reasonable levels of convergent and

discriminant validity and is consistent with theory. Test-retest

reliabilities for the instrument ranged from 0.75 to 0.86 in a series of

studies. Cronbach's (1951) coefficient alpha ranged from 0.56 to 0.83

(Steers & Braunstein, 1976). Peters (1979) states that "in the early

stages of research, modest reliability of 0.5 to 0.6 will suffice". On this basis, the MNQ exhibit adequate levels of reliability for this exploratory study.

Rotter's (1966) LOC instrument was a twenty-nine item forced choice questionnaire. This instrument is cumbersome to use and is unlikely to positively affect response rates in a mail survey. A shortened version of the Rotter questionnaire (consisting of six questions - Likert scaled) has demonstrated acceptable levels of internal consistency, with a Cronbach alpha of 0.68, and performs as well in the area of predictive validity as the original scale (Lumpkin, 1985). In constructing this scale, Lumpkin selected three of the original internal control items and three of the chance items as shown below:

Internal Items ("Internal Control")

(1) When I make plans, I am almost certain that I can make them work.

(2) Getting people to do the right things depends upon ability; luck has nothing to do with it.

(3) What happens to me is my own doing.

External Items ("Chance")

(4) Many of the unhappy things in people's lives are partly do to bad luck.

(5) Getting a good job depends mainly on being in the right place at the right time.

(6) Many times I feel that I have little influence over the things that happen to me.

Each of the six questions on this scale will be scored from 1 (strongly agree) to 7 (strongly disagree) and questions 4,5, and 6 will be reverse scored. Thus, a low total will indicate an internal orientation while a high total will indicate an external orientation.

Background Differences. Age and classification of formal educa-

tion will be identified by self-report on the survey. Functional

experience prior to founding for the entrepreneur will be reported as

years spent in full-time employment in the following functional catego-

ries: general management, marketing/sales, manufacturing. Respondents

will also be asked to report the number of firms previously started and

the number of years of experience working as a member of the top

management team in an entrepreneurial firm prior to founding the present

firm. Membership in the top management team will be defined as founder,

co-founder, company officer or functional department head.

Environmental Scanning. No well-recognized instrument exists for

the assessment of the environmental scanning variable. A variety of

instruments and methods have been used in the limited amount of

empirical work that has been done in this area. Daft, Sormunen and Park

(1988) developed a questionnaire, modeled on previous research

(Hambrick, 1982; Culnan, 1983), which was used in lengthy face-to-face

interviews with top managers. The Daft, Sormunen and Park instrument

required the top manager to rate complexity, rate of change and impor-

tance of each of six sectors of the environment individually and then to

rate frequency of scanning for each sector across four different modes

of information-gathering. Hambrick (1981) developed specialized scanning

questionnaires for three different industries (colleges, hospitals and

insurance firms) and then assessed scanning practices (frequency of

scanning, interest in a particular subsector of the environment and

hours spent per week in scanning activities). Khan and Manopichet-

wattana (1989) and Miller, Kets de Vries and Toulouse (1982) used four

seven-point Likert-scaled questions to assess scanning practices. Respondents were asked to identify the frequency from 1 (not ever used) to 7 (used extremely frequently). The questions used in both these studies are as follows:

(1) Routine gathering of opinions from clients

(2) Explicit tracking of policies and tactics of competitors

(3) Forecasting sales, customer preferences, technology, etc.

(4) Special market research studies

There is no research consensus on how the external environment should be partitioned into meaningful sectors (Hambrick, 1981). This research study will attempt to determine the breadth (number of sectors of the environment scanned) and the frequency of scanning each sector together with the importance attached to each of the sectors. For each of the six sectors defined in Daft, Sormunen and Park (1988); competition, customer, technology, regulatory, economic and socio-cultural, the respondents will be asked to define frequency of scanning by marking a seven-point Likert scale ranging from 1 (daily) to 7 (less than once a year). Perceived importance of each of the six sectors of the environment will be rated on a seven point Likert scale ranging from 1 (very unimportant) to 7 (critical to the success of the firm). An index of scanning intensity will then be computed for each firm as follows:

$$SI = \text{sum} \{ F_i \times I_i \}, \text{ for } i = 1 \text{ to } 6$$

where, SI = Scanning Intensity for a firm,

F_i = Frequency of scanning the i-th sector

I_i = Importance of the i-th sector

Scanning intensity, as computed in the formula above, will be an integer

variable with a theoretical range of 6 to 294 for each firm responding
to the questionnaire.

Although it would be preferable to employ a research instrument
with demonstrated reliability and validity for the assessment of the
scanning variable, no such instrument exists. Hence, in this study, an
instrument is proposed which combines features of several previous
approaches to the assessment of scanning, but does not entail the
face-to-face interview protocol of Daft, Sormunen and Park (1988). In
addition, respondents will be asked to respond to the four Miller, Kets
de Vries and Toulouse (1982) questions described above.

Moderator Variables

Current firm or industry-specific data describing measures of
industry structure are not available for those firms operating in
northeast Oklahoma (Wozniak, 1990). Hence, it is necessary to assess the
characteristics of industry structure on the basis of subjective
evaluations by the entrepreneurs included in the study or by tapping the
specific knowledge of experts in the field. Industry structure is
proposed to consist of two variables in this study: industry dynamism
and environmental hostility. Both of these variables have been used in
previous empirical entrepreneurial research (Covin & Slevin, 1989; Khan
& Manopichetwattena, 1989; Miller, Kets de Vries & Toulouse, 1982).
Both will be measured utilizing an instrument developed by Miller (1982)
and derived, in part, from Khandwala (1977). Industry dynamism is
measured on the basis of five seven-point Likert scale questions which
describe marketing practices, product obsolescence, competitor moves,
consumer tastes and production technology. For each question, the

respondent will be asked to circle a number from 1 (very slow) to 7 (very rapidly) indicating their perception of the rate of change within the industry.

Environmental hostility is measured with seven seven-point Likert scale questions describing environmental threat, price competition, competition in quality, dwindling markets, availability of labor and material, and perceived governmental interference. In each case the respondent rates their perception of the seriousness of the potential threat by scoring the individual items from 1 (low), to 7 (high). The environmental hostility instrument has exhibited an inter-item reliability of 0.73 (Covin & Slevin, 1989).

Means of each of the two groups of questions will be calculated to yield a score for each firm on dynamism and hostility. To avoid the problem of common method variance, a panel of five experts will be selected from the membership of the Tulsa Economic Development Foundation (TEDF) and asked to complete the same instrument for industry dynamism and hostility. The TEDF is a group of Tulsa citizens selected by the mayor three years ago to develop a strategic plan for economic development in northeastern Oklahoma. Members of the group were perceived to be those who would bring special expertise to the difficult problem of expanding the Tulsa economy. The group includes academics working in the area of entrepreneurship, economists, venture capitalists, bankers, attorneys and private investors specializing in new venture creation.

Scores on each of the instruments (Industry Dynamism and Environmental Hostility) will be compared across the two groups utilizing a t-test for equality of the means. If the results of the t-tests

indicate agreement, confirmation of the entrepreneur's perception of the structural variables is indicated. If not, each of the moderator hypotheses will be tested using the separate group means for the moderator variables.

Analyses

This research is exploratory. Only one previous study has been identified which examines the moderating effects of environment on performance of entrepreneurial manufacturing firms (Covin & Slevin, 1989). Additionally, few studies have examined the strategic orientation variables in linear combination and no known study has attempted to evaluate the impact of environmental scanning practices on the performance of entrepreneurial manufacturing firms.

This analysis will consist of four steps. In the first step, hypotheses H1 through H10 will be tested using Pearson product moment correlations. In the second step, the first research question (the effect of industry-specific experience on firm performance) will be tested using Pearson product moment correlations. In both the first and second step, bivariate correlations will be computed with average annual growth rate and average annual revenue growth coupled with each of the proposed predictors. H1 through H10 are similar in form and will follow the same testing procedure. A Pearson product-moment correlation will be calculated to determine the relationship between each of the independent variables and the two dependent variables. The relationship between the variables will be judged significant if a t-test of r (the Pearson product moment correlation) yields a t with a probability of occurrence less than 0.10.

"t" is calculated as follows:

$$t = r\{\text{square root}[(n-2)/(1-r)]\}$$

Where n = the number of pairs

r = the Pearson correlation

The form of the relationship between the independent and dependent variables will be explored using scatter plots as suggested by Tukey (1977) and potential heteroscedasticity will be checked by examining residual plots (Cohen & Cohen, 1983). Research question one will be explored using the same bivariate correlation technique as will be used in testing H1 through H10.

In the third step of the analysis, backward step-wise regression will be used to (hopefully) develop a parsimonious set of predictors which, in a linear combination, explain a significant portion of the variance in performance. The multiple regression equation resulting from the third step in the analysis is the "basic" regression equation used in the fourth step of the analysis. The fourth step in the analysis will be to explore the possible moderating effects of industry dynamism and environmental hostility on the regression equation determined in the third step utilizing the technique suggested by Sharma, Durand and Gur-Arie (1981).

Multiple regression analysis, in which one has the opportunity to evaluate the relative importance of each of the predictor variables, is one way of beginning to build a useful model of predictors of success for new manufacturing firms. The third step in the analysis is required to answer the second research question and to create the basic regression model utilized in the final step of the analysis. The choice of regression analysis appears warranted in that the two criterion vari-

ables are not viewed as being related. For example, on a national basis, manufacturing employment has decreased substantially over the last twenty years and yet the manufacturing component of the GNP has been relatively constant for more than sixty years thus indicating that although employment is falling, revenue is increasing at the same rate as GNP.

The final step will be an attempt to identify possible predictors of success for entrepreneurial manufacturing firms utilizing multiple moderated regression analysis. In this research, it is expected that industry dynamism and environmental hostility moderate the relationship between psychological, background and scanning variables (in the aggregate, the entrepreneur's strategic orientation) and the performance of the firm.

Utilizing the methods suggested by Sharma, Durand and Gur-Arie (1981) potential moderators (industry dynamism and environmental hostility) will be separately evaluated on the basis of the effects of the interaction terms. An example of a moderated simple regression equation is: $Y = a + bX + cZ + dXZ$ where,

  Y is the dependent variable

  X is the independent variable

  Z is the moderator variable

  XZ is the interaction term

If the addition of the interaction term significantly increases the ability of the regression equation to explain variance in the dependent variable, then a contingency relationship is said to exist. It should be noted that Z, the proposed moderator variable, can exhibit both direct and interaction effects. The significance of each term in the

regression equation will be determined utilizing a t-test for significance with an alpha of 0.10 (Nunnally, 1978).

Curvilinearity and homogeneity of variance are issues of concern in any linear regression analysis (Cohen & Cohen, 1983). To test for the possibility that either or both are present, residuals will be plotted against the observed values of the dependent variables and the plots examined for indications of curvilinearity and heteroscedasticity. Should either curvilinearity or heteroscedasticity be indicated, appropriate linear transformations of the independent variables will be made to attempt to correct the problem (Cohen & Cohen, 1983). Each of the potential moderators in this study will be tested separately.

There is no prior theory that allows one to propose a specific moderator relationship in this research. Hence, each of the proposed moderators (industry dynamism and environmental hostility) will be first added to the basic multiple regression equation to determine if they are predictors rather than moderators. This determination will be made by comparing the coefficient of determination for the basic model to the coefficient of determination obtained with the interaction terms included as predictors. A significant increase in R-squared, of course, would suggest that the proposed moderators are actually predictors. A significant change in R-squared is determined by calculating an F-ratio where

$$F = \frac{\text{R-squared diff}(N-p-1)}{q(1-\text{R-squared})}$$

where N = the number of cases (observations)

p = the number of independent variables

q = the number of variables entered

R-squared diff = the change in R-squared

The final steps in the analysis will be a series of regression runs with the potential moderators in a cross product with each of the predictors. This exploratory step will result in as many cross product regression runs as there are predictors in the basic regression equation determined as described above. Significance of a cross product (interaction) regression will be determined by computing the increase in the coefficient of determination attributable to the addition of the interaction term. A significant change in R-squared, as a result of the introduction of a cross product, will be determined by calculating an F-ratio as described above.

Summary

This chapter has described the unit of analysis, the sample and the data collection methods and statistical procedures to be employed. Results of this investigation will be reported in Chapter IV.

CHAPTER IV

ANALYSIS AND RESULTS

This chapter describes the results of tests of hypotheses and
research questions proposed in Chapter II. This chapter begins with a
discussion of response rate and sample representativeness and concludes
with the results of the hypothesis tests and findings in the area of the
three research questions.

Response Rate

The results described in this chapter are based on the analysis of
a mail survey conducted in the Summer of 1990 in the Tulsa Metropolitan
Statistical Area. The survey questionnaire, duplicated in Appendix A,
was mailed to 299 manufacturing firms that had been identified in the
Fall of 1989 as being:

Independent - not a subsidiary of another firm;

Started (or acquired) after January 1, 1980;

Headed by the entrepreneur who had started the firm;

A reminder/thank you post card was sent one week after the original
mailing to all 299 firms. Three weeks after the original mailing, the
questionnaire and a new cover letter were sent to all non-respondents.
The initial mailing generated forty-two responses. The second mailing,
to non-respondents, generated an additional fifty-three responses.
Non-delivery returns from the Postal Service indicated that twenty-three
firms had gone out of business between the Fall of 1989 and the Fall of

1990. Telephone directories and Chamber of Commerce lists were checked to verify the demise of the "return" firms and it was concluded that they had gone out of business. Two questionnaires that were returned were mutilated beyond use and twenty-four responses had occasional incidents of missing data that did not preclude their use in the analysis. The total response rate, from firms still in business, was 34.4% (n=95) and the net, usable response rate was 33.7% (n=93).

The 33.7% net, usable response rate was judged to be satisfactory and exceeds the response rates usually found in mail survey research involving entrepreneurial firms (Hisrich, 1989).

Representativeness of the Sample

In the one-year period between initial contact and completion of the survey, 7.7% of the firms in the original population were found to have discontinued business. This dissolution rate is similar to the overall 9.6% dissolution rate found by Birley (1986).

On the original population of 299 firms, there were eighteen two-digit SIC codes represented. No representatives were identified in SIC code 21, Tobacco Manufacturers; or in SIC code 31, Leather and Leather Products. All other manufacturing industries were represented and the four most common were: Printing, Publishing and Allied Industries (SIC 27), Machinery, except Electrical (SIC 35), Fabricated Metal Products (SIC 34) and Measuring, Analyzing and Controlling Instruments (SIC 38).

Distribution of responses by major SIC group is shown in Table II.

TABLE II

DISTRIBUTION OF RESPONSES BY MAJOR SIC GROUP

Major SIC Group	Respondents	Population Frequency
20	3	12
22	0	3
23	0	6
24	0	9
25	5	12
26	0	3
27	20	62
28	2	9
29	1	6
30	3	12
32	6	9
33	4	5
34	16	44
35	19	52
36	3	15
37	4	9
38	5	25
39	2	6
	93	299

Manufacturing industries may be broadly divided into durable and non-durable categories (Bureau of the Census, 1989). The durables category includes SIC codes 24, 25, 32, 33, 34, 35, 36, 37, 38 and 39. The non-durable category includes SIC codes 20, 21, 22, 23, 26, 27, 28, 29, 30, 31. Classifying the observed, sample responses and the population values into durable and non-durable categories allowed a Chi-square test for association to be performed as a means of evaluating the representativeness of the sample. The Chi-square value for this two by two matrix (with one degree of freedom) is 1.425. The probability of observing a Chi-square as low as 1.425 with one degree of freedom is in

excess of 0.75 and it is concluded that, at least on the basis of durable versus non-durable categorization, the sample is representative of the population. In summary, the response rate for this research was somewhat higher than typical response rates for other entrepreneurial studies (Hisrich, 1989). The dissolution rate for the population, in a one-year time period, was similar to that found by Birley (1986) and a Chi-square test for association suggests that the sample adequately represents the population from which it was derived.

<div align="center">Hypothesis Testing</div>

Hypothesis testing involved the computation of Pearson product moment correlations, and related probabilities, between hypothesized predictors and two outcome variables - average annual increase in employment and average annual increase in revenue. The sequence of hypothesis testing was as described in Chapter III. First, psychological difference variables (nAch and LOC) were correlated with each of the dependent variables. Second, background differences (age, years of formal education, years of functional experience, number of firms previously started and years as a member of a prior top-management team) were correlated with each of the dependent variables. Third, environmental scanning intensity was correlated with each of the two dependent variables.

Table III depicts the variable labels and descriptive statistics for each of the independent and dependent variables used in hypothesis testing together with descriptive statistics (and labels) for the hypothesized moderators (Industry Dynamism - Z1 and Environmental Hostility - Z2) and one additional independent variable (Industry

Experience -X11) to be explored in the research questions.

TABLE III

VARIABLE NAMES AND DESCRIPTIVE STATISTICS

Variable	Mean	S.D.	Range
Y1 Employment Growth	2.435	6.915	-51 to 17
Y2 Revenue Growth	0.958	1.518	-.1 to 8.4
X1 N ach	5.867	0.679	4 to 7
X2 Locus of Control	1.539	0.749	1 to 4
X3 Formal Education	15.011	1.912	12 to 20
X4 Age at Founding	38.407	9.178	21 to 67
X5 Years of General Management	5.196	5.424	0 to 23
X6 Years of Marketing	4.653	5.966	0 to 25
X7 Years of Production	3.118	5.721	0 to 25
X8 Previous Start-ups	0.652	1.056	0 to 5
X9 Entrepreneurial Yrs.	4.868	6.447	0 to 30
X10 Scanning Intensity	133.08	47.06	32 to 243
Z1 Industry Dynamism	3.849	0.889	2.2 to 5.8
Z2 Environ. Hostility	3.460	1.017	1 to 5.6
X11 Industry Experience	9.022	8.899	0 to 36

Industry Dynamism (Z1) and Environmental Hostility (Z2) values shown in Table III are the scores reported by the entrepreneurs. These scores were later compared to evaluations provided by a small group of industry experts for the purpose of addressing Research Question 3.

Two dependent variables were used in this research: average annual increase in employment (Y1) and average annual increase in revenue (Y2). As discussed in Chapter III, the two dependent variables were quantified as in previous research (Daviddson, 1989). Based on the bivariate correlations in Table IV, LOC, previous starts, years of entrepreneurial

experience, scanning intensity and industry-specific experience are significantly related to average annual employment growth. However, no significant correlations were found with average annual revenue growth. The Pearson product-moment correlation between the two outcome variables was 0.219 with n = 90 (p < .05). Correlations and associated probabilities for all variables used in this study are shown in Table IV.

TABLE IV

CORRELATIONS OF MODERATOR AND PREDICTOR VARIABLES
WITH DEPENDENT VARIABLES

		Y1 (empgrow)	Y2 (revgrow)
X1	(nach)	0.165 (p=.116)	0.076 (p=.480)
X2	(loc)	-0.210 (p=.045)	0.040 (p=.712)
X3	(educ)	-0.143 (p=.179)	0.042 (p=.698)
X4	(age)	-0.146 (p=.168)	-0.088 (p=.415)
X5	(genmgt)	0.047 (p=.662)	-0.047 (p=.666)
X6	(mktg)	0.066 (p=.538)	-0.076 (p=.484)
X7	(mfg)	-0.013 (p=.906)	-0.024 (p=.826)
X8	(starts)	0.181 (p=.092)	-0.091 (p=.407)
X9	(entyrs)	-0.194 (p=.066)	-0.098 (p=.368)
X10	(SI(1))	0.237 (p=.024)	0.006 (p=.958)
Z1	(inddyn)	0.126 (p=.235)	0.025 (p=.818)
Z2	(ehos)	0.013 (p=.900)	-0.052 (p=.631)
X11	(indexp)	0.212 (p=.046)	-0.074 (p=.498)

It should be noted that variables Z1, Z2 and X11 are used in exploring the research questions (in conjunction with X1-X10, Y1 and Y2) while variables Y1, Y2 and X1 through X10 are variables used directly in hypothesis testing. Variables Z1, Z2 and X11 are included in Table IV for the sake of consistency.

Outliers were evaluated by the method of standardized residual plots (Cohen & Cohen, 1983). In each of the basic hypothesis tests one to four observations appeared as outliers (ie., their standardized residual values exceeded 2.0). Various data transformations (log, exponential and inverse) were attempted and the results were consistently unsatisfactory. Elimination of the outlier observations did not result in significantly increased Pearson product moment correlations for hypotheses one through ten. Therefore, it was decided to leave the outliers in the correlation calculations.

Examination of residual versus dependent variable plots yielded no characteristic "fan shaped" distributions that would suggest heteroscedasticity problems nor did the plots yield curvilinear patterns that would suggest non-linear relationships. Bivariate correlations were judged to be significant if the probability of occurrence of the relationship was 0.10 or less. A probability of .10 is acceptable in exploratory research (Huck, Cormier & Bounds, 1974; Nunnally, 1977).

Each of the basic hypotheses (one through ten) are discussed in the following sections. They are arranged in groups by category - psychological differences, background differences and scanning intensity.

Psychological Differences

The first basic hypothesis (H1) states, "Entrepreneur's nAch is positively correlated with firm performance." This basic hypothesis becomes two testable hypotheses, reflecting the fact that two dependent variables are employed in this research. The testable hypotheses are:

H1a: Entrepreneur's nAch is positively correlated with average annual employment growth.

H1b: Entrepreneur's nAch is positively correlated with average
        annual revenue growth.

The correlation between entrepreneur's nAch and average annual

employment growth was 0.165 (p=.116). The correlation between entrepre-

neur's nAch and average annual revenue growth is 0.076 (p=.480).

Although the sign of the correlation coefficient is in the predicted

direction, neither result is significant and both H1a and H1b are

rejected. It appears entrepreneur's nAch is not positively correlated

with firm performance in a simple bivariate relationship.

The second basic hypothesis (H2) states, "Entrepreneur's

LOC will be negatively correlated with firm performance when LOC is

measured so that an internal orientation results in a low score". As

before, this basic hypothesis becomes two testable hypotheses:

H2a: Entrepreneur's LOC is negatively correlated with average
        annual employment growth when LOC is measured so that an
        internal orientation results in a low score.

H2b: Entrepreneur's LOC is negatively correlated with average
        annual revenue growth when LOC is measured so that an inter-
        nal orientation results in a low score.

The correlation between entrepreneur's LOC and average annual

employment growth is -.210 (p=.045). The correlation between entre-

preneur's LOC and average annual revenue growth is 0.040 (p=.712). H2a

cannot be rejected while H2b is rejected. These hypothesis tests

suggest that entrepreneur's LOC is significantly related to average

annual employment growth.

Background Differences

As described in Chapter III, previous research has suggested that

the background characteristics of entrepreneurs is related to the

performance of entrepreneurial firms. In this section of the present research, hypotheses related to the age, education and experience of the entrepreneur were tested.

The third basic hypothesis (H3) states, "Entrepreneur's years of formal education is positively correlated with firm performance. As before, this basic hypothesis became two testable hypotheses:

H3a: Entrepreneur's years of formal education is positively correlated with average annual employment growth.

H3b: Entrepreneur's years of formal education is positively correlated with average annual revenue growth.

The correlation between entrepreneur's years of formal education and average annual employment growth is $-.143$ with a probability of occurrence of 0.179. The correlation between entrepreneur's years of formal education and average annual revenue growth is 0.042 (p=.698). Hypothesis 3 is rejected in both cases.

The fourth basic hypothesis (H4) states, "Entrepreneur's age at founding is positively correlated with firm performance. This becomes two testable hypotheses:

H4a: Entrepreneur's age at founding is positively correlated with average annual employment growth.

H4b: Entrepreneur's age at founding is positively correlated with average annual revenue growth.

The correlation between entrepreneur's age at founding and average annual employment growth is $-.146$ with a probability of occurrence of 0.168. The correlation between entrepreneur's age at founding and average annual revenue growth is $-.088$ (p=.415). Not only are these results non- significant, the sign of the correlation coefficient is opposite that hypothesized. Basic hypothesis four (H4) is rejected.

The fifth basic hypothesis (H5) states, "Entrepreneur's years of

general management experience prior to start-up is positively correlated with firm performance". As before, this basic hypothesis becomes two testable hypotheses:

H5a: Entrepreneur's years of general management experience prior to start-up is positively correlated with average annual employment growth.

H5b: Entrepreneur's years of general management experience prior to start-up is positively correlated with average annual revenue growth.

The correlation between entrepreneur's years of general management experience prior to start-up and average annual employment growth is 0.047 (p=.662). The correlation with average annual revenue growth is -.047 (p=.666). Thus, H5 is rejected.

The sixth basic hypothesis (H6) states, "Entrepreneur's years of marketing experience prior to start-up is positively correlated with firm performance". This basic hypothesis becomes two testable hypotheses:

H6a: Entrepreneur's years of marketing experience prior to start-up is positively correlated with average annual employment growth.

H6b: Entrepreneur's years of marketing experience prior to start-up is positively correlated with average annual revenue growth.

The correlation between entrepreneur's years of marketing experience prior to start-up and average annual employment growth is 0.066 (p=0.538) and the correlation with average annual revenue growth is -0.076 (p=0.484). Thus, we reject H6 and conclude that entrepreneur's years of marketing experience prior to start-up is not significantly related to firm success in a simple bivariate relationship.

The seventh basic hypothesis (H7) states, "Entrepreneur's years of manufacturing experience prior to start-up is positively correlated with

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firm performance". This basic hypothesis becomes two testable hypotheses:

> H7a: Entrepreneur's years of manufacturing experience prior to start-up is positively correlated with average annual employment growth.

> H7b: Entrepreneur's years of manufacturing experience prior to start-up is positively correlated with average annual revenue growth.

The correlation between entrepreneur's years of manufacturing experience prior to start-up and average annual employment growth is -.013 (p=.906). The correlation between entrepreneur's years of manufacturing experience prior to start-up and average annual revenue growth is -.024 (p=.826). Thus, H7 is rejected. Entrepreneur's years of manufacturing experience prior to start-up does not appear to be significantly related to firm performance in a simple bivariate relationship.

The eighth basic hypothesis (H8) states, "The number of previous entrepreneurial start-ups will be positively correlated with firm performance". As before, this basic hypothesis becomes two testable hypotheses:

> H8a: The number of previous entrepreneurial start-ups will be positively correlated with average annual employment growth.

> H8b: The number of previous entrepreneurial start-ups will be positively correlated with average annual employment growth.

The correlation between the number of previous entrepreneurial start-ups and average annual employment growth is 0.181 with a probability of occurrence of 0.092. The correlation between the number of previous new firm start-ups and average annual revenue growth is -.091 (p=.407). Thus, H8a is not rejected while H8b is rejected.

Hypothesis 9 states, "The number of years of entrepreneurial top management experience prior to start-up will be positively correlated

with firm performance". As before, this basic hypothesis becomes two testable hypotheses:

H9a: The number of years of entrepreneurial top management experience prior to start-up will be positively correlated with average annual employment growth.

H9b: The number of years of entrepreneurial top management experience prior to start-up will be positively correlated with average annual revenue growth.

The correlation between the number of years of entrepreneurial top management experience prior to start-up and average annual employment growth is -.194 (p=.066). This is a significant, but counter-intuitive, finding. The direction of the correlation coefficient is opposite that hypothesized. As will be discussed in Chapter V, one might interpret this finding as suggesting that there is a negative (inverse) relationship between years spent on a top management team and future performance of a new firm. The correlation between the number of years of entrepreneurial top management experience and average annual revenue growth is -.098 (p=.368). The results of the hypothesis tests suggests that the number of years of entrepreneurial top management experience is not positively correlated with firm performance in a simple bivariate relationship.

Scanning Intensity

The tenth, and final, basic hypothesis (H10) states, "Scanning intensity is positively correlated to firm performance". Scanning intensity, as described in Chapter III, was operationalized using two different instruments. The first instrument, designated SI(1), was developed for this study utilizing the methodology suggested by Daft, Sormunen and Park (1989). The second instrument, designated SI(2), was

a series of four questions developed by Miller (1983) and used in
several later studies to assess scanning characteristics. Little
difference was found between the two instruments. SI(1) yielded
slightly stronger correlations and for that reason was used in the
hypothesis testing and the investigation of the research questions. As
before, the basic hypothesis becomes two testable hypotheses:

     H10a: Scanning intensity is positively correlated with average
             annual employment growth.

     H10b: Scanning intensity is positively correlated with average
             annual revenue growth.

The correlation between scanning intensity and average annual
employment growth is 0.231 (p=.027). The correlation between scanning
intensity and average annual revenue growth is 0.171 (p=.109). Thus,
H10a is not rejected and H10b is rejected with some reservation in the
case of H10b as it is approaching significance and it is concluded that
scanning intensity, in some cases, is positively correlated with
average annual employment growth.

A summary of the findings of the above correlation tests is
presented in Table V.

TABLE V

RELATIONSHIPS BETWEEN INDEPENDENT AND DEPENDENT VARIABLES

		Y1 (empgrow)	Y2 (revgrow)
X1	(nach)	+	+
X2	(loc)	- **	+
X3	(educ)	-	-
X4	(age)	-	-
X5	(genmgt)	+	-

TABLE V (Continued)

		Y1 (empgrow)	Y2 (revgrow)
X6	(mktg)	+	-
X7	(mfg)	-	-
X8	(starts)	+ *	-
X9	(entyrs)	- *	-
X10	(SI(1))	+ **	+

** = Probability < 0.05
* = Probability < 0.10

Research Questions

Three research questions were tested that relate specifically to the general topic of manufacturing firm performance during the organization's early years. Those questions are:

(1) What is the relationship between the entrepreneur's industry-specific experience and the performance of the firm?

(2) Can a parsimonious set of predictor variables be determined that, in a linear combination, significantly relates to measures of firm performance? Does the set of predictor variables generally agree with the initial, conceptual model of firm performance described in Chapter II. That is to say, do variables appear in the model that "fit" the categories of psychological differences, background characteristics and scanning intensity?

(3) Given that a linear combination of variables significantly related to firm performance can be defined, is the relationship modified by industry dynamism or environmental hostility?

The questions described above will be explored using correlation analysis for the first question and multiple linear regression analysis and moderated regression analysis for the second and third questions.

Industry Experience

Industry experience was defined as the number of years prior to start-up of this firm the entrepreneur spent in the same industry. Although few, if any, empirical studies have attempted to study the direct relationship between years of experience and entrepreneurial firm performance, many venture capitalists use industry experience as a screening mechanism in the assessment of entrepreneur's business plans (Vesper, 1990). In this study, ninety entrepreneurs reported years of industry experience ranging from none to thirty-six years. Three entrepreneurs did not respond to the question on years of experience. The mean number of years reported was 9.022 with a standard deviation of 8.899.

The correlation between industry experience and average annual employment growth was 0.212 (p=.046). The correlation between industry experience and average annual revenue growth was -.074 (p=.498). There is a significant, positive relationship between industry experience and average annual employment growth while there is a negative and nonsignificant relationship between industry experience and average annual revenue growth. This finding suggests that it would likely be worthwhile to include industry experience as a potential predictor variable in the multiple regression studies of Research Questions Two and Three.

Research Question 2

Prior to building a linear model of firm performance, it is appropriate to consider the possibility that the group of significant results obtained in testing the bivariate hypotheses is spurious. The

"omnibus null test", suggested by Cohen and Cohen (1983), is one way of assessing the possibility that the group results are spurious. A Chi-square statistic is obtained utilizing the following formula:

$$\text{Chi-square} = (n-3) \text{ sum } (z')^2$$

$$\text{where:} \quad df = k(k-1)/2$$
$$z' = \text{Fischer's z-transform}$$
$$k = \text{the number of variables}$$

In this case, Chi-square is 21.5 which is _not_ significant at forty five degrees of freedom. The null hypothesis that all ten correlation coefficients are zero cannot be rejected. This result, coupled with the notion that entrepreneurship is a multifaceted construct (Gartner, 1985) suggests that a multiple linear regression approach is preferable for the purpose of describing firm performance. By including industry experience, as a result of the correlation analyses used in exploring Research Question 1, a set of eleven potential predictors of firm performance is generated. The variables labels and names are shown in Table VI.

TABLE VI

VARIABLE NAMES AND LABELS

X1	Need for Achievement
X2	Locus of Control
X3	Years of Formal Education
X4	Age
X5	Years of General Management Experience
X6	Years of Marketing Experience
X7	Years of Manufacturing Experience
X8	Number of Previous Start-ups
X9	Years of Entrepreneurial Experience
X10	Scanning Intensity 1
X11	Industry Experience
Y1	Average annual employment growth
Y2	Average annual revenue growth

Average Annual Employment Growth. Stepwise regression was used to develop a parsimonious set of independent variables that, in a linear combination, were significantly related to average annual employment growth. Although this method has been criticized (Cohen & Cohen, 1983), it was deemed an appropriate technique in this instance since there is no prior theory specifying a multivariate explanation of entrepreneurial firm performance exists (Keats & Bracker, 1985). The particular stepwise technique used was backward elimination which entails beginning with a set of k (in this instance k = 11) potential predictors and regressing the dependent variable on all predictors. The variable with the least significance (probability > .10) is then eliminated and the dependent variable is regressed on the remaining predictors. The process is repeated until no variables remain in the regression equation which have a probability greater than 0.10. Backward elimination is the preferred method for determining a parsimonious set of predictor variables when no theoretical structure relating to the variables is available (Younger, 1979). The final backward stepwise regression test resulted in Number of Previous Start-ups (X8), Years of Entrepreneurial Experience (X9), Age (X4), Industry Experience (X11), Locus of Control (X2), and Scanning Intensity (X10) being retained as predictor variables. The regression model is depicted in Table VII and is the starting point (the basic model) for exploration of the moderating effects of proposed contingency variables - industry dynamics and environmental hostility.

TABLE VII

PREDICTOR EQUATION FOR AVERAGE ANNUAL EMPLOYMENT GROWTH

Y1 = 7.286 + 1.65(X8) - 0.412(X9) -0.213(X4) + 0.287(X11)
     - 1.57(X2) + 0.0294(X10)

Predictor	Coef.	St. Dev.	t-ratio	p
Constant	7.286	4.549	1.60	0.113
X8	1.6545	0.6911	2.39	0.019
X9	-0.4119	0.1333	-3.09	0.003
X4	-0.2127	0.0995	-2.14	0.036
X11	0.2871	0.0863	3.33	0.001
X2	-1.5666	0.8919	-1.76	0.083
X10	0.0294	0.0147	2.00	0.049

n = 85   s = 6.0833   R-squared (adjusted) = .275

Analysis of Variance

Source	DF	SS	MS	F	p
Regression	6	1399.27	233.21	6.30	0.000
Error	78	2886.16	37.00		
Total	84	4285.42			

The adequacy of any multiple linear regression equation is subject to certain underlying assumptions; no high degree of multicollinearity between the variables in the equation, no evidence of heteroscedasticity, and no evidence of a curvilinear relationship. Two tests were performed to check for the possibility of high levels of multicollinearity; intercorrelations between the variables in the equation and regression of each of the variables on the other five (Berry & Feldman, 1985). The intercorrelations are shown below in Table VIII:

TABLE VIII

INTERCORRELATIONS

	Y1	X8	X9	X4	X11	X2
X8	.181					
X9	-.194	.396				
X4	-.146	.302	.475			
X11	.212	.244	.287	.475		
X2	-.210	-.086	-.003	-.126	-.099	
X10	.237	.180	.238	.009	.118	-.153

None of the pair-wise correlations above are close to the value 0.800 which is generally taken as an indicator of high levels of multicollinearity (Berry & Feldman, 1983). Additionally, since the R-squared for the regression runs range between .093 and .353, it is reasonable to assume that high levels of multicollinearity do not exist in the basic regression equation.

Residual plots were used to test for the presence of curvilinearity and heteroscedasticity as suggested by Cohen and Cohen (1983) and Berry and Feldman (1983). Since no characteristic "fan-shaped" patterns or curvilinear patterns were present in the residual plots, it was concluded that heteroscedasticity and curvilinearity were not of serious concern.

Average Annual Increase in Revenue. Table V summarized the relationships found between the outcome variables and the proposed predictor variables. It should be noted, in Table V, that no predictor was significantly related to average annual increase in revenue in a

simple bivariate relationship. Utilizing the same backward stepwise regression technique described above, no potential predictor was left in the regression equation after twelve steps when the dependent variable was defined as average annual increase in revenue.

Moderated Regression (Research Question Three)

The purpose of the final research question was to explore the possibility that industry dynamism and environmental hostility moderate the linear relationship between the outcome variables (average annual employment growth and average annual revenue growth) and the six predictor variables identified in Research Question Two. Since no linear relationship between the potential predictors and average annual revenue growth was found in research question two and no significant relationships were found for the interaction terms (with average annual revenue growth as the criterion), results will be reported only for the relationship between average annual employment growth and the predictors and moderators.

The method used to explore possible moderating effects or influences of industry dynamism (Z1) and environmental hostility (Z2) was the method described by Sharma, Durand and Gur-Arie (1981). The Sharma et al (1981) test for the existence of moderators is a three-step process.

Step One: The first step is creation of a linear model of predictor variables with the criterion variable. For this research, the predictors are previous starts (X8), years of entrepreneurial experience (X9), age (X4), industry experience (X11), LOC (X2), and scanning intensity (X10). The criterion is average annual employment growth. In this research, this

step is identical with Research Question Two and the linear

model is shown in Table VII.

Step Two: At the second step, one extends the linear model

with the proposed moderator as a predictor.   If the partial F

test yields a significant increase in R-squared, the proposed

moderator is a predictor and the analysis stops.   In this

research, neither of the two proposed moderators - environmen-

tal hostility (Z2) and industry dynamics (Z1) - yielded a

significant increase in R-squared and it is concluded that

neither is a predictor variable.   The regression model with

industry dynaminism (Z1) as a potential predictor is shown in

Table X and the regression results with environmental hostili-

ty (Z2) are shown in Table XV.

Step Three: If one finds, in Step 2, that the proposed

moderator is not a predictor, then the cross product of the

moderator and one (or more) independent, predictor variables

is entered and, again, significance is determined with a

partial F-test.   Since no prior theory or empirical tests have

demonstrated how industry dynamism or environmental hostility

might moderate a linear combination of predictors of firm

performance, it was necessary to test for moderating effects

by developing six different versions of the cross product

equation (Step Three) with Z1 and Z2 with each of the six

predictor variables.

Potential Moderators.   Both of the potential moderators (industry

dynamism, Z1, and environmental hostility, Z2) were measured using

reliable scales developed in previous research described in Chapter III.

However, to guard against "common method variance", an independent verification of the environmental moderators was deemed appropriate. A panel of five industry experts was asked to assess industry dynamism and environmental hostility on the same scales used for the entrepreneurial survey. The five industry experts were selected from the membership list of the Tulsa Economic Development Foundation and each had substantial expertise in economic development in the Tulsa MSA. The five included the chairman of the board of a venture capital firm, a city of Tulsa economist, an economic development specialist for a major public utility, a successful entrepreneur/investor and an academic whose research area is small business development. The industry experts had a mean of 18.2 years of formal education and 11.2 years of experience working directly in the area of economic development and new venture creation. Responses of both the industry experts and the entrepreneurs are shown in Table IX:

TABLE IX

INDUSTRY DYNAMISM AND ENVIRONMENTAL HOSTILITY RESPONSES

Group	n	Dynamism (mean)	Dynamism (S.D.)	Hostility (mean)	Hostility (S.D.)
Industry Experts	5	4.440	0.434	3.600	0.490
Entrepreneurs	92	3.849	0.889	3.460	1.017

A two sample t-test for equality of means yields a t-statistic of -0.58 (p=.59) for hostility and -1.47 (p=.14) for dynamism. In neither case can the null hypothesis of equal means be rejected. The slight differences that exist between the industry experts' assessment of dynamism and hostility and the assessment of the entrepreneurs in the sample may reflect the fact that the entrepreneurs are reporting from a much broader industry base (fourteen two-digit SIC code industry groups) than the industry experts who tend to focus on only one, or a few, industry groups. However, the entrepreneur's assessments were adequate for the purpose of establishing the values of the proposed moderator variables.

Industry Dynamism as a Moderator. Industry dynamism (Z1), was first entered into the basic regression equation (Table VI) to test its effect as a predictor variable. R-squared (adjusted) for the original, basic regression equation was .275. The regression equation with industry dynamism as a potential predictor is shown in Table X:

TABLE X

INDUSTRY DYNAMISM AS A POTENTIAL PREDICTOR

$$Y1 = 9.38 + 1.66(X8) - 0.414(X9) - 0.229(X4) + 0.290(X11)$$
$$-0.507(Z1) - 1.58(X2) + 0.033(X10)$$

s = 6.108   n=85   R-squared (adjusted) = .269

Analysis of Variance

Source	DF	SS	MS	F	p
Regression	7	1400.05	200.01	5.34	0.000
Error	77	2885.37	37.47		
Total	84	4285.42			

It should be noted that the R-squared (adjusted) for the regression equation with industry dynamism (Z1) included as a potential predictor is actually smaller than the R-squared for the regression equation which does not include this term. This slightly counterintuitive result is explained by the use of adjusted R-squared - a more conservative and recommended approach (Cohen & Cohen, 1983). The adjusted R-squares reported in this research are obtained by adjusting for degrees of freedom (Willis, 1988) and the decrease in R-squared from the adjustment process exceeds the very small (and non-significant) R-squared increases resulting from the addition of the proposed moderator as a predictor. It can be concluded that industry dynamism is not a direct predictor of firm performance.

The final step in the moderated regression analysis of industry dynamism is to utilize a series of cross products (industry dynamism and each of the predictor variables) and to determine at each step if the R-squared of the regression analysis is significantly increased by the inclusion of the interaction term. The results of the six interaction regressions are shown below in Table XI. In any case where the new R-squared is actually less than the basic R-squared, the improvement is shown as "na". In Table XI it is seen that three interaction terms (Dynamism with Starts, Entrepreneurial Years and Age) all yielded increases in the adjusted R-squared.

TABLE XI

INTERACTION EFFECTS OF INDUSTRY DYNAMISM

Cross Product		R-squared	Increase	F
Dyn. x Starts	(Z1 x X8)	.283	.008	0.839
Dyn. x Ent. Yrs.	(Z1 x X9)	.451	.179	17.78 **
Dyn. x Age	(Z1 x X4)	.395	.120	11.92 **
Dyn. x Ind. Exp.	(Z1 x X11)	.263	- na -	
Dyn. x LOC	(Z1 x X2)	.268	- na -	
Dyn. x SI(1)	(Z1 x X10)	.260	- na -	

** probability < .001

The partial F-tests shown in Table XI, above, indicate that industry dynamism functions as a pure moderator in its interactions with years of entrepreneurial experience (X9) and age at founding (X4). The slight increase in r-square attributable to the inclusion of the Industry Dynamism (Z1) and Starts (X8) interaction is not significant.

The full regression equation with the entrepreneurial experience interaction is shown in Table XII and the age interaction is shown in Table XIII.

TABLE XII

INTERACTION OF INDUSTRY DYNAMISM AND YEARS
OF ENTREPRENEUR EXPERIENCE

$Y1 = 19.9 + 1.04(X8) - 2.45(X9) - 0.238(X4) + 0.249(X11)$
$- 2.81(Z1) -1.92(X2) + 0.030(X10) +0.562(Z1 \times X9)$

Predictor	Coefficient	S.D.	t-ratio	p
Constant	19.861	5.375	3.69	.000
X8	1.044	0.613	1.70	.093
X9	-2.448	0.412	-5.94	.000
X4	-0.238	0.090	-2.65	.010
X11	0.249	0.076	3.29	.002
Z1	-2.805	0.855	-3.28	.002
X2	-1.916	0.779	-2.46	.016
X10	0.030	0.014	2.18	.032
(Z1 x X9)	0.561	0.109	5.15	.000

n=85   s=5.294   R-squared (adjusted) = .451

Analysis of Variance

Source	DF	SS	MS	F	p
Regression	8	2155.10	269.39	9.61	0.000
Error		76	2130.32	28.03	
Total		84	4285.42		

A partial F-test for the significance of the increase in R-squared when the two-way interaction of dynamism and years is included in the regression equation (Table XI) also shows that industry dynamism is a pure moderator in its interaction with the entrepreneur's age at founding. The full regression model is shown in Table XIII:

TABLE XIII

INTERACTION OF INDUSTRY DYNAMISM AND
ENTREPRENEUR'S AGE AT FOUNDING

$$Y1 = 60.48 + 1.09(X8) - 0.396(X9) - 1.57(X4) + 0.316(X11)$$
$$- 13.6(Z1) - 1.40(X2) + 0.031(X10) + 0.350(Z1 \times X4)$$

Predictor	Coefficient	S.D.	t-ratio	p
Constant	60.36	13.37	4.51	.000
X8	1.094	0.645	1.69	.094
X9	-0.396	0.122	-3.25	.002
X4	-1.573	0.338	-4.65	.000
X11	0.316	0.079	4.00	.000
Z1	-13.585	3.250	-4.18	.000
X2	-1.403	0.816	-1.72	.090
X10	0.031	0.014	2.18	.033
(Z1 x X4)	0.350	0.084	4.14	.000

n=85   s=5.553   R-squared (adjusted) =.395

Analysis of Variance

Source	DF	SS	MS	F	p
Regression	8	1941.50	242.69	7.87	0.000
Error	76	2343.92	30.84		
Total	84	4285.42			

Industry Dynamism as a Moderator: Summary. The inclusion of

Industry Dynamism as a potential moderator to the multiple linear

regression model of entrepreneurial manufacturing firm performance

yielded two significant (p<.001) interaction models. Industry dynamism

seems to moderate the relationship between Years of Entrepreneurial

Experience (X9) and Average Annual Growth in Employment (Y1) and between

Age (X4) and Average Annual Growth in Employment (Y1). The increase in

R-squared for each of the interaction models, as shown in Table XI, was

substantial. This unexpected finding, in terms of magnitude of in-

crease, led to two post-hoc explorations involving the interaction effect of both original cross products in the basic regression model at the same time and the three-way interaction of Dynamism, Age and Experience. The full regression model with experience and age interactions included is shown in Table XIV. The R-squared increase for the regression model which includes both two-way interactions is significant at $P < .001$.

TABLE XIV

INTERACTION OF DYNAMISM AND AGE AND DYNAMISM
AND ENTREPRENEURIAL EXPERIENCE

$$Y1 = 43.90 + 0.89(X8) - 1.97(X9) - 0.93(X4) + 0.272(X11)$$
$$- 9.07(Z1) - 1.75(X2) + 0.030(X10) + 0.182(Z1 \times X4)$$
$$+ 0.432(Z1 \times X9)$$

Predictor	Coefficient	S.D.	t-ratio	p
Constant	43.91	13.41	3.27	.002
X8	0.892	0.608	1.47	.146
X9	-1.968	0.473	-4.16	.000
X4	-0.934	0.368	-2.54	.013
X11	0.272	0.075	3.61	.001
Z1	-9.065	3.317	-2.73	.008
X2	-1.745	0.770	-2.27	.026
X10	0.030	0.013	2.21	.030
(Z1 x X4)	0.182	0.093	1.95	.055
(Z1 x X9)	0.432	0.126	3.42	.001

n=85   s=5.199   R-squared (adjusted) = .470

Analysis of Variance

Source	DF	SS	MS	F	p
Regression	9	2257.97	250.89	9.28	0.000
Error	75	2027.45	27.03		
Total	84	4285.42			

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Three-Way Interaction. The final post-hoc test was a regression
model with a three-way interaction term in place of the model with both
two way interactions included. The three-way model yielded an adjusted
R-squared of 0.49. The significance of this increase in R-square, from
the model with the two two-way interaction terms (Table XIV) was tested
using a partial F-test, as before. The .02 increase was not significant
at alpha = 0.10.

Environmental Hostility as a Moderator. Environmental
hostility was tested as both a potential predictor and as a potential
moderator, utilizing the Sharma, Durand and Gur-Arie (1981) technique,
and was determined to be neither a predictor nor a moderator of a linear
regression model of firm performance. Table XV, describes, briefly, the
regression results and, as before, "na" in the "increase" column
indicates that there was no improvement in the overall R-squared with
the introduction of the new variable at that step. The interaction of
environmental hostility with years of entrepreneurial experience and
hostility with scanning intensity did improve R-squared slightly but the
increase was not significant.

As before, the proposed moderator (environmental hostility) was
first entered as a potential predictor. Then, the product of the
proposed moderator and each of the original six predictors was entered
as a new independent variable and the combined set regressed against the
dependent variable.

TABLE XV

ENVIRONMENTAL HOSTILITY AS A PREDICTOR OR MODERATOR

New Variable	Entered	R-squared	Increase	F
Basic Model		.275		
EHOS	(Z2)	.268	- na -	
EHOS x Starts	(Z2 x X8)	.259	-na-	
EHOS x Ent. Yrs.	(Z2 x X9)	.292	.017	1.82*
EHOS x Age	(Z2 x X4)	.263	-na-	
EHOS x Ind. Exp.	(Z2 x X11)	.260	- na -	
EHOS x LOC	(Z2 x X2)	.262	- na -	
EHOS x SI(1)	(Z2 x X10)	.282	.007	0.74*
	*not significant			

Summary

This investigation has demonstrated that certain characteristics of entrepreneurs, such as personality, experience and environmental scanning practices are related to one measure of firm performance - average annual employment growth. Entrepreneur's LOC, number of previous start-ups, industry-specific experience and scanning intensity were all significantly correlated, in the hypothesized direction, with average annual employment growth.

No significant relationship with employment growth was found for entrepreneur's n Ach, education, age or functional experience. Addi-

tionally, no significant relationship was found between any hypothesized predictor variable and average annual revenue increase in either a bivariate form or a linear regression form. Several findings related to explorations of the three research questions emerged. First, a positive relationship was demonstrated between the entrepreneur's industry-specific experience and firm performance. No previous empirical work was identified that looked at this relationship in spite of the fact that industry experience is used commonly by venture capitalists as a screening device in the assessment of business plans submitted by entrepreneurs for funding.

The second finding is the development of a model of entrepreneurial firm performance that includes the moderating effects of the external environment. Despite the wealth of research that points to the importance of environmental influences on firm outcomes in general, no model was identified in the literature review that is directly applicable to entrepreneurial manufacturing firms. The model that evolved from exploration of Research Question Three is one step in the direction of theory building in this area. It seems to partially address the dictums of Gartner (1985) and Keats and Bracker (1988) that entrepreneurship is a multifaceted concept and that entrepreneurial firm performance models must be developed that reflect the complexities of the entrepreneur's personality and background and the contingency effects of the external environment.

The non-significant findings using the firm's reported financial results as the dependent variable with aspects of entrepreneurial personality and background was unexpected. Some previous entrepreneurial and strategy research has linked aspects of entrepreneurial personality

and background to revenue growth for the firm. The possible explanations for the non-significant findings in this area will be discussed in Chapter V.

This chapter reported the results of Hypothesis Tests One through Ten and Research Questions One through Three. Two post-hoc tests were conducted of the effect of two-way and three-way interactions. It was found that although inclusion of two two-way interactions (DYNAMISM x AGE AND DYNAMISM x EXPERIENCE) in the regression model yielded a substantial and significant increase in explanatory power that the inclusion of a three-way effect (DYNAMISM x AGE x EXPERIENCE) did not yield a significant increase. The next chapter will discuss the interpretation of the findings and implications for practitioners and additional research.

CHAPTER V

CONCLUSIONS, IMPLICATIONS AND SUGGESTIONS

FOR FURTHER RESEARCH

Chapter IV presented this study's findings as a result of hypothesis testing and exploration of the research questions. This chapter draws conclusions from the findings, relates the findings to previous empirical work, reviews some of the implications that the findings might have for managers and identifies avenues for future research in this area.

This study originally proposed two outcome variables: average annual increase in employment and average annual increase in revenue. Results of hypothesis testing and exploration of the research questions with average annual increase in employment as the outcome variable yielded statistically significant findings. On the other hand, with average annual increase in revenue as the outcome, no significant findings resulted from either hypothesis testing or exploration of the research questions.

On the surface, this apparently divergent set of results might appear to be contradictory and perhaps even counter-intuitive. Clearly there should be some relationship between revenue growth and employment growth. As firms increase the annual volume of business, they will, at some point, need a greater number of employees unless the growth rate in revenue is less than the growth rate of labor productivity increases. How then, can one explain the findings of this study? It is

theoretically possible that although there is some significant relation-
ship between the entrepreneur's psychological, background and scanning
characteristics and average annual increase in employment, that there is
no corresponding relationship between the predictors and average annual
increase in revenue. This suggests that there are two models, one of
which is incorrectly specified. This explanation is inherently weak
based on the preponderance of previous empirical work that suggests
otherwise (Kent, Sexton & Vesper, 1982).

An alternative explanation of the findings is that the average
annual increase in revenue variable is incorrectly quantified. This
explanation, too, is rejectable in that the quantification of this
variable is identical with previous empirical work that has yielded
significant findings (Daviddson, 1989; Miner, Smith & Bracker, 1989).

One might question the accuracy of the reports of average annual
increase in revenue. This explanation may be the most likely. Small
business owners are reluctant to report accurate, meaningful financial
results (Fiorito & LaForge, 1986). This reluctance may be as a result
of the common characteristic of small business owners not to think in
financial terms (Miner, Smith & Bracker, 1989) or, perhaps as a result
of tax implications that tend to encourage the under-reporting of income
by some small businesses.

Finally, this puzzling result may be related to the fact that
changes in employment tend to functional monotonicity while revenue
changes exhibit considerable variability from year-to-year.

Whatever the reason for this lack of statistically significant
findings with average annual growth in revenue as the outcome variable,
future research in this area is clearly indicated. The remainder of the

discussion in this chapter will focus on the outcome variable that did yield statistically significant findings: average annual increase in employment (Y1).

Psychological Differences

Two psychological measures of individual differences were proposed as potential predictors of firm performance: Need for Achievement (nAch) (McLelland, 1961) and Locus of Control (LOC) (Rotter, 1966). In this study, entrepreneurial nAch correlated at 0.165 (p=.116) with average annual increase in employment and is in the hypothesized direction, although it narrowly misses significance. Previous research has shown nAch to be a predictor of entrepreneurial aspirations (McLelland, 1961; McLelland, 1965) and entrepreneurial success (Komives, 1972).

However, previous findings are not entirely consistent and Brock-haus states, "The causal link between ownership of a small business and a high n Ach is not proven" (1982).

There are several possible explanations of the conflicting previous research utilizing the nAch construct. In the first case, different instruments have been employed to measure nAch and it is not obvious that these measured the same thing. McLelland, for instance, employed the T.A.T., a projective test to assess nAch. Komives (1972) used Gordon's "Study of Personal Values". The current research study utilized Steers and Braunstein's Manifest Needs Questionnaire (1976).

A second difficulty lies in understanding how a high nAch might affect an individual. McLelland (1965) and McLelland and Winter (1969) argued that individuals with a high nAch were more likely to start new

firms, while other researchers (Komives, 1972) felt that entrepreneurs with a high nAch would be more successful. It may well be that it takes a certain "threshold" level of individual nAch to start a business: beyond the threshold, the relationship between nAch and firm performance is less clear. For example, in the present research no entrepreneur had a nAch below 4.0 (on a scale ranging from 1.0 to 7.0) and the mean was 5.8677, a fairly high nAch in comparison to other recent studies (Chusmir, 1988). The findings in the present research seem to support Khan and Manopichetwattana's (1989) observation that although nAch seems to be a core personality factor in entrepreneurs, a causal link between nAch and entrepreneurial performance has not been established.

Locus of Control (Rotter, 1966) was the second psychological variable proposed as a potential predictor of firm performance. The present research found a significant relationship between entrepreneur's LOC and performance of the firm measured by average annual employment growth. LOC correlated at -0.210 (p=.045) with Y1. This relationship is significant and in the hypothesized direction. LOC was operationalized using Lumpkin's (1985) shortened version of Rotter's (1966) original instrument in which an internal orientation is reflected in a low score while an external orientation results in a high score. In the present research, the entrepreneur's mean LOC was 1.5387 which is lower (more internal) than the 3.94 mean in Lumpkin's (1988) sample of 3009 Consumer Mail Panel respondents.

Two conclusions can be drawn from these results. The first is that there is a statistically significant relationship between entrepreneur's LOC and firm performance. Although not part of the original hypotheses, the second is that the entrepreneurs in this sample have a greater

internal orientation than a broad, nationwide panel of consumers. These findings tend to support the findings of Borlund (1974), Brockhaus (1975), Shapero (1975) and Khan and Manopichetwattana (1989). It is possible that a potential entrepreneur's score on the LOC instrument may provide some insight into the important business question, "Will this entrepreneur be successful in a new venture?"

To summarize, one of the two proposed predictors of entrepreneurial firm performance may have utility in discriminating between potentially successful and potentially unsuccessful new manufacturing ventures. This is an important finding because although venture capitalists and other investors have for some time attempted to identify "hungry" entrepreneurs, there is no consensus on how one might objectively measure a "hungry" (ie., internal) orientation.

Background Differences

The present research investigated four research-based background differences: age of the entrepreneur at the time of founding, years of formal education prior to founding, years of functional experience prior to founding and entrepreneurial experience prior to founding the firm.

The mean age of the entrepreneurs in this study was 38.4 years at the time that they founded the firm. The correlation between age (X4) and average annual increase in employment (Y1) was -0.416 (p=.168). This is not a significant finding, and the direction of the relationship is opposite that hypothesized. Some previous research has indicated a relationship between entrepreneur's age and firm success (Birley & Norburn, 1987; Cooper & Dunkelberg, 1987; Hay & Ross, 1989). In the previous empirical research it was demonstrated that successful entre-

preneurs were older than the median age of the United States population. The median age in the United States was 31.8 years in 1986 (Bureau of the Census, 1988). As is shown later in this chapter, the mean years of formal education for the entrepreneurs was fifteen and they had nine years of industry-specific experience. On average, this suggests that the entrepreneurs had to be at least thirty years of age at founding and the sample's interquartile range was thirty-one to forty-three years of age at founding. It is possible that the age variable rather than being linearly related to firm success exhibits a "threshold" or "window of opportunity" characteristic. Such a possibility would be consistent with previous empirical research (Birley & Norburn, 1987; Hisrich & Brush, 1984) which found that successful entrepreneurs were between thirty and forty-five years of age at founding.

Years of formal education (X3) correlated with average annual increase in employment at -0.143 (p=.179). This is not a statistically significant finding and the sign of the correlation coefficient is opposite that originally hypothesized. This finding is not surprising as previous empirical research also tends to exhibit mixed results. For instance, Collins and Moore (1970) discovered that successful entrepre- neurs in their sample had less formal education than business managers of the time. They expressed an opinion that normal higher education was incapable of providing the skills required for success as an entrepre- neur. One must realize, though, that the Collins and Moore sample was drawn primarily from small metalworking firms and was prior to the wide-spread use of any of the high-tech metalworking machines or processes. The entrepreneurs in the Collins and Moore sample might well be categorized as income-replacing craftsmen. A substantial number

of more recent empirical studies (Birley & Norburn, 1987; Hisrich &
Brush, 1984; Neiswander & Dollinger, 1986) involved either hi-tech firms
or those in the service industries where greater levels of higher
education are common (Gasse, 1982). The more recent studies suggest
that successful entrepreneurs have more formal education than the
population as a whole and, at least in the case of high-tech, more
formal education than business professionals in the non-entrepreneurial
firms.

Type of industry may moderate years of formal education as a
predictor of entrepreneurial performance. High-tech and service firms
may require well-educated entrepreneurs to cope with the complexities of
process, product and market whereas low-tech firms may not have such a
need. Unfortunately, this research project did not attempt to control
for level of technology and it is not possible to assess the potential
moderating influence of technology even on a post-hoc basis.

Functional experience has been shown to affect the type of strategy
employed and the relative success of larger firms. It seemed reasonable
to assume that years of functional specialization in such areas as
general management (X5), marketing (X6) and manufacturing (X7) prior to
founding might well explain part of the variance in the performance of
new manufacturing firms. However, this was not the case. As is seen in
Table IV, none of the three functional background variables were
significantly related to average annual employment growth. Were it not
for the results discussed below, involving other types of experience,
the results would have been counterintuitive since investors and venture
capitalists place a high value on experience in their decisions to fund
new manufacturing firms.

Two other types of background experience were evaluated in this research: years of experience as a member of the top management team in an entrepreneurial firm (X9) and number of previous entrepreneurial start-ups (X8). In the case of prior start-up experience, the correlation between number of start-ups and firm performance was 0.181 (p=.092). The mean number of prior start-ups was 0.652 and the maximum was 5.0. Interestingly, the correlation between years of top management experience in an entrepreneurial firm prior to founding and average annual employment growth was -0.194 (p=.066). The conclusion that might be drawn from this finding is that the experience of actually starting a new firm leads to better performance in succeeding start-ups while simply being a member of the top management team is negatively related to future firm performance. It has been shown that entrepreneurs who have started multiple careers and are more successful than single-venture entrepreneurs (Ronstadt, 1988). The multiple venture effect has been termed the "Corridor Principle" and the findings regarding the positive relationship between number of prior start-ups and firm performance seems to confirm Ronstadt's (1988) Corridor Principle while the negative relationship between years of top management experience and the outcome variable seems to suggest either a poorly-operationalized variable, perhaps related to the findings for functional experience or a suggestion that there are major differences between actually starting a new firm and helping to run one. Informal, post-hoc discussions with a small group of successful entrepreneurs and venture capitalists suggests that there is, indeed, a significant difference between assuming the total responsibility for a start-up and functioning as a top manager in an entrepreneurial firm. Verbatim comments from the discussions

included, "It's as different as night and day." and "There's almost no relationship between the two". Not surprisingly, the individual responsible for a start-up functions in the role of generalist while even in very small firms, the members of the top management team have the freedom to concentrate the majority of their activities in one or a very few responsibility areas.

Scanning Practices

Environmental scanning is "the means through which top managers perceive external events and trends" (Daft, Sormunen & Park, 1988). Environmental scanning has been shown to be related to the performance of firms (Aguilar, 1967; Hambrick, 1982). No prior empirical research that addressed environmental scanning, specifically in entrepreneurial firms, was identified in the literature. Furthurmore, there is no agreed-upon, consensus instrument to assess environmental scanning in organizations. A scanning instrument was developed (as described in Chapter III), based on the work of Daft, Sormunen and Park, (1989). A scanning intensity score was computed for each entrepreneur that ranged from 32.0 to 243.0 with a mean of 133.08. Scanning intensity (X10) correlated 0.237 (p=.024) with average annual employment growth. In fact, scanning intensity alone accounted for nearly six percent of the variance in firm performance.

A comparison was made between the correlation of scanning intensity, as described above, and the correlation of an environmental scanning measure developed by Miller, Kets de Vries and Toulouse (1982) and used in several subsequent large-firm strategy studies. The Miller et al. instrument correlated 0.231 (p=.027) with average annual employment

growth. The two instruments described are fundamentally different in terms of approaches to measuring environmental scanning. The first (based on the work of Daft, Sormunen and Park, 1989) is a twelve item instrument that basically determines the respondents belief that a particular sector of the environment is important and the frequency that it is examined. The second (Miller et al.) determines how frequently the entrepreneur gathers client opinions, tracks competitive moves, forecasts such things as sales and conducts special market studies. The two instruments are quite different in terms of composition, but they attempt to measure essentially the same construct. The intercorrelation of the two measures is fairly high (0.571), but they only explain about one third of the variance in each other. It seems reasonable to assume that the use of two different measures of environmental scanning is what has been called systematic replication and that, since the outcomes are virtually identical, it is reasonably sure that scanning intensity is positively correlated with the performance of entrepreneurial manufacturing firms.

Since the temporal ordering of environmental scanning and small, new, manufacturing firm performance is likely to be scanning preceding performance, it is possible that this study may have identified a causal relationship. If so, this may be an important finding. Substantial additional replication of the correlation between scanning intensity and entrepreneurial manufacturing firm performance would be required to validate the findings in this study. It would also be necessary to demonstrate that scanning intensity and performance are chronologically ordered to give any serious consideration that this research may have identified a causal link. If it is reasonable to assume that there is a

causal link between scanning intensity and entrepreneurial manufacturing firm performance, then one might very profitably seek to improve the scanning practices of small, new manufacturing firms for the purpose of improving their "survivability" and growth opportunities. Successful, growing manufacturing firms provide the economic foundation for viable economies (Hayes & Wheelright, 1984; Thurow, 1980).

Industry Experience: A Research Question

Generally speaking, appropriate experience is a background attribute industry values. Venture capitalists have used industry-specific experience as one of the screening devices for evaluation of business plans (Burch, 1986). The common-sense rationale for ascribing value to industry-specific experience is that virtually every identifiable industry has its own peculiarities that can have a dramatic impact on all firms in the industry, but especially the small, new firms that have limited organizational slack.

Organizational theorists seem to fall into two camps: Population ecologists (Hannan & Freeman, 1977) and proponents of strategic choice (Astley & Van de Ven, 1983; Borgeois, 1984, Porter, 1980). The ecologists argue that organizational outcomes are, in large degree, deterministic and governed by such mathematical rules as those proposed by the Lotka-Volterra equations. Certainly this perspective has merit in the study of contiguous groups of related organizations. However, the focus of this paper (and perhaps the major theoretical perspective today in organization theory) is that of the proponents of strategic choice. It is believed that organizations have some control over their individual outcomes and that prudent choices in the allocation of resources and

structuring of responses to environmental impacts results in relatively better performance than industry competitors (Porter, 1980).

If reaction to competitive pressures entails good decision-making, then it seems most reasonable to propose that those entrepreneurs with superior knowledge of the industry are at least equipped to make better decisions. Better decision-making should result in superior performance and this notion underlies the first research question, "What is the relationship between prior industry experience (of the entrepreneur) and firm performance?"

No previous empirical study was identified that specifically addressed the research question for entrepreneurial manufacturing firms. In this study, entrepreneurs were asked to report the number of years of industry experience prior to founding the new firm and this figure was correlated with average annual growth in employment. The correlation was 0.212 (p=.046). This makes prior industry experience the second most powerful predictor of firm performance, after scanning intensity.

This, too, is an interesting and potentially important finding. By definition, prior industry experience must temporally precede firm performance, thus we may have identified a second causal relationship in addition to uncovering a statistically significant relationship. Clearly, this finding tends to confirm industry practice (in the evaluation of business plans by venture capitalists) and, in a general way, emphasizes the important role that specific information can play in determining firm performance.

Combined Results: A Multiple Linear

Regression Approach

The second research question asked if a parsimonious set of predictor variables existed in a linear combination that was significantly correlated with firm performance. Secondarily, assuming such a linear model *did* exist, did the model conform to the configuration posited in Chapter II? That is, was firm performance significantly related to a combination of entrepreneur's psychology, background and information-gathering practices?

Research question two is not a trivial issue. Some prior research suggests the entrepreneurship is a multi- faceted construct (Covin & Slevin, 1989; Gartner, 1985; Khan & Manopichetwattana, 1989). However, much of the earlier research seems to parallel the "Trait School" of leadership research (Bedeian, 1989). The trait school attempted to identify one or a few personality traits that distinguished successful and unsuccessful leaders. Just as the trait school was eventually discredited (Bedeian, 1989), so too, it seems, the early single construct approach to entrepreneurial firm performance will give way to a more comprehensive multi-faceted approach (Cooper, 1982).

The results of exploratory step-wise regression, described in Chapter IV, seem to support the multi-faceted approach. In testing hypotheses one through ten, it was found that no single predictor of firm performance explained more than slightly over five percent of the variance in average annual employment growth. Combining the various potential predictors of entrepreneurial manufacturing performance yielded somewhat better explanatory power. The following multiple

linear regression equation explains in excess of twenty seven per cent of the variation in average annual employment growth.

TABLE XVI

FIRM PERFORMANCE (BASIC REGRESSION MODEL)

EMPGROW = 7.286 +1.654(STARTS) -0.412(ENTYRS) -0.213(AGE)
          +0.287(INDEXP) -1.567(LOC) +0.294SI1

Where EMPGROW = Average annual employment growth
      STARTS = Previous number of start ups
      ENTYRS = Years of entrepreneurial management experience
      AGE   = Age at founding
      INDEXP = Years of experience in this industry
      LOC   = Locus of control (Lumpkin's instrument)
      SI(1)   = Scanning intensity (Box's instrument)

and, R-squared = 0.275, F = 6.30, p < 0.000

Student's t-tests of each of the independent variables (as depicted in Table XVI) at an alpha of 0.10 allows the rejection of the null hypothesis that the independent variables have zero coefficients in the regression equation. The F-test, in Table XVI, allows the rejection of the null hypothesis that all of the regression coefficients are zero and further suggests that a meaningful linear model has been developed.

Although ENTYRS, AGE and INDEXP are measured in years, SI1, STARTS and LOC are measured on different scales and therefore no direct comparison of the regression coefficients is possible for the determination of relative strength or "importance". However, the relative importance of each of the independent variables in the equation can be

assessed on the basis of Beta weight (Huck, Cormier and Bounds, 1974)

The results of this exploration are shown in the following table:

TABLE XVII

RELATIVE IMPORTANCE OF INDEPENDENT VARIABLES

Variable	Beta
STARTS	0.2527
ENTYRS	-0.3840
AGE	-0.2823
INDEXP	0.3695
LOC	-0.1696
SI1	0.2000

The absolute value of the Beta weights reflects the relative importance of each of the independent variables in the regression equation. It is seen in Table XVII that the "experience factor" (ie. ENTYRS and INDEXP) contributes most heavily to the average annual increase in employment followed by AGE, STARTS, SI1 and LOC. The negative coefficients attached to ENTYRS and AGE might be explained on the basis of the ad hoc discussions with entrepreneurs (discussed earlier in this chapter) and the current findings of other empirical studies (notably Birley, 1986; Hisrich & Brush, 1984) that suggests that successful entrepreneurship is a "young person's game" with start-up ages clustering in the range of thirty to forty-five years. The above regression equation resolves the first part of the second research question. A parsimonious linear model of entrepreneurial manufacturing

performance has been derived from the sample data. The second part of the second research question has also been answered. One psychological difference factor (Locus of Control), four background differences (number of previous starts, years of entrepreneurial experience, age and industry experience) and a measure of scanning intensity all combine in a linear model of firm performance.

<div align="center">Contingency Effects</div>

The final research question addressed the important area of environmental influence on firm performance. This question reflects the suggestion of several researchers (Covin & Slevin, 1989 Keats & Bracker, 1989; Miller, Kets de Vries & Toulouse, 1982) that environmental contingencies have an effect on the performance of entrepreneurial firms. It also reflects the position of some industrial organization economists (Porter, 1980) that industry structure actually determines the growth and profitability of most firms in a defined industry.

Two literature-based measures of environmental/industry structural variables were selected to explore possible contingency effects: environmental hostility and industry dynamism. As is shown in Table XV, the predictor and moderator effects of environmental hostility were negligible and not significant. However, as shown in Table XI, industry dynamism exhibited some potentially interesting and statistically significant moderating effects on firm performance. Industry dynamism was not significantly correlated with average annual employment growth in a bivariate relationship (r=0.126, p =.235). Nor did it function as a predictor in a multiple linear regression model of firm performance, as is shown in Table X.

However, the interaction effects of industry dynamism and entrepreneurial years and age at founding are significant (see Table XI). In the first case, the inclusion of the interaction of entrepreneurial years (ENTYRS) and dynamism (INDDYN) improved the R square of the basic regression model by 63.6%. The regression equation showing this relationship is found in Table XII. In the second case, the inclusion of the interaction of age at founding (AGE) and dynamism (INDDYN) increased the R square of the basic regression model by 40.4%. The regression equation specifying this relationship is shown in Table XII. In both cases, the magnitude of the increases in explanatory power argue against a spurious relationship.

The explanation of these significant contingency relationships is not intuitively obvious. The basic regression model showed that entrepreneurial manufacturing firm performance was impacted by the age at founding and the years of entrepreneurial top management experience. Younger entrepreneurs and those with fewer years of top management experience (in entrepreneurial firms) would, ceteris paribus, be expected to enjoy better firm performance. One possible explanation for the contingency relationships is that starting a manufacturing firm in a highly dynamic environment demands the attitudes of younger entrepreneurs who are more resilient in the face of environmental impacts. It is also possible that years of top management entrepreneurial experience - as a part of the managing coalition - tends to imprint certain behaviors that mitigate against success in very dynamic industries. Clearly these contingency relationships need to be replicated in other areas and industries for the purpose of beginning to understand the rather surprising findings.

In a general sense, the third research question seems to have been answered. In some cases, environmental or industry variables can affect performance outcomes in a contingency fashion. The magnitude of these contingency relationships lends some support to the suggestions of other researchers (Keats & Bracker, 1989) that it is imperative that contingency models including structural variables be tested so as to understand the real mechanisms of entrepreneurial firm performance.

The post-hoc inclusion of both moderator cross product interactions in a single multiple regression model lends additional support to the idea that Industry Dynamism moderates the relationship between the entrepreneur's strategic orientation (the combination of psychological differences, background characteristics and environmental scanning intensity) and firm performance. The difference in R-squared between the basic regression model (Table VII) and the moderator equation including both interactions (Table XIV) is 0.195 and this represents a 70.9% increase. With a coefficient of determination (in the second model) of 0.47, almost half the variance in performance is explained.

Limitations

The analysis and findings in this research are subject to several limitations. First, and perhaps most importantly, this research (other than hypothesis tests one through ten) is strictly exploratory. No existing model has been identified that relates the entrepreneur's psychology, background characteristics and environmental scanning practices to firm performance. In addition, relatively few studies have been conducted in the area of contingency effects on the performance of entrepreneurial firms. In summary, then, the model that resulted from

the moderated regression approach in this research simply suggests that contingency effects may be present and that entrepreneurial performance is likely to be influenced by a number of different factors including, but not limited to, psychological attributes, background and information-gathering practices.

In addition, the sample includes only "survivor" firms. In one sense, all of the respondents might be considered to have performed well in that they were still in business. No information was available on failed firms and no conclusions can reasonably be drawn regarding the effect of the hypothesized variables in failed firms.

Although the sample size was somewhat larger than the samples in a number of previous entrepreneurial studies, it certainly would have been preferable to have a larger sample in order to control for potential industry effects. Somewhat related to the cell size problem of the existing sample is the possibility that the results from this study are not generalizable in any meaningful way to other geographic regions or to other time periods. The sample was drawn from the Tulsa Metropolitan Statistical Area which is a geographic region with some special, and perhaps unique, characteristics. Historically, the economy has been heavily dependent upon the energy industry - particularly oil and natural gas. In addition, ownership of the factors of production has been tightly concentrated in the hands of relatively few "old money" families. The time period covered in this study was 1980 through 1989. During that time period the United States moved through one major recession (in terms of severity, the worst since the Depression) and a significant swing in national politics from the liberal Carter years to the conservative Reagan/Bush era. It is possible that results for small

manufacturing firms might be quite different in other political and economic climates.

Finally, it could be argued that the selection of potential predictors of firm performance was incomplete. Certainly the variables selected for inclusion in this research were based on previous empirical studies in the entrepreneurship field; however, many other variables not directly related to the entrepreneur could have been selected. Additionally, a host of other industry and environmental variables may have substantial influence on the performance of new manufacturing firms in a contingency fashion. Note that even in the best case in the present research approximately 55% of the variance in performance is unexplained. The only real defense for not including the other potential predictors and moderators is best expressed by Keats and Bracker's (1989) comment that some things must be "set to zero" to create intelligible (admittedly simplified) models of real world phenomena.

Implications

Implications for this research study will be discussed in two contexts: managerial/policy implications and research implications. The rationale for splitting the discussion of implications is quite simple. In many cases (unfortunately) managers and policy analysts have little appreciation for or understanding of research findings. At the same time, most empirical research strives to "push the envelope" of knowledge with limited attention paid to the practical applications of new knowledge.

Managerial/Policy Implications

The outcome variables in this study were average annual growth in employment and average annual increase in revenue. Taking revenue growth first, had significant results been found, the managerial implications are quite straightforward. Certain characteristics of the potential entrepreneur and industry characteristics could be evaluated by investors in new manufacturing firms for the purpose of estimating future performance. Being able to make informed choices about the likelihood of success leads to better portfolio returns. On the other hand, potential entrepreneurs could use the criteria for the purpose of self-assessment to gain some insight into their own probability for high levels of performance. Unfortunately, this particular application of the findings must await future research studies which uncover significant predictor relationships for revenue growth and other accounting measures of performance.

In the second case, the possible applications of the findings of this study involve addressing the presumably important goal of job creation. Billions of dollars have been spent by various government agencies in the last few decades for the stated purpose of creating new jobs (Mokey, 1988; Solomon, 1986). If one examines the efforts of most Chambers of Commerce (non-governmental entities), one immediately sees that the bulk of their activities are directed at job creation rather than revenue appreciation. Even our educational systems are directed (particularly at the state level) at the creation of new jobs. Assuming that job creation is an important socioeconomic goal, then this research offers some information that could, potentially, make that process more

efficient. It seems clear, in at least the last ten years, that more jobs are being created in the smaller (newer) manufacturing firms than in the older, larger firms. It seems, then, almost a tautology that improving the performance of entrepreneurial manufacturing firms would increase the rate of job creation. This research suggests that resources (both public and private) should be directed at entrepreneurs that have the following characteristics:

(1)   The entrepreneur should have a low LOC, significant <u>industry</u> experience, some prior start up experience and an inquisitive attitude with regard to the environment.

(2)   In addition, for firms poised to enter dynamic environments, age and the type of work experience may be critical success factors.

Research Implications

This has been an exploratory study. Hence any interpretation of the findings should be done with considerable caution. The models developed using moderated regression should be studied for other samples from different geographic regions and in other time periods.

Nonetheless, some potentially interesting findings have emerged. The exploration of the first research question (involving the relationship between industry experience and firm performance) suggests that industry experience is significantly correlated with firm performance. This is interesting in the sense that no previous empirical study (involving entrepreneurial manufacturing firms) was identified that considered this relationship.

Intensity of environmental scanning was found to correlate significantly with firm performance. This, too, is an interesting finding in that relatively few empirical studies of environmental scanning have

been conducted since Aguilar's seminal work in 1967 (Smelzer, Fann & Nikolaisen, 1988). The development of an instrument (in this research) to measure scanning intensity may also be of some value to future research.

The contingency models developed in the exploration of research questions two and three suggest very strongly that environmental/ industry variables moderate the relationship between entrepreneurial characteristics and firm performance. Other contingency relationships should be explored using the many variables implicit in the strategy and industrial organization literature. Better operationalization of the experience predictors (particularly in the case of functional experience) along with more successful efforts in the financial outcome measures would be advantageous in future studies of this type.

Summary

The present research has made a contribution to the small number of empirical studies in the area of entrepreneurial manufacturing firm performance. Two variables (industry experience and scanning intensity) seldom used as predictors were found to be significantly correlated with one measure of firm performance.

The development of a reliable measure of scanning intensity is a contribution that other researchers may find beneficial. Finally, contingency models of firm performance which included three groups of predictors as opposed to the usual focus on one or a few variables is a notable contribution. The larger than normal sample size (for entrepreneurial research) facilitated the use of multi-variate techniques rather than the more common bi-variate correlations and non-parametric ap-

proaches usually seen in this field. The R squared of .470 for the final (post-hoc) interaction model is a significant finding.

A number of limitations of this research were identified not the least of which is the disappointing lack of significant results in the use of an accounting measure of firm performance. However, this disappointment is slightly tempered by Biggadike's (1979) observation that it takes eight years for most new firms to achieve prosperity while the mean age of the firms in this study was slightly over five years.

Finally, if this research contributes in any way to the understanding of what makes some new manufacturing firms more successful than others, the author will have achieved one of his personal goals.

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THE UNIVERSITY OF TULSA

ENTERPRISE DEVELOPMENT CENTER

1990 MANUFACTURING SURVEY

****

The Enterprise Development Center at TU is conducting its 1990 Survey of
Entrepreneurial Manufacturing Firms. Please take a few minutes to
answer the following questions. All responses will be kept confidential
and no firm will be identified by name.

If you would like a copy of our research findings, please enclose your
business card. If you have questions about the form, I can be reached
through the Enterprise Center at 918-621-2684.

Thanks for your help with this important research project!

Thomas M. Box
Assistant Professor

****

(1)   What is the principle **PRODUCT or SERVICE** of your firm?

_____

(2)   What is your principal **SIC CODE?** _ _ _ _

(3)   What was your first **FULL** calendar year of operations?
_____ (YEAR)

(4)   About how many employees did your firm have in each of the
categories shown for the first **FULL YEAR** and 1989?

		FIRST YEAR	**1989**
A	FOUNDERS (Owners of the firm)	_____	_____
B	OTHER SALARIED EMPLOYEES	_____	_____
C	HOURLY EMPLOYEES – FULL TIME	_____	_____
D	HOURLY EMPLOYEES – PART TIME	_____	_____

TOTAL number of employees:

(5)   How many firms did the founder/entrepreneur start   BEFORE
starting this firm?

_____ (NUMBER OF PREVIOUS START-UPS)

(6) Did the founder/entrepreneur have experience WORKING as a member
     of the TOP MANAGEMENT TEAM in other new firms before this one?

     [A member of the top management team would include president,
     vice-president, directors and departmental managers]

               YES [ ], Number of years? _____   NO [ ]

(7) What was the AGE of the ENTREPRENEUR the year the firm was started
     or acquired?

               ENTREPRENEUR'S AGE: _____

(8) PRIOR to starting or acquiring the firm, approximately how many
     years experience did the entrepreneur have in each of the
     following functional areas? Please indicate the NUMBER OF YEARS
     in each area. Do not "double count" years of experience. If the
     entrepreneur was working in two or more areas, pick the most
     important so that the total will be correct.

     FUNCTIONAL AREA   YEARS OF EXPERIENCE
     A. General Management: _____
     B. Sales/Marketing: _____
     C. Engineering/R&D   _____
     D. Manufacturing   _____
     E. Other   _____

                    TOTAL YRS:

(9) Please check the block that best describes the FOUNDER'S FORMAL
     EDUCATION BEFORE founding this firm:

               Less than H.S. Graduate   [ ] YRS? _____
               High School Graduate   [ ]
               Some College   [ ]
               Bachelor's Degree   [ ]
               Master's Degree   [ ]
               Law Degree   [ ]
               Doctoral Degree   [ ]
               Other _____ [ ]

(10) How many years of EXPERIENCE did the founder of this firm have in
     the INDUSTRY in which this firm competes BEFORE founding (or
     acquiring) this firm?

     FOUNDER'S YEARS OF EXPERIENCE IN THIS INDUSTRY: _____

137

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********************
* INDUSTRY DYNAMICS *
********************
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(11) Please tell us about your INDUSTRY by circling the number that
describes RATE OF CHANGE of each of the following:

A   Our firm RARELY
changes its marketing
practices to keep up
with competitors.

                     Our firm FREQUENTLY
changes its marketing
practices to keep up
with our competitors.

```
!   !   !   !   !   !   !
1   2   3   4   5   6   7
```

B   The rate of product
obsolescence is LOW

                     The rate of product
obsolescence is HIGH

```
!   !   !   !   !   !   !
1   2   3   4   5   6   7
```

C   Actions of competitors
are EASY to predict.

                     Actions of competitors
are EASY to predict.

```
!   !   !   !   !   !   !
1   2   3   4   5   6   7
```

D   Customer demand is
EASY to forecast.

                     Customer demand is
is UNPREDICTABLE.

```
!   !   !   !   !   !   !
1   2   3   4   5   6   7
```

E   The production tech-
in our industry DOESN'T
CHANGE very much.

                     Production technology
CHANGES FREQUENTY in our
industry.

```
!   !   !   !   !   !   !
1   2   3   4   5   6   7
```

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****************
* ENVIRONMENT *
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(12) The next 7 questions describe ENVIRONMENTAL HOSTILITY. Please
circle the number that best describes the degree of THREAT from
each part of the environment.

		Not a great threat					A major threat	
A	The overall environment.	1	2	3	4	5	6	7
B	Tough price competition.	1	2	3	4	5	6	7
C	Competition in product quality	1	2	3	4	5	6	7
D	Dwindling markets for our products.	1	2	3	4	5	6	7
E	Scarce supply of labor.	1	2	3	4	5	6	7
F	Scarce supply of of material.	1	2	3	4	5	6	7
G	Government inter- ference	1	2	3	4	5	6	7

(13) Please list the **NUMBER** of business-oriented clubs or organizations
that the entrepreneur belongs to in each
of the categories listed below:

LOCATION	NUMBER OF ORGANIZATIONS
Local (Northeastern Oklahoma)	_____
Regional (OK,TX,AR,MO,KA)	_____
National	_____
International	_____

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*****************************************
* ENTREPRENEUR'S ATTITUDES AND BELIEFS *
*****************************************
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FOR THE FOLLOWING QUESTIONS, PLEASE ANSWER FROM THE
PERSPECTIVE OF THE MOST SENIOR FOUNDER (ENTREPRENEUR).

		NEVER						ALWAYS
(14)	I do my best work when my responsibilities are fairly difficult.	1	2	3	4	5	6	7
(15)	I try very hard to improve on my past performance at work.	1	2	3	4	5	6	7
(16)	I take moderate risks and stick my neck out to get ahead.	1	2	3	4	5	6	7
(17)	I try to avoid any added responsibilities.	1	2	3	4	5	6	7
(18)	I try to perform better than my competitors.	1	2	3	4	5	6	7

		STRONGLY DISAGREE						STRONGLY AGREE
(19)	When I make plans, I am almost certain that I can make them work.	1	2	3	4	5	6	7
(20)	What happens to me is my own doing.	1	2	3	4	5	6	7
(21)	Many of the unhappy things in people's lives are partly due to bad luck.	1	2	3	4	5	6	7
(22)	Getting people to do the right things depends upon ability; luck has nothing to do with it.	1	2	3	4	5	6	7
(23)	Getting a good job depends mainly on being in the right place at the right time.	1	2	3	4	5	6	7
(24)	Many times I feel that I have little influence over the things that happen to me.	1	2	3	4	5	6	7

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**************************
* INFORMATION GATHERING *
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The environment can be described in terms of six important sectors. We
would like you to rate each of the sectors in terms of importance to
your firm and frequency of information gathering from that sector.

COMPETITION SECTOR: The firms and products that compete with your firm.
Also, competitive practices in your industry.

CUSTOMER SECTOR: Companies or individuals that purchase your products.

TECHNOLOGY SECTOR: Development of new production techniques, innovation
in materials or products, and trends in science.

REGULATORY SECTOR: Federal, state and local laws, regulations and
political developments of all kinds.

ECONOMIC SECTOR: Economic factors such as stock markets, interest
rates, foreign trade balances, unemployment, etc.

SOCIOCULTURAL SECTOR: Social values in the general population,
demographic trends, work ethic, religious beliefs, etc.

(25)   Please rate the IMPORTANCE of each of the six sectors to your firm
       by CIRCLING the number that applies.

	NOT IMPORTANT					VERY IMPORTANT	
COMPETITION	1	2	3	4	5	6	7
CUSTOMER	1	2	3	4	5	6	7
TECHNOLOGY	1	2	3	4	5	6	7
REGULATORY	1	2	3	4	5	6	7
ECONOMIC	1	2	3	4	5	6	7
SOCIOCULTURAL	1	2	3	4	5	6	7

(26) Please tell us how often (FREQUENCY) you gather information from each sector of the environment.

	ALMOST NEVER			EVERY MONTH			EVERY DAY
COMPETITION	1	2	3	4	5	6	7
CUSTOMER	1	2	3	4	5	6	7
TECHNOLOGY	1	2	3	4	5	6	7
REGULATORY	1	2	3	4	5	6	7
ECONOMIC	1	2	3	4	5	6	7
SOCIOCULTURAL	1	2	3	4	5	6	7

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***************************************************
*  MARKETING STRATEGY AND FINANCIAL PERFORMANCE  *
***************************************************
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(27) Please provide your best estimate of the data below for the first FULL year of operations and 1989.

	FIRST YEAR	1989
SALES (Dollars)	_____	_____
PROFIT (After-Tax)	_____	_____
ASSETS (Depreciated)	_____	_____

(28) Please estimate the NUMBER OF IMPORTANT COMPETITORS you faced in each region for the FIRST YEAR and 1989.

	FIRST YEAR	1989
A. Northeastern Oklahoma	_____	_____
B. OK, TX, MO, AR, KA (not including NE OK)	_____	_____
C. The rest of the US	_____	_____
D. International	_____	_____

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************************************************************
*   PLEASE BE SURE TO ANSWER THE QUESTIONS ON THE NEXT PAGE *
************************************************************
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(29) Please tell us **HOW OFTEN** your firm uses the following strategic marketing techniques. Please **CIRCLE** the number that best describes the frequency of use.

	Not Ever Used				Used Very Frequently		
A. Routine gathering of opinions from clients.	1	2	3	4	5	6	7
B. Explicit tracking of policies and tactics of competitors	1	2	3	4	5	6	7
C. Forecasting of sales, customer preferences, technology, etc.	1	2	3	4	5	6	7
D. Special market research studies.	1	2	3	4	5	6	7

(30) Please estimate your **AVERAGE ANNUAL CHANGE IN REVENUE** from the **FIRST FULL YEAR THROUGH 1989**. For example, if your firm doubled sales between 1985 and 1989, the average annual increase would be 20%

AVERAGE ANNUAL CHANGE: _____ % (If sales declined, show this as a negative percentage)

THANK YOU FOR HELPING US WITH THIS SURVEY.


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*************************************************************
*    IF YOU'D LIKE A COPY OF OUR RESEARCH FINDINGS, JUST    *
*    ENCLOSE YOUR BUSINESS CARD IN THE RETURN ENVELOPE.     *
*************************************************************
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VITA

Thomas Morgan Box

Candidate for Degree of

Doctor of Philosophy

Thesis: PERFORMANCE PREDICTORS FOR ENTREPRENEURIAL MANUFACTURING FIRMS: AN EMPIRICAL STUDY OF PSYCHOLOGICAL, BACKGROUND AND ENVIRONMENTAL SCANNING ATTRIBUTES

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