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Antecedents of opportunity recognition: The role of perceived self-efficacy

Krueger, Norris Farwell, Ph.D.

The Ohio State University, 1989

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ANTECEDENTS OF OPPORTUNITY RECOGNITION:
THE ROLE OF PERCEIVED SELF-EFFICACY

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

By
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1989
To My Family and Friends

(especialy Mom and Dad)
ACKNOWLEDGEMENTS

This research could never have been possible without the persistence, patience, insights, and friendship of Dr. Peter Dickson, my advisor. Similarly, the other members of my advisory committee, Drs. Randy Bobbitt and Jon Cunyngham provided more guidance, I think, than they realize and more patience than perhaps I deserved. All three made suggestions that were remarkably insightful and useful. I am grateful.

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FIELDS OF STUDY

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Studies in:

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Entrepreneurship
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CHAPTER I

INTRODUCTION

"The results do make us wonder whether an entrepreneur perceives the same risks that a rational outsider would."

--Albert Shapero (1975)

The Nature of the Problem

Researchers face conflicting evidence about entrepreneurs. Entrepreneurs clearly describe themselves as risk takers. They clearly take above-average risks; indeed, any new venture is clearly a very risky proposition. Paradoxically, research also clearly demonstrates that entrepreneurs do not have an above-average propensity to take risks. Psychologically, they simply are not risk takers. The clue to resolving the paradox lies in some other striking evidence. Entrepreneurs clearly and repeatedly report that their own new ventures are not very risky. They also report accepting an opportunity, not taking a risk.
To understand this entrepreneurial optimism we need to understand its antecedents. Existing research has several parallels with related research in social psychology. What entrepreneurs report closely parallel findings in research on risk perceptions and perceived self-efficacy.

Problem Statement

The questions and issues addressed in this study are: Can we identify and test what drives the opportunistic behavior of the entrepreneurial individual? Do situational perceptions of competence and control influence opportunity identification and thus risky behavior? Does personality significantly influence on opportunistic behavior?

Research Objectives

This study intends to determine whether differences in risk taking can result from situational optimism in addition to any global propensity to take risks. Situational perceptions of opportunity and/or threat are central to perceived optimism. Underlying perceptions of optimism are situational perceptions of competence.

Overview of the Design

This study employs an experimental economics approach to study the influence of differences in perceived self-efficacy. Bogus performance feedback provided separately on
each of the two risky exercises manipulated perceived self-efficacy. Thus, the study uses reinforcement on the decision, not the stimulus. The design randomly assigned subjects to different feedback conditions. It was predicted that changes in self-efficacy will influence changes in perceptions of opportunity and threat. Changes in perceptions will in turn influence changes in risk taking.

The experiment also measures selected personality traits related to risk taking. These tested for direct and indirect effects on perceptions and risky behavior. Finally, the design includes manipulation and validity checks.

To reduce the possibility of identifying spurious relationships, causal ('path') analysis was employed.

Introduction

The essence of entrepreneurship and entrepreneur-like behavior is opportunity recognition. Innovative individuals such as entrepreneurs measure the risks of their actions differently. They see more situations as opportunities than as threats (Olson, 1986; Stevenson and Gumpert, 1985). The risk of missing a significant opportunity outweighs the risk of trying and failing.

However, this observation begs an important question. Why do entrepreneurial individuals see opportunities where others do not? Why do they see opportunities to seize where others may only see risks to take? As individuals operate
under bounded rationality, they must interpret limited information to make decisions (e.g., March and Simon) and contextual cues influence their interpretations (e.g., Kahneman and Tversky, 1969).

Better understanding what perceptions underlie optimism will help us to better understand the entrepreneur. Virtually all entrepreneurship research studies new venture initiation and its consequences. More extensive research is clearly needed on the antecedents of new venture initiation.

Despite the consistently disappointing efforts to demonstrate the risk taking propensities of entrepreneurs (Brockhaus, 1987), research efforts continue. New ventures are clearly a very risky proposition. Therefore, entrepreneurs 'obviously' must be risk takers. The evidence of entrepreneurial optimism explains why measuring risk taking propensities has proven fruitless. Whether entrepreneurs have a significant propensity to take risks is basically irrelevant to the process of new venture formation. Optimists may take risks, but perceive those risks very differently. They perceive the situation as an opportunity to seize, not as a risk to take. Risk takers, on the other hand, perceive the riskiness; indeed, they prefer it. This compels us to examine the scattered streams of research on optimism and apply them to the empirical evidence on entrepreneurial optimism. From there we can
propose and test several hypotheses about the antecedents of optimism and opportunity recognition.

Three different research studies demonstrate the remarkable extent of entrepreneurial optimism (Buckeye, 1984; Cooper, Dunkelberg and Woo, 1987; Shapero, 1984). Each study found that despite a seemingly very risky activity, entrepreneurs perceived surprisingly little riskiness. Each study found this optimism to be independent of other variables which were expected correlates (education, experience, etc.) The breadth of this optimism is in itself a remarkable finding. However, the studies produced only tantalizing hints about the underpinnings of this optimism. This research attempts to identify the general antecedents of optimism and apply them to the specific case of entrepreneurial optimism. In short, one must conclude that optimism is an integral part of the process of opportunity recognition and opportunistic behavior.

Let us first characterize what the labels 'opportunity' and 'threat' mean. Opportunities are positive situations (involving probable gain) under relatively controllable circumstances. Threats are negative situations (involving probable loss) under relatively uncontrollable circumstances (Dutton and Jackson, 1987). As we shall see, controllability is the key word.

A close review of the appropriate literatures finds no dominant consensus model of optimism and pessimism. However,
a considerable body of theoretical and empirical knowledge about optimism exists in economic as well as psychological research. It appears that the concept of optimism does indeed shed light on the nature of entrepreneurial optimism. The research on risk perceptions and risk taking is particularly instructive in suggesting possible antecedents of optimism. The optimism construct may also explain much of the inconclusive literature on entrepreneurial risk-taking. It might also provide insights into the mixed findings on the so-called 'entrepreneurial personality.'

EVIDENCE OF ENTREPRENEURIAL OPTIMISM

The actual failure rate of new businesses is probably overstated (Shapero and Giglierano, 1982). Nonetheless, one must still objectively view the creation of a new venture as a risky proposition (Aldrich and Auster, 1986). Managers of smaller and newer firms take more risks (Aiginger, 1986; MacCrimmon and Wehrung, 1986). Also, entrepreneurs self-report as risk takers significantly more than managers (MacCrimmon and Wehrung, 1986; Sexton and Bowman, 1986). Yet, three different studies using different methods on different samples each found the same unequivocal result. Founders of new ventures have a strong tendency to rate the riskiness of their new ventures as surprisingly low.
Buckeye (1984) used in-depth structured interviews with the founders of new educational software firms. She found that none of her subjects believed that their ventures were very risky. Her subjects advanced two important rationales. First, they instead expressed belief in their own abilities. Second, they reported a focus on the opportunities, not on the risks. They appear to attribute success to their effort and skills; failure would result from external risks. Interestingly, subsequent company performance was positively related to the founders' prior optimism.

Shapero (1984) used structured interviews with 150 self-reported entrepreneurs across a wide range of businesses. His subjects founded their businesses over a wide range of time. He too found a clear bias toward optimism regarding the venture. In answer to the question, "At the time you started your business, how risky did you think your venture was?", the majority viewed their ventures as not very risky. However, they seemed well aware of the risks, though not with the riskiness. Shapero's entrepreneurs expressed belief not that they can beat the odds, but rather that they can change the odds.

Shapero included a wide range of other questions relating to venture formation. However, there were few correlations between risk assessment and other variables. Moreover, subjects appeared to have defined 'risky' diversely. Subjects volunteered comments that they felt in
control of the situation. More interestingly, several felt that the real risk was the risk of missing out on an attractive opportunity.

Cooper, Dunkelberg and Woo (1988) surveyed several thousand new venture founders and once again found a remarkable level of entrepreneurial optimism. They too found that this optimism appears independent of most other variables in their study. They asked subjects their personal expected probability of success. They also asked for their perceptions of the average person's chances of success.

Cooper, et al. (1988) suggest that this optimism results from a form of post hoc rationalization. That is, once committed to a course of action, individuals usually maintain high expectations despite evidence to the contrary. This raises an interesting question. Individuals are typically optimistic about the outcomes of actions to which they have already committed themselves. Commitment is hardly uniform across activities. Thus, even if commitment explains optimism, the evidence of entrepreneurial optimism still argues that opportunistic behavior is primarily situational.

ENTREPRENEURS AS OPPORTUNITY-SEEKERS

There are almost as many definitions of 'entrepreneur' as there are researchers. The one core dimension that appears almost universally is that entrepreneurs seek and
accept opportunities. No matter what literature we examine, we find this recurring theme. In economics, Kirzner (1985) proposes that the critical attribute of entrepreneurs is what he calls 'alertness' to opportunities. Opportunities are everywhere, but not everyone sees them. Shackle (1986) proposes that entrepreneurs have a unique 'imagination' to visualize new opportunities. To perceive an opportunity, one must first be looking for it. The entrepreneur has a bias toward seeking opportunities. This accompanies the entrepreneur's bias toward seeing opportunities in certain situations. Both biases require optimism.

A final point: Kirzner and Shackle emphasize that the tasks facing entrepreneurs operate under conditions of pure uncertainty, not risk. To echo Shapero, entrepreneurs' task is to change the odds, not beat them.

OPTIMISM

Risk Perceptions and Risk Taking

The first point is that individuals perceive risk as something negative. The economics and finance literatures define 'risk' as the variability of the expected returns. This distinction is potentially confusing. Economic 'risk' is a different concept than that used by laypersons.

Control perceptions significantly affect decision making (Cohen, 1960). There are risks in any uncertain
situation; the existence of risks, however, is not the same thing as riskiness. Any situation presents potential negatives; riskiness has to do with the consequences of those negatives. Perceived riskiness is then a function of (1) what potential negatives individuals see and (2) what consequences they foresee. The level of perceived riskiness arises from the identified consequences of the recognized problems. Some problems are real, some are imagined; however, the consequences depend greatly upon one's ability to influence them. Perceived consequences depend greatly with self-confidence in that ability. Thus, risk perceptions are idiosyncratic. 'Actual' riskiness is a meaningless concept outside of actuarial populations or trivial cases such as a coin flip (Slovic, et al., 1984). Risk taking is thus largely a function of perceived riskiness.

Most research on risky behavior ignores the implications of risk perceptions. Instead, it focuses upon risk taking under conditions of chance. Few have investigated the taking of skill-type risks, that is, risks taken where control is perceived to change the outcome likelihoods. As Shapero noted for entrepreneurs, the concern is not with a perception of beating the odds but with changing the odds. A situation that requires skill rather than luck creates self-perceptions of self-efficacy. Conversely, self-efficacy creates the perception that a situation entails skill, not luck.
Identifying a situation as an 'opportunity' does not necessarily imply that the decision maker perceives little riskiness. Opportunities require the potential for significant rewards. Indeed, one possible definition of 'opportunity' is that the decision maker perceives a risk of "missing the boat" (Dickson and Giglierano, 1986). That is, the decision maker chooses to focus on the potential reward and the opportunity cost of not venturing. The decision maker chooses not to focus on the risks of venturing and failing. This focus is not risk taking, this is optimism. A focus on the potential rewards is optimism.

As noted, opportunity recognition is central to the entrepreneur (Kirzner, 1985; Olson, 1986; Stevenson and Gumpert, 1985). The decision to launch a new venture includes a wide array of potential influences on that decision. However, the last step of the process is recognizing and accepting the opportunity (Shapero, 1982; Martin, 1985). The venture has to be perceived not only as desirable but also as feasible. All the other influences must ultimately work through opportunity recognition.

Opportunity recognition is central to the entrepreneur; optimism is central to opportunity recognition. Is it surprising that entrepreneurs exhibit such optimism about their new ventures? More evidence is available from what researchers know about optimism and pessimism.
Psychological Optimism

Psychology tends to view measures of 'optimism' as a general personality trait with the significant exception of perceived self-efficacy. Several constructs are of direct interest but no one measure or construct has gained exclusive title to 'optimism' per se. Also, the variety of constructs can be confusing. For instance, distinctions between 'control' and 'competence' are not always evident to the casual reader.

The central theme in optimism studies is that optimists view situations as being relatively under control. Control perceptions research falls into three overlapping camps.

(1) Perceived control: focus on global judgments of control.
(2) Attribution theories: focus on causal attributions.
(3) Perceived self-efficacy: focus on perceived competence.

Perceived Control

Humans have a natural bias to seek control and thus find confirming evidence of having control, whether real or illusory (Langer, 1983). Langer would define optimism as the healthy (even if unsubstantiated) belief in having a global sense of control over personal events. In most situations, the illusion is normal and useful for much of one's daily functioning. One learns how much control one has in a
situation by mastering salient behaviors. A perception that successful behaviors result from one's own efforts leads to a general perception of control (even if illusory).

Causal Attributions

Attribution theory extends control perceptions to include a broader range of attributions about the nature of causal relationships. Research tends to focus on global measures of causal attributions. Individuals have a dominant attributional style (Weiner, 1985). This model asserts that an optimistic style of causal attributions is psychologically healthy. Pessimistic attributions about causal relationships are deemed unhealthy.

Research also shows that attributional styles can dramatically differ across situations (Weiner, 1985). One of the few studies of attributions in specific situations found that optimistic attributions significantly predict success in sales (Seligman and Schulman, 1987).

Psychologically healthy optimists tend to perceive that the locus of causality for favored outcomes is internal. They also perceive the relationship to be controllable. Negative outcomes are perceived as externally caused and uncontrollable. Pessimists have the exactly opposite pattern of perceptions.

MacCrimmon and Wehrung's (1986) massive empirical study of managerial risk taking suggests that one cannot
completely ignore the possible influence of personality variables (e.g., optimism relates to the subject's desire for control which varies across situations). Taking the less certain alternative reflects a desire to exert control, to change the odds (instead of simply accepting the odds).

The variability of attributional style implies that one learns a particular attributional style. One might learn relative optimism in one setting and relative pessimism in another. Thus, optimism research should consider situational as well as global influences.

**Perceived Self-Efficacy**

Bandura's concept of perceived self-efficacy (Bandura, 1977) has demonstrated great explanatory and predictive power (Bandura, 1986). Self-efficacy is essentially a quantitative self-estimate of an individual's competence at a particular task. Given a number of similar tasks, subjects are asked how many they can complete successfully within a given time. While usually measured in a highly specific context, perceived self-efficacy appears to generalize to other situations. Bandura further asserts that perceived self-efficacy is the key element to perceived control. Thus it would be the single best measure of optimism. Bandura points out that it is also the best known predictor of future performance (even better than past performance). It is difficult to envision having control over a situation
without having some competence. However, attributional measures do provide more richness and insight into the antecedents of control perceptions. Nonetheless, this study will seek to avoid confusion by referring to 'perceived self-efficacy' or 'perceived competence.'

**Optimism versus Entrepreneurial Optimism**

The above overview of optimism research raises points echoed by respondents to the three entrepreneurial optimism studies. Table 1 compares the key points of the optimism literatures with responses from the entrepreneurial optimism research. Entrepreneurial optimism studies strongly suggest that situational optimism, not risk taking, is critical to the opportunistic behavior of the entrepreneur.

Note that Buckeye's subjects (1984) expressed confidence in their abilities. They perceived themselves as having control and self-efficacy in the new venture. They also claimed to focus on the opportunity, a condition where optimism is usually a prerequisite. Shapero's subjects (1984) also perceived themselves as having control. The incidence of being willing to try again if their businesses failed reflects perceived stability (and perhaps globality) in their causal attributions. References to missing an opportunity reflect a focus on prospective gains not losses, evidence of optimism. Cooper, et al.'s subjects (1988) clearly perceived self-efficacy at their new ventures. The
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<td><strong>PERCEIVED CONTROL</strong></td>
<td>Subjects reported confidence in their abilities to handle the new venture. They perceived very little risk.</td>
<td>Subjects explicitly volunteered perceptions of control. Perceived risk, on average, was low.</td>
<td>Subjects were not asked about control perceptions. The difference between self-efficacy and the efficacy of others serves as proxy. Control (relative to others) perceived as high.</td>
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<td><strong>RISK ORIENTATION</strong></td>
<td>Subjects reported a focus on the opportunity, not on the risks.</td>
<td>Subjects volunteered perceptions of the risk of missing a significant opportunity.</td>
<td>Subjects not asked.</td>
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<td><strong>PERCEIVED SELF-EFFICACY</strong></td>
<td>No estimate made.</td>
<td>Subjects provided estimated odds of success. These averaged well above even the most optimistic failure rates.</td>
<td>Subjects estimated their probability of the venture's success. Average estimates of success probability likely reflect high perceived self-efficacy.</td>
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Figure 1. Optimism versus Entrepreneurial Optimism
differential between their own perceived efficacy and the efficacy of others is yet another measure of perceived control. It also cleverly does so without explicitly asking for control perceptions.

None of these studies necessarily intended to specifically and primarily study optimism or opportunity recognition. However, they offer powerful testimony that (1) optimism is a prime candidate for explaining entrepreneurial behavior and (2) we need to understand what underlies situational optimism.

CONCLUSIONS

Entrepreneurs display remarkable optimism regarding their own new ventures. Psychological and economic models of optimism provide a deeper level of understanding of this entrepreneurial optimism. One can now better understand how entrepreneurs can objectively take such risks, yet subjectively see little riskiness. Research has long investigated entrepreneurs' risk taking propensities. The emphasis should have been on their optimism. Research should focus on how entrepreneurs recognize opportunities. How do situational and personality factors influence their decision to accept the opportunity of a new venture? This research is a first step toward turning researchers' attention in the direction of the many facets of optimism.
2.1 OPPORTUNITY IDENTIFICATION AND RECOGNITION

The popular conception of entrepreneurs and other innovators is that of swashbuckling risk takers. This conception ignores the extensive evidence that entrepreneurs do not exhibit any meaningful disposition toward risk taking. Instead, research strongly suggests that entrepreneurs are optimists: they view their ventures as opportunities, not as risks. Perhaps because of this popular conception, research is virtually absent on how individuals recognize opportunities.

One study found that entrepreneurs come to identify a venture idea as a significant opportunity through a process of researching and planning the venture. The process itself can increase the attractiveness of the opportunity (Long and McMullan, 1984).

However, this approach requires either reliance on the possibly biased memories of subjects or on extensive
longitudinal interviewing. Researchers need to find alternative methods for exploring the antecedents of opportunistic behavior.

STRATEGIC ISSUE CATEGORIZATION

Strategic issue categorization theory (Dutton and Jackson, 1987) explicitly assumes that managers interpret their environments. This grows out of a literature which assumes that managers operate under limited information and thus tend to use heuristics in decision making (e.g., March and Simon's "bounded rationality" and Weick's "enacted environment"). They tend to label strategic issues in a situation as either 'opportunities' or 'threats.' Having made this attribution, strategic behavior and the associated strategic decision making processes should significantly differ between 'opportunities' and 'threats.' The label 'opportunity' is associated with situations which Dutton and Jackson describe as positive in nature, involve a probable gain, and reflect relatively controllable circumstances. Conversely, the label 'threat' is associated with situations involving expected losses, relative noncontrollability and otherwise negative circumstances. The theory focuses on the consequences of this categorization (Dutton and Jackson, 1987). The antecedents of this categorization are not well-
understood. The scarce empirical research also focuses on consequences (e.g., Sullivan and Nonaka, 1988).

Organizations tend to act most opportunistically (defined as taking above-average risks) under two circumstances. (1) When they could most afford it (under benign circumstances such as high levels of slack) (Singh, 1986). (2) When opportunity costs are low: times are bad and they had nothing to lose (Bowman, 1984). Either way, organizational risk taking increases (is more opportunistic) as perceived risks decrease. Risk perceptions can vary widely within an industry and between insiders and outsiders (Baird and Thomas, 1985).

Dispositional characteristics are associated with opportunity recognition. Opportunistic strategic behavior has been related to top managers' internal locus of control (Gilad, 1981; Miller, et al., 1982). Similarly, entrepreneurs are characterized as having a strong control beliefs (e.g., Brockhaus, 1987). If a general disposition such as locus of control significantly predicts a general opportunistic behavior, then a more situational measure should demonstrate even better predictive power in that given situation.

Entrepreneurial biases toward seeing opportunities should be even stronger at the situational level.
OPPORTUNITY RECOGNITION

Identifying a situation as an 'opportunity' does not necessarily imply that the decision maker perceives little riskiness. Opportunities obviously require the potential for significant rewards. Entrepreneurial decision makers may see the same risk of loss but entirely different risks of missing an opportunity. They may see a great risk of loss, but an even larger risk of 'missing the boat' on an attractive opportunity (Dickson and Giglierano, 1986). Decision makers clearly trade off risks and rewards (e.g., Nygren, 1977). Focusing on the rewards (or 'missing the boat' risk) is optimism (not risk seeking) and appears based on perceived self-efficacy. Opportunity recognition is central to the entrepreneurial process (Stevenson and Gumpert, 1985). Entrepreneurs must perceive new ventures as desirable and as feasible (Shapero, 1984). Entrepreneurs (like managers) will change strategic behavior based on their labelling of situations as 'opportunities' or 'threats' (Dutton and Jackson, 1987).

RISKY BEHAVIOR versus OPPORTUNISTIC BEHAVIOR

Accepting an opportunity patently requires accepting some risk (at least from an objective standpoint). Thus much of the extensive research on risky behavior is applicable
to research on opportunity recognition. Accepting a risk need not imply recognizing that risk. The risk-accepter may recognize only the opportunity. Uncertainty need not be perceived as a threat. Any study of opportunistic behavior should carefully examine the antecedents of risky behavior. Risk taking has been studied widely and in many contexts. A comprehensive review thus needs segmenting along the broad lines drawn by the various dominant schools of thought. There are four primary approaches to understanding why people take risks.

First, one can hypothesize that risk taking behavior results from individual differences. Economic theory also suggests that risk taking is rational based on an individual's utility curve for money. It may also result from personality characteristics. The 'risk taking personality' is reviewed below.

Second, one can hypothesize that risk taking is a cognitive artifact of the content and presentation of decision-relevant information. Biases induced by the limits of human information processing often present circumstances where decision makers perceive risk taking as rational. 'Behavioral decision theory' is reviewed below.

Third, risk taking can depend on perceived risk. Individuals can vary widely in their perceptions of the riskiness of a given situation.
Finally, one can hypothesize that risk taking results from contextual forces. Risk taking will vary depending on the degree of perceived control over the decision situation. This research attempts to demonstrate that situational perceptions of competence (i.e., perceived self-efficacy) significantly influences perceptions of opportunity and threat. These in turn will significantly influence risky behavior.

The next section discusses aspects of entrepreneurship research which help shed light on the entrepreneur-like orientation toward opportunity.

DEFINITIONS and MODELS of ENTREPRENEURSHIP

The Entrepreneur as Risk Taker

Entrepreneurs typically report themselves as above-average risk-takers (MacCrimmon and Wehrung, 1986; Sexton and Bowman, 1986) and that they undertake ventures that are above-average risks (Aiginger, 1986; MacCrimmon and Wehrung, 1986). Still, they perceive little risk of loss in what is objectively an extremely risky undertaking.
Second, despite this remarkable optimism and risk taking, entrepreneurs simply do not exhibit a psychological propensity to take above-average risks (Brockhaus, 1987; Brockhaus, 1986; Hartley, 1987; Krasner, et al., 1987; Ray, 1986; Unni, 1987). Regardless of methodology, these avid risk seekers do not exhibit a risk taking personality.

On the other hand, it is often claimed that entrepreneurs should act like everyone else on standard risk-aversion tests which mostly measure uncontrollable risks (Brockhaus, 1987; Peacock, 1986). However, these measures touch only a small part of how humans make decisions under uncertainty. Risk perceptions are subjective and depend upon the specific situation.

Thus we find that entrepreneurs typically exhibit a remarkable optimism about their own ventures, fully independent of the clear and present risks they see in a new venture (e.g., Buckeye, 1984; Cooper, et al., 1988; Shapero, 1984). As discussed in Chapter 1, this optimism strongly suggests a need for greater research on this topic.

The literature on entrepreneurship and the entrepreneur provides little guidance for this research. An orientation toward opportunity is accepted as the 'heart' of entrepreneurship. Yet, little research addresses opportunity recognition (Stevenson and Gumpert, 1985). Existing models of entrepreneurship do provide clues about the antecedents of risk taking and opportunity seeking.
What exactly is an 'entrepreneur'? Are entrepreneurs risk takers? Instead are they opportunity seekers? There is little closure on a rigorous definition of 'entrepreneur' which pleases everyone. Kilby (1971) compares the entrepreneur to the Heffalump from the Winnie-the-Pooh stories. Nobody ever actually saw a Heffalump, so they looked around and whatever they found they deemed a Heffalump. The entrepreneur is such a beast. Whatever entrepreneurship researchers studied seemed to get called an "entrepreneur." This lack of consensus extends to the relationship, if any, between entrepreneurs and risk bearing. If entrepreneurial behavior does entail risk bearing, then what kinds of risks do entrepreneurs bear? Or, does it make more sense to focus on entrepreneurial opportunism? The section below synopsizes economic and behavioral models of entrepreneurship and two models of the decision to start a new venture. The discussion will focus on the role of opportunistic (and apparent risk taking) behavior in entrepreneurship.

**ECONOMIC MODELS OF ENTREPRENEURSHIP**

Economists disagree on whether entrepreneurs have a functional role as risk bearers. Table 1 demonstrates the lack of consensus among economists. At least they implicitly agree that entrepreneurship and opportunistic behavior go hand in
hand. As we shall see, 'opportunity' is the focal point of most economic models of entrepreneurship. The first appearance of the entrepreneur in economic writings was in Cantillon in the 1700's (in Hebert and Link, 1982). Cantillon defined the entrepreneur as the "bearer of uninsurable risk." Uninsurable risk is pure uncertainty. An insurable risk can become (with insurance) a certainty. Adam Smith (in Hebert and Link, 1982) viewed the entrepreneur as an opportunity-seizing organizer who did not necessarily bear any financial risk. More recently, Schumpeter (1936) argued that the entrepreneurial function was completely separate from risk-bearing. It made more sense to focus on the process of entrepreneurship rather than entrepreneurial individuals. Schumpeter argued that economic profit is a return to entrepreneurship, a widely shared view. Schumpeter's work is critical to understanding entrepreneurship. However, he says little about opportunities.

This century has seen several economists who provide insights into entrepreneurial risk perceptions. Knight (1921) originally made the distinction between 'risk' and 'uncertainty.' In risky situations one knows the probabilities of various outcomes. In uncertain situations one lacks even that information. Knight saw the entrepreneur as the bearer of uncertainty. Foreshadowing Schumpeter, economic profit was the reward for accepting uncertainty. The rise of the von Neumann-Morgenstern paradigm of rational economic humans maximizing their expected utilities supplanted Knight's
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Table 1. Economic Theories of Entrepreneurship

<table>
<thead>
<tr>
<th>AUTHOR</th>
<th>Entrepreneur Bears Risk?</th>
<th>Key Attribute/Role of Entrepreneur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cantillon (1794)</td>
<td>uninsurable risk</td>
<td>bearing that uninsurable risk</td>
</tr>
<tr>
<td>Adam Smith (1776)</td>
<td>yes</td>
<td>planning/organizing</td>
</tr>
<tr>
<td>Knight (1921)</td>
<td>moral hazard only</td>
<td>reaper of economic profits</td>
</tr>
<tr>
<td>Schumpeter (1936)</td>
<td>not necessary</td>
<td>agent of creative destruction</td>
</tr>
<tr>
<td>Shackle (1984)</td>
<td>cognitive risks</td>
<td>&quot;imagination&quot; to see new opportunities</td>
</tr>
<tr>
<td>Kirzner (1986)</td>
<td>N/A</td>
<td>&quot;alertness&quot; to existing opportunities</td>
</tr>
</tbody>
</table>

*(pertaining to risk-bearing and/or opportunity recognition)*
information-based conception. The von Neumann-Morgenstern framework renders the distinction between risk and uncertainty operationally meaningless (Arrow, 1973). Knight and later Barzel (1981) reconceptualized Cantillon's conception of uninsurable risks as 'moral hazard.' Moral hazards are risks which one cannot trade off or hedge. Either one accepts them or not. Accepting moral hazard requires the expectation of additional profits.

Two current approaches are useful here. These present 'alertness' and 'imagination' as pivotal functional roles for entrepreneurs. Entrepreneurs are 'alert' to opportunities and take advantage of them (Kirzner, 1985). They discover opportunities in the inefficiencies of markets, where markets are incomplete or distorted. A student of Kirzner found that an internal locus of control led to greater entrepreneurial alertness. This in turn led to more entrepreneurial behavior (Gilad, 1981).

On the other hand, the ability to 'imagine' opportunities is also a key characteristic of the entrepreneur. The opportunities that entrepreneurs see are 'new,' never before seen and acted upon. To Shackle (like Schumpeter) the entrepreneur is a disequilibrating force. Kirzner's entrepreneur is a pro-equilibrating factor in the economy. For both Kirzner and Shackle, though, the entrepreneur sees the opportunity, not the risk. In fact, Kirzner's definition of entrepreneurial alertness is reasonably analogous to Dickson
and Gigliero's risk of 'missing the boat.' In either case, entrepreneurs do not accept opportunities which they feel incapable of exploiting.

Thus, in the absence of competence perceptions, there can be no opportunity perceptions. Perceived self-efficacy is necessary to perceived opportunity.

Economic models are less adept at including cognitive processes and less prone to do so. We need models which more explicitly consider perceptions. Thus we turn to behavioral models of entrepreneurship.

BEHAVIORAL MODELS of ENTREPRENEURSHIP

Personality-Based Models: The psychological and sociological literatures on entrepreneurship offer even less consensus on a definition of the entrepreneur. Several models do consider risk perceptions and risk-taking. Again, however, relatively little research discusses opportunity-seeking. One early model asserts that a high need for achievement (nAch) characterizes the entrepreneurial personality. Individuals with high nAch should prefer to take moderate risks (i.e., acceptable opportunities). Entrepreneurs exhibit high nAch, thus entrepreneurs should prefer moderate risks. However, most people prefer moderate risks (Brockhaus, 1980). Moreover, nAch does not discriminate between entrepreneurs and managers.
Successful entrepreneurs share many characteristics with successful managers (Sexton and Bowman, 1985). Entrepreneurs also possess a configuration of additional characteristics which differentiate the entrepreneurial from the non-entrepreneurial. Thus, a disposition such as need for achievement may be necessary to characterize the successful entrepreneur but hardly sufficient. Upper echelon theory suggests that personality plays more of a moderating role rather than a direct influence (Hambrick and Mason, 1985). Ambiguity tolerant managers may not necessarily prefer more risk taking. They may simply be better at it (Govindarajan, 1985). Similarly, managers with an internal locus of control may be better at aggressive strategies (Miller, et al., 1983).

Taxonomies: Behavioral models provide a taxonomy or continuum of entrepreneurial types (see Table 2). Opportunistic behavior differs among the types. The best known distinction is Smith's dichotomy of 'craftsperson' and 'opportunist' entrepreneurs (Smith and Miner, 1984). Smith's 'opportunist' parallels the entrepreneur described by Kirzner and Shackle. The craftsperson is entrepreneurial primarily for the sake of being self-employed. As the name suggests, the opportunist seeks opportunities while the craftsperson seeks independence. Opportunists should more likely perceive self-efficacy at a new venture and thus may perceive less risk.
Researchers increasingly distinguish truly entrepreneurial individuals as a particular managerial type. The 'small businessperson' is a manager who just happens to own and operate a small or new enterprise. True entrepreneurs are growth-oriented, future-oriented and manage strategically (Carland, Hoy, Boulton and Carland, 1984). To grow and look to the future implies a strong focus on new opportunities. This particular approach provides a definition of entrepreneurs which clearly distinguishes them from managers of 'mom and pop' enterprises (Sexton and Bowman, 1986). Stevenson and Gumpert (1985) assert a distinction between entrepreneurial 'promoters' and bureaucratic 'trustees' explicitly based on their orientation toward opportunities. At one extreme, the promoter has a total orientation toward exploiting new opportunities. The trustee has a total orientation toward threat avoidance. Both might be highly self-efficacious in their own domains, but the promoter would have higher self-efficacy for starting a venture.

MODELS of the ENTREPRENEURIAL DECISION

Starting a new venture is the quintessential example of accepting an opportunity. It is important, then, to examine the two major models of how new ventures happen. At
Table 2. Behavioral Models of Entrepreneurship

<table>
<thead>
<tr>
<th>AUTHOR(S)</th>
<th>Entrepreneurial Archetypes</th>
<th>Key Attribute/Role(s) of Entrepreneurial Archetypes*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collins, et al.; (1964)</td>
<td>CRAFTSPERSON</td>
<td>&quot;Craft&quot; oriented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In this business to support lifestyle</td>
</tr>
<tr>
<td>Smith and Miner; (1984)</td>
<td>OPPORTUNIST</td>
<td>Business-oriented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In &quot;the business of being in business&quot;</td>
</tr>
<tr>
<td>Stanworth, Curran (1979)</td>
<td>&quot;ENTREPRENEUR&quot;</td>
<td>Future-oriented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Strategically Managing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Growth-Oriented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Driving force behind an emerging enterprise</td>
</tr>
<tr>
<td>Carland, et al. (1984)</td>
<td>&quot;SMALL BUSINESSPERSON&quot;</td>
<td>Not Growth-Oriented</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not managing an emerging enterprise</td>
</tr>
<tr>
<td>Sexton and Bowman (1986)</td>
<td>PROMOTER</td>
<td>Oriented to seek opportunities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accepts reasonable risks</td>
</tr>
<tr>
<td>Stevenson and Gumpert (1985)</td>
<td>TRUSTEE</td>
<td>Oriented to avoid threats</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seeks risk reduction</td>
</tr>
</tbody>
</table>

*(relevant to risk-bearing and/or opportunity recognition)
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UMI
Figure 2. Shapero Model of the Entrepreneurial Event
the core of both models is the recognition of a seemingly viable opportunity. Shapero (1982) provides the first comprehensive model (see Figure 2) of the 'entrepreneurial event,' the decision to create an organization. His model has four components:

1. a predisposition to act, to take initiative
2. a perception that the venture is feasible
3. a perception that the venture is desirable
4. a displacing event which triggers the action

The model has considerable intuitive appeal. No research has specifically tested this model as yet. The feasibility perception largely centers on the belief that the entrepreneur has the capabilities to successfully launch the venture (perceived competence). That is, those perceived capabilities greatly improve the perceived chances of the venture succeeding. The desirability perception encompasses the attractiveness of the venture opportunity. Survey evidence from Shapero (1984) and Cooper, et al. (1988) and interview data from Buckeye (1984) provide valuable insights. Entrepreneurs focus on the opportunity and they appear to have strong self-efficacy beliefs.

Martin (1984) extends the Shapero model to explicitly include a broader number of contributing factors (Figure 3).
Identification of Venture Opportunity

Social "Push":
Immigrant or member of entrepreneurial minority

Precipitating Event:
positive or negative trigger

Psychological Predisposition:
high nAch, ambiguity tolerance, etc.

Free-Choice Period:
perception of having freedom to act

Demonstration Effects:
Incubators, mentors, role models

Family:
supportive or not tied down

Financial Support:
personal/family $, friends/private $, banks/trade credit

Supportive Environment:
education/cultural, services (legal/CPA), governments, etc.

Figure 3. Martin's Model of New Venture Initiation
A new venture's likelihood depends on some unspecified combination of these factors. Central to Martin's model is the identification of the specific venture idea as a valid, attractive opportunity. Prospective entrepreneurs must believe that they are capable of exploiting the opportunity. Identifying a situation as an opportunity involves identifying it as controllable. One common mechanism is a convincing feasibility study or strategic business plan.

Both Shapero's model and Martin's extension provide more general insights into the antecedents of opportunistic behavior. Neither model has seen explicit testing. However, this research should evidence regarding their validity. For either model, we can experimentally increase controllability (i.e., self-efficacy) beliefs. This should increase the perception of opportunity (and decrease the perception of threat). If self-efficacy perceptions affect opportunistic behavior directly (instead of operating through opportunity and/or threat perceptions) then these models may have to be rejected or significantly revised.

Such findings will advance entrepreneurship theory and provide support for the Shapero and Martin process-type models.

Understanding why many entrepreneurs view their actions as opportunistic, not risky, will add to the very definition of that elusive Heffalump, the entrepreneur.
DEFINING AND MEASURING RISK

Since opportunistic behavior is, by definition, risky behavior, there is considerable value in exploring existing research into risk and risk taking. Definitions and measures of risk taking depend on definitions and measures of 'risk.' The many different conceptualizations of the term vary in the dimensions of the respective definitions. The overall 'riskiness' of a given decision is usually multidimensional. Even something as highly structured as playing blackjack in a casino has consequences beyond the mere winning or losing of money. Playing cards is fun and gives a social payoff. Winning may bring prestige and a sense of mastery. Losing may bring sympathy and a sense of lost mastery. Thus, riskiness (let alone perceived riskiness) could dramatically differ for each decision and for each dimension of that decision.

Similarly, entrepreneurial risk perceptions could have multiple dimensions: the risk of social embarrassment might outweigh the risk of financial loss.
The subjectiveness of perceived riskiness compels us to also examine 'opportunity.' How do researchers measure opportunistic behavior? Two ways seem appropriate. First, apparent risk taking behavior is prima facie evidence that someone has perceived and accepted an opportunity. ('Apparent' is in the eyes of relatively objective third parties.) Second, researchers can measure the subjects' perceived risk of missing an opportunity (Dickson and Giglierano's 'missing the boat' risk). Thus, risk taking behavior depends more strongly on perceived 'missing the boat' risk than on the objective riskiness. Finally and most directly, to knowingly accept an opportunity by definition requires perceiving the situation as a significant opportunity.

The two major schools of thought in the definition of risk are economic and behavioral. Both start with the premise that risk is unavoidably connected with decision making. Without choice, risk is a meaningless concept. More importantly, it is crucial to distinguish between 'risks' and 'riskiness.' 'Risks' are the hazards themselves, real or perceived. 'Riskiness' is the perceived potential consequences of those hazards and their probability of occurrence. Economic models tend to uniformly map consequences directly onto hazards. 'Risk' is defined very differently in psychology than in economics.
Behavioral models suggest a more complex, subjective relationship. To the economist, risk is simply the uncertainty associated with a given expected financial return. Psychologists note that humans appear to recognize four basic kinds of risk and perceive 'risk' as the potential for negative consequences. The core dimensions of risk are: physical, social, personal and financial (MacCrimmon and Wehrung, 1986; Jackson, et al., 1972). Thus, the perceived risk of new ventures includes more than perceived financial risk. It includes the perceived risks to social status and to personal psychological well-being.

The financial and economic literatures define 'risk' as the variability of returns (MacCrimmon and Wehrung, 1986). Expected utility maximization theory assumes that human rationality equals maximizing expected utility. Ceteris paribus, individuals tend to prefer less risk to more. Thus, risk-aversion is rational but individuals vary in risk-aversion. Economists employ the Arrow-Pratt coefficient (Arrow, 1973), the decision maker's general attitude toward risk. This measure of risk aversion is a function of subjects' utility curves for wealth. Again, though, 'risk' is variability, not negative consequences.

The underlying assumption of 'rationality' does not hold up well. Maximizing expected utility is an intuitively pleasing concept, but it is not consistently predictive. The economic model does accept subjective probabilities.
However, subjective elements and the cognitive processes behind them are inherently secondary to the model. Behavioral models focus on the formation of individuals' perceptions of risk and return. A review of the literature on perceived riskiness yields four consistent conclusions.

(1) Risk is in the eye of the beholder.
(2) Risk is multidimensional.
(3) Perceived risk is measurable and predictable.
(4) Decision makers trade off expected returns and risks

(Slovic, et al., 1984; see also Nygren, 1977).

Perceived riskiness influences risky behavior more than the objective risk. However, differences in perceived risk are insufficient to explain differences in actual behavior (Slovic, 1964). Tradeoffs between expected risk and expected return explain risky choices better than the utility maximization model. However, there were large individual differences between subjects in terms of the perceived risk and attractiveness of gambles. Perceived risk was also independent of attractiveness (Nygren, 1977). Decision makers might view a gamble as highly risky yet even more highly attractive. Thus, perceived risk explains risky behavior better than objective risk. However, perceived risk
Figure 4. Antecedents of Perceived Riskiness

Authors: Slovic et al. (1984):
- RISK (measurable riskiness)
  - Perceived Risk
  - CONCERN (unmeasurable riskiness):
    - Unobservability
    - Unfamiliarity
    - Novelty

Vlek and Stallen (1982):
- Perceived Risk:
  - Controllability
    - Size of possible loss
  - Acceptability of Risk:
    - Potential Beneficiality
    - Perceived Risk

Subdimensions:
- Uncontrollability
  - Globality
  - Inequity
  - Involuntariness
  - Irreducibility
  - Personal Impact
  - Rate of Increase
  - Negative Affect (e.g., fear)

Unknownness:
- Unobservability
- Unfamiliarity
- Novelty

Dread:
- Involuntariness
- Irreducibility
- Personal Impact
- Rate of Increase
- Negative Affect (e.g., fear)
alone does not fully explain attractiveness. One must conclude that there is something else involved in the process of assessing the acceptability of a risk. The model proposed here suggests that this "something else" is the perception of an opportunity.

The Slovic group (Figure 4) developed a hierarchical model of decision making. Ultimately, individuals trade off the perceived benefits of a choice against its perceived riskiness. Expected riskiness is comprised of actual 'risk' and 'concern'. In most situations, measures of the actual risk prove either unavailable or unreliable. Thus, the crucial element is 'concern,' analogous to pure uncertainty. They empirically demonstrate using factor analysis that 'concern' has two correlated dimensions: 'Unknownness' and 'Dread'. 'Unknown' risk includes cognitive aspects of the degree of uncertainty: unobservability, unfamiliarity, change, and novelty. 'Dread' risk includes more affective attitudes, including aspects of the possible negative consequences of the uncertainty. Components of 'dread' risk are uncontrollability, feelings of dread, globality, inequity, irreducibility, involuntariness, change in the rate of change, and degree of personal impact. In short, uncertainty depends on familiarity and controllability. These variables come from an extensive review of the literature. Parallel theoretical and empirical analyses by
Vlek and Stallen (1980) support these antecedents or correlates of perceived riskiness.

Vlek and Stallen's own empirical multidimensional scaling results (1982) differ only slightly from the Slovic group's (again Figure 4). Vlek and Stallen found that perceived risk of loss had two underlying dimensions: the size of the possible loss and controllability. Controllability reflects the perceived influence the decision maker has on the likelihood of a loss occurring. Acceptability of the risks were a function of the potential benefits and the above two risk dimensions. Thus, risk taking depends on the magnitude of the opportunity and the risk perceived. Perceived risk in turn depends on perceived controllability.

These studies share an interesting similarity. The critical elements of perceived risk are cognitive. Individuals learn to view risky choice situations as more controllable and hence more attractive. One can thus change perceptions of the size and credibility of opportunities. Thus, opportunity recognition entails a cognitive process. It is also clear that perceptions can change and be changed. We can train individuals to recognize opportunities.

In the case of entrepreneurship, this suggests that individuals can be trained to better identify personally relevant entrepreneurial opportunities.
MEASURING RISK TAKING AND PERCEIVED RISK

Risk Taking Measures

The wide variety of available research methodologies share a common assumption that a general propensity to take risks exists and is central. Nonetheless, some methods will apply to the proposed situation-specific model. Two criteria usefully classify existing risk taking measures.

(1) physical methods (measuring actual behavior) versus 'pencil-and-paper' methods (measuring hypothetical behavior)

(2) artificial situations versus natural (real) situations

Table 3 below lists the most frequently used methods classified on these dimensions. For instance, most decision making research uses either 'standard gambles' or 'choice dilemmas.' Both are 'paper-and-pencil' but the gambles provide little or no contextual information (artificial) while the choice dilemmas usually include contextual (i.e., more natural) information (see examples below).
Table 3. Typology of Measures of Risk Taking Propensity

<table>
<thead>
<tr>
<th>Nature of the Decision Context</th>
<th>NATURAL</th>
<th>ARTIFICIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed of Response</td>
<td></td>
<td>Toggle Switch</td>
</tr>
<tr>
<td>Guessing on Tests</td>
<td></td>
<td>Ring Toss</td>
</tr>
<tr>
<td>Biography</td>
<td></td>
<td>Attitude Scales</td>
</tr>
<tr>
<td>Choice Dilemmas</td>
<td></td>
<td>Standard Gambles</td>
</tr>
</tbody>
</table>

Nature of the Risky Activity

PHYSICAL

COGNITIVE
Physical versus Paper and Pencil

'Physical' methods observe actual behavior which presumably captures the subject's propensity to take risks. Underlying is the assumption that some sort of general risk taking propensity exists and will surface in any well-designed measure. Actual managerial risk taking is an example.

'Paper and pencil' methods measure more indirectly. They often better capture the multiple dimensions of risk taking. They try to tap the cognitive processes underlying risky decision making while forgoing the greater face validity of actual behavior. However, face validity is no match for demonstrated external validity.

Artificial versus Natural

'Artificial' situations are experimentally more controllable and thus provide greater explanatory power. Subjects guess which toggle switch will work or whether they can toss a ring over a target. The basic premise is that risk-averse individuals will less likely bet on their own actions than risk-accepting individuals. The opportunity-recognition approach to apparent risk taking would assert that subjects bet on their perceived competence. Subjects would perceive themselves as testing a skill, not necessarily as taking risks. The toggle approach is more
chance-based, the ring toss is skill-based. Therefore, we might expect to observe dramatically different measurements of 'risk taking.'

'Natural' choice situations tap the same general propensity but attempt to measure it at a deeper, richer level. Again, actual risky managerial behavior would fall under here. Also, Eysenck (1986) proposes that risk takers are impulsive. The speed of responding could tell as much as the actual responses.

This study intends to better understand the cognitive processes underlying opportunistic behavior. It tests a richer model which does not require the assumption of a general risk taking propensity.

Artificial choice situations, as above, provide more experimental control. They still typically assume the existence of a general risk taking propensity. Most attitude scales provide subjects the opportunity to self-report their attitudes toward risk taking (e.g., the risk taking scale of the Jackson Personality Inventory). Subjects consistently report less risk-aversion than actual behavior reflects (MacCrimmon and Wehrung, 1986).

Asking subjects to predict coin flips (or wager on them) is most popular in the perceived control literature. The disadvantage of coin flips is one of generalizability. However, the advantage of coin flips is the 'obvious'
randomness of the process. Risk taking is easy to measure. More importantly, the effects of perceived control are equally easy to observe (Langer, 1983). However, the most common measure of this genre is the 'standard gamble' (examples below). Note that gambles can ask for subjects to simply choose between two specified alternatives. Subjects also may be asked to provide a missing piece of information which would render the two choices equivalent (Figure 5 below). Subjects' utility curves for money are calculable from subjects' choices. Such frequency of usage means a large pool of already-validated items to employ in research. This also permits replication of prior research.
Choice Gamble—

Choice A: Receive $100 for certain, or
Choice B: Flip a coin for $0 or ???

What payoff makes you indifferent? [choice mode]

Probability Equivalence Gamble—

OR, Choice A: Receive $100 for certain, or
Choice B: Receive either $0 or $300

What probability of winning do you require?

FIGURE 5: EXAMPLES OF STANDARD GAMBLES

Mr. Chou has a severe heart ailment. He has this choice: (A) he can seriously restrict his lifestyle OR (B) he can undergo a delicate operation which, if successful, would eliminate all restrictions, but, if unsuccessful, would be fatal.

At what probability of success for (B) would you recommend the operation?

FIGURE 6: EXAMPLE OF CHOICE DILEMMA
Natural situations add richness to the risky decisions. Much of the early research employed a biodata approach on the premise that past risk taking would predict future risk taking (Torrance and Ziller, 1957, in MacCrimmon and Wehrung, 1986). The mixed results from this were the first inkling that risk taking propensities did not generalize across situations (Slovic, 1964). The most used cognitive/natural measure is the choice dilemma, popularized by Kogan and Wallach (Figure 6 above). Their Choice Dilemmas Questionnaire (CDQ), despite its flaws, remains the instrument of choice for research into entrepreneurial risk taking propensities.

How one measures risk depends on how one defines or frames it. The measured riskiness of a situation can vary widely according to the measure used, often with little convergence between measures. One can even see a complete reversal of preferences depending on the question format (Grether and Plott, 1979).

Two critical reasons for this is the confounding of results because of differences in the task being observed (situational differences) and the moderating influences of individual differences. The same measures given to samples which differ by age or gender can yield different results (Slovic, 1964).

The very way one frames and presents a question can drastically change the response. One common technique is to
offer two alternatives and simply ask subjects to choose. This is called 'choice' mode. The alternative, 'equivalence' mode, offers the subject two situations and asks what would make them equally desirable. In theory, these should yield identical results, but they rarely do.

MacCrimmon and Wehrung (1986) argue that researchers need a portfolio of risk measures which include different measures to get a complete picture (e.g., a multimethod-multitrait approach). Their results indicated significant effects for the situational (context) differences and some effects driven by individual differences.

Moreover, almost no matter how one defines risk, it is a multidimensional phenomenon. The domain or context of decisions (e.g., business versus personal) provides one critical distinction. MacCrimmon and Wehrung's (1986) battery covers personal and business risk taking over several situations. It has already been extensively tested on managers and entrepreneurs. It also includes a battery of personal characteristics questions (demographics, locus of control, etc.) This allows calculation of several risk-aversion measures. However, it also takes several hours to complete.
ENTREPRENEURSHIP-RELATED MEASUREMENT ISSUES

One problem with the study of risk taking is the weaknesses of the measures. The economics measure (Arrow-Pratt coefficient of risk aversion) depends on the method of calculating utility curves. Behavioral measures have often fallen short as well. The widely-used Choice Dilemmas Questionnaire (Kogan and Wallach, 1964) queries subjects on a wide variety of situations. It only used choice mode, thus it measures utility in only one way. Subjects' familiarity with the situation vary widely across items. Cartwright's review article (1971) highlights these and several other of the CDQ's shortcomings. Cartwright also points out that the real weakness is not an improper measure, but a measure used improperly. Within its intended domain, the CDQ is actually a well-regarded instrument (Peacock, 1986).

The greatest measurement concern is that most research on risky behavior studies risk taking under conditions of chance. Relatively few studies have investigated the taking of skill-type risks, that is, risks taken where decision makers perceive some control over outcomes. The concern is not with beating the odds but with changing the odds. In Knight's terms, entrepreneurs deal with uncertainty, not risk. Perceived uncertainty can be met with perceived skill; perceived riskiness cannot. A situation that requires skill rather than luck creates self-perceptions of competence and
self-efficacy. The reverse should also occur. Self-efficacy, beliefs create a perception that a situation entails skill instead of luck.

Research into entrepreneurial risk taking has used the CDQ almost exclusively. The Brockhaus studies (1980) of the risk taking propensities of entrepreneurs used the CDQ for lack of a better instrument (and for comparability). The entrepreneurial sample differed little from the general population. More recently, Krasner and others (1987; Ray, 1986; Hartley, 1987) modified the CDQ to increase familiarity, decrease contextual differences and, most importantly, present risks based on entrepreneurship-related skills. They evaluated each item by context, rather than aggregating across contexts. The risk taking propensity of entrepreneurs was observed to still not differ meaningfully from the general population. However, qualitative differences were obtained (Krasner, et al., 1987). Top managers of smaller and newer firms are more risk taking as are managers of growing firms and very successful firms (Aiginger, 1986; MacCrimmon and Wehrung, 1986).

Existing results are far from the final word on entrepreneurial risk taking. However, the model proposed in this study would argue that global measures are not particularly relevant to studies of entrepreneurs. They could be less risk-averse under high perceived control and more risk-averse under low perceived control. That is,
measures of disposition may fail to capture situation-driven phenomena.

Any business entails risk taking. The significant effect that perceived control and perceived self-efficacy has on perceived risks has managerial implications for more than entrepreneurs. Risk taking entrepreneurial managers need not see themselves as taking great risks. They obviously do not perceive the same riskiness as a relatively objective observer might see. 'Obvious' risk takers consistently report these control and competence perceptions. This phenomenon is particularly evident for 'successful' risk takers (Keyes, 1985; Gunther, 1982). Similarly, successful managers typically perceive more control in business situations than they really had (MacCrimmon and Wehrung, 1986).

Another problem is that research has ignored the 'missing the boat' dimension, the risk of not seizing an opportunity. This project will accordingly include measures of the risk of 'sinking the boat' (or, 'threat risk') and the risk of 'missing the boat' (or, 'opportunity risk'). These measures should complement measures of perceived opportunity and perceived threat.
RISK AND RISK TAKING: ECONOMIC MODELS

The dominant paradigm for explaining risky decision making fundamentally assumes that rationality as expected utility maximization. This paradigm has pervaded economics and finance since proposed by von Neumann and Morgenstern in 1947 (Schoemaker, 1982). The original formulation considered risk as objective. Later formulations ('subjective expected utility' or SEU) allow risk to be subjective to the economic actor. Given this definition of rationality, it logically follows that one defines 'risk' in terms of the probability distribution for a given outcome. EU models calculate overall utility as a probability-weighted average (expected value) of the utilities associated with each possible outcome. Simply calculate the expected value of each alternative and choose the one with the highest utility. This is elegant, straightforward and imperfect description of (and prescription for) human decision making.

Unfortunately, this paradigm renders Knight's distinction between risk and uncertainty as operationally meaningless. The uncertainty faced by the entrepreneur is considered as no different than the risk faced by a dice roller. Also, risk as variability is not the same as risk as potential for negative consequences.
Critical attacks on the formulation include the famous paradoxes of Allais and Ellsberg (Allais, 1952; Ellsberg, 1963: in Schoemaker, 1982). These paradoxes show that optimal behavior is not always so simple. Risky behavior of a given individual may widely vary across highly similar situations.

There are disutilities associated either with losses or with disappointing outcomes. Decision making may entail minimizing expected 'regret,' the difference between the actual outcome and the best possible outcome given perfect knowledge. This concept of expected regret negates the usefulness of the Arrow-Pratt coefficient which assume utility maximization.

A variety of explanations exist for these within-subject differences as well as between-subject differences.


(2) The context (i.e., primarily perceptions of control and competence) is important for both risk taking behavior and perceived risk.
Human behavior differs greatly between situations perceived as opportunities and situations perceived as threats (Dutton and Jackson, 1987). This study hypothesizes that contextual influence is of primary importance to understanding attributions of opportunity or threat. Cognitive biases may contribute toward the decision maker's framing of a situation and thus the perceptions of risk, opportunity and threat. A global optimistic bias might also moderate relationships between perceived control and risk taking behavior.

For instance, high self-efficacy beliefs may lead the entrepreneur to assume near-certainty of success. One may then see clear maximization of subjective utility. Locus of control predicts whether subjects attempted to maximize subjective utility (Fisher and Bauman, 1985). Locus of control is not the same thing as self-efficacy, but serves as a weak proxy. Highly external subjects preferred alternatives with the highest probabilities of some gain, not the highest expected values. Those scoring as highly internal preferred alternatives with the highest expected values, not the highest expected probabilities of a gain.

Prospect theory (Kahneman and Tversky, 1979) asserts the rationality of risk-seeking under conditions of probable loss. The attractiveness of avoiding a loss outweighs the risk of further loss. Similarly, the risk of giving up an existing gain outweighs the attractiveness of further gains.
(Risk-avoiding is rational under conditions of probable gain). Subjects' behavior under gain conditions is unrelated to behavior under loss conditions (M. Cohen, et al., 1986). Goals or aspiration levels can serve as thresholds between risk-averse and risk-acceptant behavior (Lopes, 1987).

Optimism can simply be represented as the difference between two differently-measured utility curve measures (Hey, 1986). Mathematical equivalent methods of capturing utilities can generate different utility curves (MacCrimmon and Wehrung, 1986; McCord and deNeufville, 1986). Each measure of utility asks slightly different questions (Hey, 1986). Preferences can significantly change as ambiguity changes (Ellsberg, 1964, in Hey, 1986). Optimists are more receptive to ambiguity, pessimists less receptive. Optimists' utility curves should be lower for relatively unambiguous measures (e.g., the von Neumann-Morgenstern method) than for more ambiguous measures. The reverse is true for pessimists.

Figure 7 illustrates the net result of this phenomenon. Optimists essentially see the odds skewed at least slightly in their favor (the probabilities, the payoffs or both) as opposed to the odds seen by a 'realistic' observer. Pessimists see the distribution skewed against them. One psychologist (Streufert, 1986) argues that risky behavior largely results from 'cognitive error.'
Figure 7. Economic Implications of Optimism and Pessimism
Of interest to this research, this optimism is completely independent of the 'rational' level of risk aversion. One could be a risk-loving pessimist or a risk-hating optimist (Hey, 1986). Since utility measures are often situation-specific, Hey's measure need not be a global measure.

The economic paradigm handles psychological considerations (such as regret, disappointment or optimism) with some difficulty. More importantly, emphasizing 'objective' rationality diverts attention from the fundamental subjectivity of the situation. Entrepreneurs may take risks but it is their perceptions of the risks (including the risk of 'missing the boat') that motivate their behavior.

Not surprisingly, research has moved toward cognitive psychology and the focus has shifted to issues of perception. Research continues to heavily focus on dispositional factors, the 'risk taking personality.' The next section addresses the sizeable literature on personality influences on risk taking.
Differences in risk perceptions and risk taking behavior can arise from decision makers' personality characteristics. While the model in this study proposes the primacy of situational forces, research into this competing explanation has found so many significant results that dispositional influences must be considered and controlled for. For instance, the risk taking subscales of the Jackson Personality Inventory correlate very highly with actual risk taking (Jackson, et al., 1972). More importantly, they clearly discriminate between entrepreneurs and managers.

Assessing personality characteristics is itself fraught with potential pitfalls. These include the frequent lack of satisfactory theory and equally frequent problems of measurement.

Considerable evidence strongly supports the likelihood that personality can influence opportunistic behavior. This evidence surfaces in research into entrepreneurship, innovativeness or related fields. Each characteristic discussed below has empirical or theoretical links to risk taking or opportunity seeking.

The variables fall into three primary dimensions: Optimism, Preference for Risk Taking and Preference for Change.
Dispositional Influences: Global Optimism

Decision makers clearly treat prospective gains and losses quite differently (M. Cohen, et al., 1986; Kahneman and Tversky, 1979; Norem and Cantor, 1987). A dispositional bias toward optimism or pessimism would thus influence behavior under uncertainty. This bias may derive from a sense of personal control or a global assumption of positive outcomes.

(1) PERSONAL CONTROL
A sense of personal control in a decision situation lessens the perceived riskiness. This is primarily a situation-specific phenomenon. However, research links more global measures of perceived control to various risky behaviors. The two predominant constructs employed are (A) internal/external locus of control and (B) desirability of control. The leading empirical researchers on managerial risk taking propose that control perceptions and desire for control could explain much of the individual differences in apparent risk taking (MacCrimmon and Wehrung, 1986).

(A) Locus of Control
Both entrepreneurs and successful managers score as having a highly internal locus of control. Internal locus of
control scores by top management correlated with innovative and strategically aggressive organizations (Miller, et al., 1982). An internal locus of control corresponded to an increased Kirznerian entrepreneurial alertness (Gilad, 1981). Risk taking covaried with internality of locus of control (MacCrimmon and Wehrung, 1986). Internals are more likely to try to optimize by maximizing expected utility. Externals instead try to satisfice by maximizing the expected probability of at least some gain (Bauman and Fisher, 1985).

(B) Desire for Control

Individuals usually desire more control over their lives than they already have. (Burger, 1985) note a significant link between high desire for control and susceptibility to developing the illusion of control. Thus, desire for control will influence any experimental manipulation of perceived control. Entrepreneurs appear to possess more desire for control over their jobs than managers. Desire for control discriminated more significantly between entrepreneurs and non-entrepreneurs than locus of control (Greenberger and Sexton, 1987).
(2) GLOBAL OPTIMISM

Perceived control is not the only source of an optimistic bias. Research has suggested an even broader approach to optimism. We can identify areas where decision makers tend to assume situations as having an expected positive result. This orientation is more competence-oriented than control-oriented.

A) Life Orientation

Carver and Scheier (1985) argue that many individuals possess a consistent bias toward expecting positive (or negative) outcomes from important life events. These are generalized outcome expectancies independent of self-efficacy.

B) Ambiguity Tolerance

Highly ambiguity-tolerant individuals are likely predisposed to view uncertain situations as less risky. High ambiguity tolerance increases the relationship between opportunistic strategy and performance (Govindarajan, 1985). Shapero (1984) argues that, almost by definition, entrepreneurs and innovators are ambiguity tolerant.
Dispositional Influence: Preference for Risky Situations ("Thrill Seeking")

The final set of dispositional influences reflects risk seeking elements of subjects' personalities. Such individuals simply enjoy taking chances. This "pure" desire to take risks is quite distinct from seeking opportunities. It represents the preference for trying to beat the odds, not trying to change them. The construct most cited in the risk taking, entrepreneurship, innovativeness and other related literatures is Zuckerman's measure of sensation seeking.

Sensation-Seeking

Risk taking research frequently employ measures of sensation-seeking (Zuckerman, 1964, in MacCrimmon and Wehrung, 1986). Zuckerman argues that many risk takers prefer the greater stimulation afforded by higher uncertainty. If a decision maker sees circumstances as an opportunity and thus less risky, sensation-seeking will be irrelevant. MacCrimmon and Wehrung (1986) found no meaningful correlation between sensation-seeking and measures of managerial risk taking. Similarly, Streufert (1986) found that the "thrill" of risk taking did not correlate with risk taking. He concluded that risk taking
thus may simply be 'cognitive error.' That is, risk takers are rational, but operate with an optimistic bias. Sensation-seeking nonetheless remains prevalent in the risk taking literature. This study will use this measure to confirm that opportunity seeking and thrill seeking are independent.

**Dispositional Influence: Preference for Change**

A final area of relevance is the preference for change. Individuals who strongly desire change may engage in risky activities because they produce change, not because they involve risk. They may not see change as risky. Two measures identify change-oriented individuals: (A) innovativeness and (B) intention to start a business and attitudes toward entrepreneurship.

**(A) Innovativeness**

Some individuals respond to change or novel stimuli by 'doing the same things better.' Other respond by 'doing things differently.' Kirton's Adaption-Innovation Inventory is used to identify successful R&D managers and other successful innovators (Kirton, 1984).
(B) Entrepreneurial Intentions

Starting a business is an objectively risky undertaking and is generally perceived as riskier than simply taking a job. In a vocational-preference test pure (growth-oriented) entrepreneurs rated themselves as risk takers (Sexton and Bowman, 1986). Given the research findings to date (Brockhaus, 1987), entrepreneurial intentions alone should not have any significant effect on risky behavior. The study will ask subjects for their intentions toward starting a business and their attitudes toward entrepreneurship (Shapero, 1984; Cooper, et al., 1988).

Table 4 below summarizes the short list of selected scales employed.
Table 4. Personality Variables Linked to Risk Taking

<table>
<thead>
<tr>
<th>Scale</th>
<th>Source/Author(s)</th>
<th>Measures</th>
<th>Type of Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attributional Style</td>
<td>Seligman and Schulman, 1987</td>
<td>Causal Attributions</td>
<td>6 items (short answer)</td>
</tr>
<tr>
<td>Questionnaire</td>
<td></td>
<td></td>
<td>[A]</td>
</tr>
<tr>
<td>Desire for Control</td>
<td>Burger, 1985</td>
<td>Desire for Control</td>
<td>20 Likert items</td>
</tr>
<tr>
<td>Future Orientation</td>
<td>Gjesme, 1979</td>
<td>Future Orientation</td>
<td>6 Likert items [A]</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>Eysenck (1986)</td>
<td>Impulsivity</td>
<td>19 Forced choice</td>
</tr>
<tr>
<td>Life Orientation Test</td>
<td>Carver and Scheier</td>
<td>General Optimism</td>
<td>8 Likert items</td>
</tr>
<tr>
<td>Locus of Control</td>
<td>[included in ASQ above]</td>
<td>Sensation-Seeking</td>
<td>7 Likert items [A]</td>
</tr>
<tr>
<td>Sensation-Seeking</td>
<td>MacCrimmon and Wehrung, 1986 (using Zuckerman)</td>
<td>Sensation-Seeking</td>
<td></td>
</tr>
<tr>
<td>Tolerance for Ambiguity</td>
<td>Lorsch and Morse (in Govindarajan, 1985)</td>
<td>Cognitive Style</td>
<td>4 Likert items [A]</td>
</tr>
</tbody>
</table>

[A] denotes short form of scale
Behavioral decision theory attempts to explain decision making from the limits of human information processing. This literature draws on March and Simon's seminal work on "bounded rationality" and the assumption that decision makers operate in perceived environment (e.g., Weick). These cognitive constraints introduce heuristics which can consistently bias decisions. These biases often explain failures by individuals to rationally maximize utility (as with preference reversals). Different framing of questions presents information differently, sometimes invoking different cognitive processes. Those differences lead subjects to dramatically reverse their choices. Researchers must take care not to inadvertently bias decisions.

Changing perceptions of decision makers' competence can also significantly alter perceptions of the decision situation. Entrepreneurs' chronic optimism may thus drive their chronic orientation toward opportunities. This research evaluates this as yet untested relationship.

Under uncertainty decision makers typically simplify outcomes (J. Cohen, 1960). Subjects perceived outcomes as either determined by chance or determined by skill. Subjects chose between a skill situation and a chance situation. Those who perceived themselves as skillful would strongly and consistently prefer skill-oriented alternatives. Those
who saw themselves as unskilled would prefer chance-based alternatives. Across situations, risk perceptions were strongly and inversely related to skill perceptions.

THE CENTRALITY OF RISK SUBJECTIVITY

Perceived risks vary widely across individuals, even experts. Technological researchers are increasingly skeptical that 'objective' risk actually exists in most complex situations (Fischoff, et al., 1985).

Most research into the process of human risk perception has investigated either perceptions of technological risks (Vlek and Stallen, 1981; Slovic, et al., 1982) or marketing risks (Oglethorpe and Monroe, 1987). The strong consensus on the dimensions underlying human risk perception has not migrated to the business literature except some interesting work on insurance decisions (e.g., Schoemaker and Kunreuther, 1979). Risk perception research also studies pathological risk taking (Streufert, 1986). Virtually no research addresses the antecedents of perceptions of risk and reward as defined by economists.

Significant cognitive biases influence human risk perceptions even if the objective risks are obvious, easy to understand, or explicitly given. Even experts are guilty of these biases. Even insurance salespersons prefer to insure against frequently-occurring, low-magnitude risks although rationality dictates insuring against low-
frequency, large-magnitude risks (Schoemaker and Kunreuther, 1979). Since real world payoffs are uncertain, we seek to reduce uncertainty. One way is to maximize the probability of some gain (or minimize the probability of loss).

Individuals' typical bias toward optimism is enhanced in situations they perceive as within their control (Kahneman, et al., 1982).

However, this begs the fundamental question. Does objective risk actually exist? Certain highly structured situations have obvious, well-advertised probabilities (e.g., a coin flip). Actuarial situations exist where experts can accurately estimate the probabilities for a large population. Nonetheless, most uncertain situations are just that, uncertain. In complex real-life decision situations one rarely knows the outcomes, the repercussions of those outcomes and the odds of occurrence.

Influences on Perceived Risk and Risk Taking

Research identifies a wide range of factors which influence the decision process. Table 5 discusses contextual influences which appear to affect risk perceptions. Table 6 summarizes contextual influences which affect risky behavior. The first set of influences could confound the research if not controlled for in some manner. The second set support the proposition that perceived controllability is absolutely central to opportunity recognition. Table 7
Table 5. Context Issues Affecting Perceived Risk

<table>
<thead>
<tr>
<th>Contextual Factor</th>
<th>Effect on Perceived Risk (Key Authors)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CONTROL-RELATED FACTORS:</strong></td>
<td></td>
</tr>
<tr>
<td>Familiarity</td>
<td>Inverse (perceived risk decreases with familiarity; Slovic, et al.; Vlek and Stallen)</td>
</tr>
<tr>
<td>Controllability</td>
<td>Inverse (Slovic, et al.; Vlek and Stallen)</td>
</tr>
<tr>
<td>Perceived Control</td>
<td>Inverse (Langer)</td>
</tr>
<tr>
<td>Chance vs. Skill Task</td>
<td>Perceived risk INVERSE to amount of skill perceived as required for task (Cohen, 1960)</td>
</tr>
<tr>
<td>Perceived Competence</td>
<td>Inverse (Bandura)</td>
</tr>
<tr>
<td><strong>&quot;COGNITIVE&quot; FACTORS:</strong></td>
<td></td>
</tr>
<tr>
<td>Potential Beneficiality</td>
<td>Disproportionately large possible benefit will DECREASE perceived risk (Vlek and Stallen)</td>
</tr>
<tr>
<td>Potential for Catastrophe</td>
<td>Disproportionately large possible loss will INCREASE perceived risk (Vlek and Stallen)</td>
</tr>
<tr>
<td><strong>&quot;PERSONAL&quot; FACTORS:</strong></td>
<td></td>
</tr>
<tr>
<td>Personal Impact</td>
<td>Perceived risk decreases: hazard is less likely to affect decision maker personally (Vlek and Stallen)</td>
</tr>
<tr>
<td>Equity</td>
<td>If hazard (or consequences) perceived as inequitable then perceived risk HIGHER (Vlek and Stallen)</td>
</tr>
<tr>
<td>Negative Affect</td>
<td>Emotional tone definitely influences risk perceptions (Slovic, et al.; Vlek and Stallen)</td>
</tr>
</tbody>
</table>
Table 6: Experimental Biases and Context Issues Affecting Risk Taking

<table>
<thead>
<tr>
<th>Contextual Factor</th>
<th>Effect on Risk Taking (Key Authors)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Experimental Biases:</strong></td>
<td></td>
</tr>
<tr>
<td>NATURE OF INSTRUCTIONS</td>
<td>Subtle differences in instructions will induce results in the direction of signals</td>
</tr>
<tr>
<td>(implicit signals as to value to experimenter of risk taking)</td>
<td></td>
</tr>
<tr>
<td>INFORMATION PROVIDED</td>
<td>Subjects will tend to use any sort of normative information</td>
</tr>
<tr>
<td>(normative information)</td>
<td></td>
</tr>
<tr>
<td>TYPE of MEASURE</td>
<td>Results will vary depending on measuring instrument employed (Slovic, et al.)</td>
</tr>
<tr>
<td><strong>External Influences:</strong></td>
<td></td>
</tr>
<tr>
<td>MOOD (affective state)</td>
<td>Elation leads to more risk-taking (Isen and Patrick); negative affect leads to LESS risk taking (Deldin and Levin)</td>
</tr>
<tr>
<td>PERCEIVED SELF-EFFICACY</td>
<td>Perceived self-efficacy leads to MORE risk taking behavior (Durr)</td>
</tr>
<tr>
<td>(perceived competence)</td>
<td></td>
</tr>
<tr>
<td>PERCEIVED ENVIRONMENTAL UNCERTAINTY</td>
<td>Risk taking behavior inverse to magnitude of perceived uncertainty of context (Jauch and Kraft); degree of perceived uncertainty in decision making depends on the type of information uncertainty (Gifford, et al.)</td>
</tr>
<tr>
<td>PERCEIVED CONTROL</td>
<td>Even the illusion of control will lead to MORE risk taking behavior (Langer)</td>
</tr>
</tbody>
</table>
Table 7. Content Issues Affecting Risk Taking

<table>
<thead>
<tr>
<th>Content Factor</th>
<th>Effect on Risk-Taking (Key Authors)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Magnitude of the Gamble</strong></td>
<td>Risk-aversion proportional to magnitude</td>
</tr>
<tr>
<td><strong>Decision Domain</strong></td>
<td>More risk-averse in a personal setting than in an impersonal situation (MacCrimmon and Wehrung, 1986)</td>
</tr>
<tr>
<td>(personal vs. impersonal)</td>
<td></td>
</tr>
<tr>
<td><strong>Magnitude of the Uncertainty</strong></td>
<td>Risk-aversion proportional to variability (Nutt, 1986)</td>
</tr>
<tr>
<td>(variability)</td>
<td></td>
</tr>
<tr>
<td><strong>Gain vs. Loss Situation</strong></td>
<td>Risk-aversion proportionate to size of certain gain; risk-acceptance proportionate to size of certain loss (Kahneman and Tversky, 1979); zero reference point depends on goal or aspiration level (Lopes); information processing differs between gain and loss situations (Cohen, et al.); loss situations perceived as more uncertain than gain situations (Cohen, et al.)</td>
</tr>
<tr>
<td>(goals/aspiration levels)</td>
<td></td>
</tr>
<tr>
<td><strong>Nature of Alternatives Compared</strong></td>
<td>Duplex gambles less biased, particularly for measurement of utility curves (McCord and deNeufville)</td>
</tr>
<tr>
<td>(simple vs. duplex gambles)</td>
<td></td>
</tr>
<tr>
<td><strong>Question Format</strong></td>
<td>Gain equivalence format most consistent; same gamble not consistently evaluated across question formats (MacCrimmon and Wehrung)</td>
</tr>
<tr>
<td>(gain equivalence vs. probability equivalence, e.g.)</td>
<td></td>
</tr>
<tr>
<td><strong>Opportunity or Threat</strong></td>
<td>Risk taking behavior much greater if decision maker perceives situation to be an opportunity; much less if perceived as a threat (MacCrimmon and Wehrung)</td>
</tr>
</tbody>
</table>
addresses how the content of a question can affect the answer. That is, the phrasing can induce a biased response. Again, researchers need to be aware of these factors. The most prominent of these is the 'framing' effect and merits careful consideration.

Framing and the Formation of Risk Perceptions

Behavioral research offers a strong consensus on the formation process of risk perceptions. For instance, which outcomes are emphasized strongly influences decision makers. Cognitive biases can cause the framing of a choice to radically affect perceptions of risk and consequently decisions (Kahneman and Tversky, 1984).

The framing of a decision as an opportunity or a threat should strongly influence risk perceptions. Individuals tend to classify situations as either an expected gain or an expected loss situation. Prospect theory (Kahneman and Tversky, 1979) argues that individuals take more risks under conditions of expected loss than under conditions of expected gain. If one expects a loss anyway, it makes sense to take a chance on turning the situation into a positive one. Conversely, a decision maker may not wish to jeopardize an expected gain. The expected gain (loss) condition is itself perceptual. Further, individuals may instead see losses as costs or necessary occurrences. (Entrepreneurs may regard an occasional venture failure as part of the cost of
being an entrepreneur.) In such a case they perceive the situation as less risky.

Human information processing differs remarkably between expected gain and expected loss situations. Subjects' behavior under gain conditions differed from behavior under loss conditions. In a gain situation subjects considered the exact probabilities given and they analyzed risk and uncertainty differently. In a loss situation they considered plausibility, not probability. Subjects treated a negative frame as significantly more uncertain than a positive frame (M. Cohen, et al., 1986). Cognitive biases induced by information processing limitations explain many anomalies of decision making (Streufert, 1987). These biases are best illustrated by some actual framing effects.

Here are examples of this phenomenon (as seen earlier):

Choice A: Of 600 people, you can save 200 lives for certain.
Choice B: Or, you have a 1/3 chance of saving all 600; a 2/3 chance of losing all 600.

Most people choose A. But, under different framing the same odds can yield the opposite result.

Choice C: Out of 600 people, 400 die, or
Choice D: 1/3 chance of 0 dying; 2/3 chance of 600 dying
Most people choose D this time. (Yet, A and C are mathematically equivalent, as are B and D.) However, A and B are framed in positive terms, C and D in negative terms. Prospect theory predicts such nonlinearities in risk-return tradeoffs. Rationally, conditions of expected gain induce risk-aversion, but conditions of expected loss induce risk-seeking. However, the expectation of gain or loss is clearly perceptual. Framing differences can present the same situation in either light.

The perceived risk in a 'loss' situation can dramatically decrease if the wording presents that loss as a cost (Kahneman and Tversky, 1984). For example, compare:

Gamble E: 10% chance to win $95, 90% chance to lose $5,
Gamble F: Buy $5 lottery ticket with 10% chance to win $100

One can easily see that the two gambles are mathematically equivalent bets. However, the average person rejects E, but paradoxically accepts F. Most likely, F frames the prospect of losing $5 as a cost, not as a pure loss.

Why should subjects respond differently to mathematically equivalent gambles? The payoffs are mathematically equivalent, but the decision situations are not. Individuals have a strong cognitive bias toward options with higher perceived control (Cohen, 1960). In the example of the epidemic, subjects could thus perceive choices A and
D as offering significantly greater control than B and C, respectively. Subjects also bet significantly more on a future coin flip than on a past one. Subjects perceive more control over a future flip, despite knowledge that coin flips are random (Strickland, Lewicki and Katz, 1966).

Effects of Perceived Control on Risk Taking

Decision makers' perceptions of control over the decision situation play a much larger role in decision making than usually recognized (Langer, 1983). Even the illusion of indirect control can increase risk taking (Ladouceur, et al., 1986). Similarly, perceived self-efficacy increases risk taking behavior and task persistence (Durr, 1985).

Effects of Perceived Control on Perceived Risk

Research exploring the role of perceived risk should consider the antecedents of perceived risk. Relatively little empirical evidence exists because economics-based models have dominated. One antecedent already addressed is the perception of having control or competence.

Also previously discussed are the relationships between the perceived risk of loss and the situation's familiarity and its controllability (Slovic, et al., 1982; Vlek and Stallen, 1981), perceived control (Langer, 1983), perceived competence (Bandura, 1986) and perceptions that the task
requires skill (Cohen, 1960). In the context of this research, the typical entrepreneur's low risk perceptions may derive from a strong sense of control. General perceptions of control may be evidenced by a general internal locus of control. Situation-specific control perceptions should be associated with situational perceptions of competence (Bandura, 1986).

The foregoing section strongly suggests that control perceptions can dramatically affect decision making. The next section explicitly addresses situational perceptions of control and their anticipated influence on opportunity recognition.
This section surveys causal attributions, perceived control and perceived self-efficacy. A brief recapitulation of Chapter 2's major findings follows.

CAUSAL ATTRIBUTIONS

Attribution theories deal with human perceptions of "how the world works." Individuals observe relationships in a given situation and make inferences about the causal nature of those relationships. In a given situation, individuals perceive the locus of causality to be either internal to the subject (i.e., ability or effort) or external (i.e., chance or powerful others). There is also a general disposition to believe that either external or internal influences have control over outcomes in their lives (i.e., locus of control). Typically, individuals attribute their successes as internal, their failures as external. Two highly overlapping concepts allow us to get to the core of this theory.

(1) Individuals assess situations in terms of how controllable they appear to be (Cohen, 1960). Behavior in a situation perceived as controllable will differ from behavior under perceived uncontrollability.
(2) Closely related to this is perceived self-efficacy, the strength of the decision makers' belief in their situational competence (Bandura 1977, 1986).

**The Role of Attributions in Opportunity-Seeking**

Central to any understanding of control perceptions is the decision maker's pattern of causality attributions. An obvious example is a situation where complete control actually exists. A decision may entail risk only insofar as the decision maker does not understand the situation or does not believe that he understands it.

Poker is mostly a game of chance for beginners, but for experts it is more a game of skill. However, certain things may distort players' perceptions of skill. (1) Objectively skillful players could come to believe that an opposing player is more skillful. The game now appears riskier. (2) Weaker players may have unwarranted confidence. (3) Familiarity may breed the illusion of skill requirements in a purely chance situation. (4) Gambling research suggests that the longer people gamble, the more likely they are to believe that skill is important. This seems to hold even if the task involves zero skill. Frequent winning accentuates this (Letarte, et al., 1986). Conversely, failure in a skill situation leads to a perception that it happened by chance (Langer, 1983). Opportunity and threat perceptions should thus result from prior performance in related endeavors.
Opportunistic behavior would thus be encouraged by past success, discouraged by past failure. We should thus expect that entrepreneur-like behavior will be found in areas of perceived prior success.

Most decision situations involve both skill and chance. As individuals we differ in what we identify as requiring skill and as requiring luck. The self-efficacy and perceived control literatures argue that these differences in perceived skills are critical because assumptions about what 'causes' outcomes drive much behavior. The literature on causal attributions (including self-efficacy, discussed below) broadens our perspective. To what does the person attribute an outcome: skill, effort, powerful others, luck? Does the perceived locus of causality differ between positive and negative outcomes? For instance, clinical depressives see failure as internally caused (e.g., the result of low skill). They see success as externally caused (e.g., the result of luck). Attributions persist across situations for a given individual. A general feeling that negative outcomes result from lack of effort can carry over to a specific situation (such as a new venture). Changing causal attributions should parallel changes in perceived self-efficacy. Both should alter perceptions of opportunity and threat. Perceptions of high competence (skill, not luck) should reduce perceptions of riskiness. Opportunities by definition entail perceived controllability (Dutton and
Thus, the entrepreneur will likely perceive more (or greater) opportunities where perceived controllability is high.

As Figure 1 (in Chapter I) showed, studies of entrepreneurial optimism confirm this proposition. For instance, Shapero's (1984) subjects volunteered perceptions of ability (internal control) influencing new venture success, that the risk (negative outcome) was in not trying (effort-related). Buckeye's (1984) subjects also focused on the opportunity (positive and controllable), not the risks (negative and uncontrollable).

PERCEIVED CONTROL

We desire to have control over our lives. We prefer control and we actively seek it. We may not desire, prefer or seek the responsibilities implied by having control. Still, the quest for control is central in our lives. In fact, we often observe control where it is not present, the so-called "illusion of control" (Langer, 1983). Or, we fail to observe personal control which does exist, the phenomenon of "learned helplessness."

greater optimism about their own ventures than about 'average' ventures (thus more controllable).

ILLUSION OF CONTROL--The congenital optimism of human beings allows the illusion of control to occur frequently and with little effort. Only a handful of trials can create or destroy the illusion of control (Langer, 1983). Subjects predicted the results of 15 coin flips. (Feedback came orally; they did not always see the actual flips.) The illusion (or lack thereof) became evident in the first few flips. Several early "correct" predictions followed by several "incorrects" nonetheless created the illusion of control. Most replications have not been this dramatic but the effect continues to appear (Letarte, et al., 1985; Ladouceur, et al., 1986).

The following two sections will examine manipulation and measurement of control attributions and self-efficacy.

MEASURING PERCEIVED CONTROL

Measuring perceived control at a more global level is easier because the attributions involved are more stable. Entrepreneurship and management researchers have widely used locus of control. However, predictive purposes usually require more situation-specific measures. Perceived self-efficacy is independent of subjects' varying
definitions of 'control.' In fact, the nature of perceived self-efficacy is such that self-reports by definition should be relatively accurate (Bandura, 1986). These two constructs overlap considerably; so should the measures. However, the self-efficacy measure addresses perceptions of overall controllability. The attribution measures provide a richer picture.

Perceived control is relatively simple to measure. Experimenters simply ask subjects about their attributions. How confident they would be in making predictions about future performance? How controllable do they perceive the situation to be? How much of a role does skill plays in determining outcomes (as opposed to luck)?

MANIPULATING PERCEIVED CONTROL

Manipulating a subject's perceived control is quite simple, particularly in the direction of increased control. One method widely used in illusion of control research (Langer, 1983) employs a series of 15 coin "flips" which the subject is to predict. Using false feedback, one pattern of "wins" and "losses" induces a higher level of perceived control; another induces a lower level.

In general, though, performance feedback is most effective in altering a subject's perceived control (Langer, 1983). This is completely consonant with the extensive
literature on feedback which stresses that effective feedback must be clear, timely, specific and credible (e.g., Ilgen and Moore, 1987).

**PERCEIVED SELF-EFFICACY**

**DEFINITION**

The key element to the illusion of control is changing the individual's perception of competence at the task. Psychologist Albert Bandura coined the term "perceived self-efficacy" to describe this pivotal psychological construct. Humans change their self-efficacy perceptions not only by successfully doing ("enactive mastery") but also by watching ("vicarious modeling").

Psychological processes of change closely correspond to changes in the perception of having the capability to perform a specified behavior. Expectations that one will be personally efficacious is a powerful predictor of behavioral changes. In plain English, to believe that you can do something is the best predictor of whether you will successfully achieve it. Often this predicts better than even past performance. This construct reflects Bandura's theories of social learning. Self-efficacy is one of the few models which include vicarious learning. Individuals' risk perceptions often derive from observation. Other sources of
change in perceived self-efficacy are past performance, verbal persuasion and physiological states (e.g., emotions). His original 1977 work has been extended and replicated in a wide variety of settings (Bandura, 1986).

Self-efficacy is defined as an individual's expectancy that she can successfully perform a behavior. This need not have a direct relationship to outcomes from the behavior. Locus of control is the expectancy that one's behavior can influence important outcomes. From the decision to act to the ultimate outcomes there are two expectancies. Self-efficacy measures one; locus of control measures the other.

Self-efficacy is specific to situations. However, it does have generalized effects. That is, raising specific self-efficacy has a spillover effect to other situations (Bandura, 1982). Thus, within a reasonably limited domain (such as starting a new venture) increasing perceived self-efficacy in one situation (a given venture) should raise self-efficacy perceptions in similar situations (different ventures).

The "illusion of control" (Langer, 1983) can grow simply with exposure. Self-efficacy also grows from exposure. In risky situations individuals prefer alternatives where at least the possibility of control exists. If forced to take risks, they develop some perceptions of having control (Cohen, 1960). Thus, existing
entrepreneurs may perceive much more control than they actually have.

THE INFLUENCE OF SELF-EFFICACY ON RISK TAKING

Decision makers who believe that a situation required skill are much more likely to maximize subjective expected utility. (That is, they accept more opportunities.) Those who believed that the situation involved only luck would tend to decide according to the probabilities, not the expected value of the outcomes (Fisher and Bauman, 1985). In high-uncertainty situations humans often decide according to the probabilities. Thus, people buy too little disaster insurance (low-frequency, larger-loss events). Instead they buy too much insurance (or pay too much) for higher-frequency, lower-value events (e.g., setting deductibles too low). In this context, entrepreneurs with high self-efficacy will be less fearful of a failed venture (a low-frequency, large-loss event).

Perceived self-efficacy has strongly predicted risk taking and task persistence. However, risk taking was uncorrelated with locus of control (Durr, 1985).

Entrepreneurship researchers have long emphasized that entrepreneurs are characterized by an internal locus of control. However, this trait is far from unique to the
entrepreneur (Brockhaus, 1986, 1987). Moreover, locus of control is not the same thing as self-efficacy, though they are related constructs. Locus of control refers to the belief that a given individual has control over the outcomes in his lives, while self-efficacy deals with belief in one's ability to successfully perform a behavior. In either case, successful individuals in general should exhibit both an internal locus of control and high perceived self-efficacy. More importantly, general expectancies explain little about specific circumstances.

Controllability and thus perceived risk depend on the perception that skill, not chance, is involved. Therefore, self-efficacy (which deals with skill expectations) will play a much larger role than locus of control (which deals with behavior-outcome expectations). Locus of control strongly predicts the degree of individuals' alertness to entrepreneurial opportunities (Gilad, 1981) and their willingness to pursue them (Miller, et al., 1982). However, this review suggests a stronger relationship between self-efficacy and the alertness to opportunity that Kirzner believed crucial to entrepreneurship. That is, a situational measure such as self-efficacy should exhibit a stronger relationship with situational behavior.

If self-efficacy is a major determinant of risk perceptions, then understanding situational risk perceptions requires measurement of perceived self-efficacy.

While self-efficacy has repeatedly predicted performance, the construct has seen negligible application in the management literature. This research should demonstrate that self-efficacy beliefs are critical to risk perceptions and risk taking.

MEASURING PERCEIVED SELF-EFFICACY

Measuring self-efficacy perceptions is elegantly straightforward. Simply show subjects samples of the given task and ask them "how many do you think you can successfully complete?" In a sense, this is an estimate of the probability of success. Bandura and associates have repeatedly validated this elegant self-report approach (Bandura, 1986).
Perceived self-efficacy is an outgrowth of Bandura's social learning theory. One can manipulate self-efficacy perception in several ways. First, apparent success or failure when actually undertaking the activity significantly alters self-efficacy perceptions. Feedback from the environment which provides information on the subject's task mastery is the strongest manipulator. Second, vicarious learning can change perceptions. Third, mentors (or other authority figures) can persuade subjects into changing their perceptions. Finally, altering the emotional tone can also alter self-efficacy perceptions (Bandura, 1986).

However, as with perceived control, performance feedback is the most potent modifier of perceived self-efficacy. The difference is that Bandura recommends explicitly quantified measures of performance, delivered immediately. An actual 'score' is clear, timely and specific, as per the usual dictates of feedback researchers (e.g., Ilgen and Moore, 1987).
Chapter II has addressed various literatures which are germane to this thesis. This review has identified several clear points of interest to this research, summarized below.

(1) Opportunity-seeking is a critical element of entrepreneurship and entrepreneur-like behavior.

(2) Individuals interpret their environment by categorizing situations as opportunities and/or threats. Entrepreneurs have a clear bias toward seeing opportunities.

(3) This categorization entails trading off potential reward (perceived risk of 'missing the boat') and potential risk (of loss).

(4) Decision making thus depends on risk perceptions.

(5) Behavioral models appear more useful than economic models in understanding opportunity/threat identification (and thus entrepreneurial behavior). Economic models, however, demonstrate that optimism is conceptually independent of rational risk-aversion.
(6) This categorization process is perception-based: framing effects can be induced by the content and presentation of risky tasks.

(7) Similarly, causal attributions significantly affect opportunity identification and thus opportunistic behavior.

(8) Evidence also suggests that psychological traits play at least a limited role in opportunity acceptance.

(9) Perceptions of control, specifically perceived self-efficacy (competence), play the central role in explaining opportunistic behavior.
CHAPTER III

FORMAL HYPOTHESES

This study hypothesizes that strategic risk taking and the underlying perceptions of opportunity and threat should depend largely on situational factors. Especially crucial are perceptions of self-efficacy or situational competence. Figure 8 below illustrates the anticipated relationships. To fully assess this model requires three distinct stages of analysis and testing three sets of hypotheses.

Stage I verifies that the feedback manipulation properly influenced (a) risk taking and (b) perceived self-efficacy. That is, feedback on gambles should influence risk taking and self-efficacy only for gambles, not for dilemmas. Similarly, feedback on dilemmas should only influence risk taking and self-efficacy for dilemmas, not for gambles. Stage I and the first set of hypotheses address these relationships.

Stage II and the second set of hypotheses address the relationships between self-efficacy, opportunity and threat perceptions and risky behavior. Specifically, increasing perceptions of self-efficacy will increase the perception
Figure 8. HYPOTHESIZED MODEL OF OPPORTUNISTIC BEHAVIOR

Change in Perceived Opportunity

Change in Risk Taking Behavior

Performance Feedback

Change in Perceived Self-Efficacy

Change in Perceived Threat

(with expected directions of relationships)
of the situation as an opportunity and decrease the perception of threat. If these changes are valid, one should expect corresponding changes in risk taking behavior.

Stage III and the third set of hypotheses further test and confirm relationships in the model. First, the experiment should confirm that situation dominates disposition. That is, post-intervention opportunity (and threat) perceptions and risk taking behavior are hypothesized to not be associated with trait measures of risk taking propensity.

Second, the experiment should lessen concern about the measures employed. To further support the hypothesized model, corroboratory measures (Table 9) were collected which are hypothesized to be significantly associated with the primary measures (Table 8).

The formal hypotheses associated with this model are specified below along with their justification.

STAGE I: TESTING FEEDBACK MANIPULATION

HYPOTHESIS 1: Feedback properly manipulates risk taking.

Performance feedback for dilemmas should affect only dilemma-related behavior, particularly risk taking and self-efficacy. Gamble performance feedback should affect only
gamble-related behavior. Given the expected robustness of the feedback manipulation (Bandura, 1986; Ilgen and Moore, 1987) it is conceivable that feedback on dilemma performance may influence behavior related to gambles and vice-versa.

**H1a:** Feedback on dilemma performance is significantly associated with risk taking for dilemmas.

**H1b:** Feedback on dilemma performance is not significantly associated with risk taking for gambles.

**H1c:** Feedback on gamble performance is significantly associated with risk taking for gambles.

**H1d:** Feedback on gamble performance is not significantly associated with risk taking for dilemmas.

**HYPOTHESIS 2:** Performance feedback properly manipulates perceived self-efficacy.

The experiment must also assess whether the feedback manipulation properly influenced self-efficacy. Dilemma feedback should influence only dilemma self-efficacy and gamble feedback should only influence gamble self-efficacy.

**H2a:** Feedback on dilemma performance is significantly associated with perceived self-efficacy for dilemmas.

**H2b:** Feedback on dilemma performance is not significantly associated with perceived self-efficacy for gambles.
H2c: Feedback on gamble performance is significantly associated with perceived self-efficacy for gambles.

H2d: Feedback on gamble performance is not significantly associated with perceived self-efficacy for dilemmas.

Once it is clear that the feedback manipulation worked as expected, we can now evaluate the influence of perceived self-efficacy on risk taking behavior and on perceptions of opportunity and threat.

STAGE II: TESTING MODEL OF PERCEPTIONS AND RISKY BEHAVIOR

HYPOTHESIS 3: Changes in perceptions of situational opportunity are inversely related to changes in perceived self-efficacy.

Perceived self-efficacy has predicted risky behavior and task persistence (e.g., Durr, 1986) while perceived controllability is central to attributions of opportunity (Dutton and Jackson, 1987). Perceived control is strongly inversely related to perceived risk of loss (Slovic, et al., 1982; Vlek and Stallen, 1981). Theory suggests that perceived self-efficacy and perceived opportunity should have a strong relationship (Bandura, 1986).
HYPOTHESIS 4: Changes in perceptions of situational threat are directly related to changes in perceived self-efficacy.

Paralleling the arguments in support of Hypothesis 1, perceived uncontrollability is central to situational attributions of threat (Dutton and Jackson, 1987) and that perceived self-efficacy should be strongly inversely related to threat perceptions (Bandura, 1986).

HYPOTHESIS 5: Changes in strategic risk taking are directly related to changes in perceived situational opportunity.

HYPOTHESIS 6: Changes in strategic risk taking are inversely related to changes in perceived situational threat.

HYPOTHESIS 7: Changes in strategic risk taking are not directly associated with changes in perceived self-efficacy.

Evidence strongly suggests that risky behavior depends on subjective (not objective) risks (Slovic, et al., 1982). Moreover, we must also consider the risk of 'missing the boat' (Dickson and Giglierano, 1986).
Rejection of Hypotheses 5 and 6 would suggest that perceived self-efficacy influences risky behavior directly, instead of operating through opportunity and/or threat perceptions. This is directly tested by Hypothesis 7.

HYPOTHESIS 8: Changes in threat perceptions are not associated with changes in opportunity perceptions.

A given strategic issue need not be categorized exclusively as an opportunity or as a threat. Decision makers may view a situation as representing both opportunity and threat or neither.

STAGE III: TESTING CORROBORATORY MEASURES

A: Testing Influence of Personality Traits

HYPOTHESIS 9: Changes in risk taking behavior are not associated with dispositional variables.

As noted above, research frequently links personality characteristics to risky or opportunistic behavior. The breadth of such findings argues for careful consideration of suitable individual difference measures. Suitable
measures will demonstrate (a) a strong theoretical connection to opportunistic or risky behavior, (b) empirical support and (c) psychometric soundness.

Support for Hypothesis 9 will confirm that situational influences on risky behavior dominate dispositional influences.

B: Issues of Construct Validity

Research should confirm that its instruments measure what they were intended to measure. Otherwise, research results can merely be artifacts of inappropriate measures. This is particularly true where new measures are employed.

For instance, Hypothesis 8 anticipates no relationship between changes in opportunity and threat perceptions. However, most operationalizations of threat and opportunity perceptions assume mutual exclusivity (Dutton and Jackson, 1987). This introduces an artifactual inverse relationship. On the other hand, separate measures conceivably could introduce their own biases.

In this example, measures of perceived risk can corroborate Hypothesis 8. 'Missing the boat' risk should be independent of the risk of loss (Dickson and Giglierano, 1986). The attractiveness of an opportunity does not particularly correlate with perceived riskiness (Nutt, 1986; Nygren, 1977; Slovic, et al., 1982).
Where possible, the research design should thus include additional measures to further validate the relationships hypothesized by the model (Table 9 below).

Hypothesis 10: Changes in perceived self-efficacy should be confirmed by positive associations with perceived control and causal attributions of skill and by negative associations with attributions of luck.

Hypothesis 11: Changes in opportunity perceptions are positively associated with perceived risk of 'missing the boat' and negatively associated with perceived risk of loss.

Hypothesis 12: Changes in threat perceptions are negatively associated with perceived risk of 'missing the boat' and positively associated with perceived risk of loss.
### Table 8. Primary Constructs and Measures

<table>
<thead>
<tr>
<th>Theoretical Construct</th>
<th>Operational Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Situational competence</td>
<td>Perceived self-efficacy perceptions</td>
</tr>
<tr>
<td>Risky behaviors</td>
<td>Risky decisions: standard gambles, choice dilemmas</td>
</tr>
<tr>
<td>Strategic issue categorization</td>
<td>Perceived situational opportunity</td>
</tr>
<tr>
<td></td>
<td>Perceived situational threat</td>
</tr>
</tbody>
</table>

### Table 9. Corroboratory Measures
(with expected direction of relationship)

<table>
<thead>
<tr>
<th>To Corroborate:</th>
<th>Also measure:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived self-efficacy</td>
<td>Global perceived control (+)</td>
</tr>
<tr>
<td></td>
<td>Attributions of skill (+)</td>
</tr>
<tr>
<td></td>
<td>Attributions of luck (-)</td>
</tr>
<tr>
<td>Perceived opportunity</td>
<td>Perceived risk of loss (-)</td>
</tr>
<tr>
<td></td>
<td>Perceived risk of 'missing the boat' (+)</td>
</tr>
<tr>
<td>Perceived threat</td>
<td>Perceived risk of loss (+)</td>
</tr>
<tr>
<td></td>
<td>Perceived risk of 'missing the boat' (-)</td>
</tr>
</tbody>
</table>
This research tests whether risk taking behavior can be explained by situational factors. Performance feedback should significantly affect both perceived self-efficacy and strategic risk taking. Self-efficacy should be associated with risk taking. However, the association operates indirectly through intervening variables of opportunity and threat perceptions. Adding perceptions of opportunity and threat to the model explains the association between self-efficacy and risk taking. Perceived self-efficacy should significantly influence opportunity and threat perceptions.

Testing the hypothesized model requires three distinct analyses. Stage I tests whether performance feedback situationally manipulates perceived self-efficacy. Dilemma feedback only affects dilemma behavior and gamble feedback only affects gamble behavior.

Stage II tests whether risk taking behavior depends on perceptions of both opportunity and threat, while perceived opportunity and threat should be mutually independent.

Stage III confirms these results. If the situation is a greater influence on risk taking than disposition, we can test whether risky behavior is independent of dispositional variables. Finally, we test the validity of key measures with confirming measures.
CHAPTER IV
EXPERIMENTAL DESIGN

This inquiry into the formation of entrepreneurial risk perceptions particularly focuses on the effect of self-efficacy on risk taking behavior. Prior chapters argued that the topic has broad usefulness and intellectual interest and lay out the specific questions which require answering. Similarly, this study and its critical research questions have been positioned in the context of extant knowledge and existing unanswered questions.

INTRODUCTION

The literature suggests two important relationships. Figure 8 (p. 97) presents the hypothesized model. First, self-efficacy perceptions should significantly affect opportunity (and threat) perceptions. Second, opportunity perceptions should significantly affect risk taking behavior (while threat perceptions should inversely affect risky behavior). The literature also suggests a competing hypothesis that these phenomena may not depend on self-perceptions on task competence (i.e., self-efficacy).
Instead, they may hinge upon dispositional factors (risk taking personality). This study tested subjects on risky decision making. Experimentation was necessary to directly manipulate competence and control perceptions using explicit performance feedback.

This experiment explores the underlying dimensions of perceptions relevant to decision making. Strategic behavior, particularly entrepreneurial behavior, appears to depend greatly upon perceptions of opportunity (and threat). The risks involved include the risk of loss which corresponds to threat perceptions. They also include the newer concept of 'missing the boat' risk (Dickson and Giglierano, 1986) which is associated with opportunity perceptions. The study tested the differential effects of perceived self-efficacy and personality traits directly on these perceptions and indirectly on risky behavior.

OVERVIEW

This investigation primarily explores the relationships between opportunity and threat perceptions, perceived self-efficacy, psychological characteristics and risk taking. An outline of the proposed experimental process is found in Figure 9 below.
Debriefing

Round 2 of Decision Tasks ("Warmup")

Subjects Report Perceptions of Risk, Control and Self-Efficacy

Subjects Complete Trait Battery (awaiting feedback)

INTERVENTION: Performance Feedback

Round 2 of Decision Tasks

Subjects Report Perceptions of Risk, Control and Self-Efficacy

Debriefing

Figure 9. Flowchart of Experimental Protocol
EXPERIMENT DESCRIPTION

The experiment straightforwardly manipulated subjects' perceptions of competence using performance feedback. The study then measured changes in subjects' risk taking behavior and perceptions of competence, control, opportunity perceptions, threat perceptions, risk of loss, and risk of missing an opportunity.

The experimental task entailed risky decisions where subjects chose between two alternatives under uncertainty. Subjects made an initial round of eight gamble choices similar to those used by previous researchers to measure risk taking biases. The gamble choices were between a high probability of a smaller reward (the cautious option) and a lower probability of a higher reward (the risky option). Subjects also made an initial round of eight different choice dilemmas. Dilemmas are also widely used in risk taking research but present the choice between risky and cautious options in a different format, using more detailed scenarios. After each of the initial gamble and dilemma decisions, the various perception variables were measured. These items were selected to represent as broad a range of situations and decision contexts as possible (e.g., some are highly detailed, others are highly ambiguous).

Competence perceptions were then manipulated using performance feedback. Prior research suggested this would
significantly modify subjects' perceived self-efficacy (Bandura, 1986).

Induction of an illusion of control requires consistent feedback from only a handful of trials (Langer, 1983). Similarly, performance feedback robustly manipulates changes in perceived self-efficacy (Bandura, 1986).

After receiving feedback, subjects then completed a second round of risk-taking tasks accompanied by re-measurement of the above variables. This was followed by thorough debriefing.

The results provide new information on changes in self-efficacy perceptions, changes in opportunity and threat perceptions and measures of objective risk taking and other relevant information. Thus, one can directly test whether changes in perceived self-efficacy induces changes in perceived opportunity and threat (which in turn induces changes in risk-taking behavior).

METHODOLOGY

Primary Statistical Method: To adequately test the hypothesized model (Figure 8, p. 95) requires using causal analysis (also known as path analysis). Causal analysis uses regression to decompose the correlation between two variables into direct ('causal') effects and indirect
('spurious') effects. Indirect effects results when another variable covaries with both of the variables in question which inflates or deflates the apparent degree of association between them. Causal analysis is widely used in psychological and organizational research (Asher, 1979).

**Level of Analysis:** The central issues at hand deal with individual phenomena. Therefore, the sample should match the level of analysis and include individuals.

**Sample:** The experiment used a convenience sample of 153 college seniors drawn from the business college of a major university. The pilot study used 32 similar subjects. Relatively naive subjects have a much wider range of risk, control, and self-efficacy perceptions. This avoids at least some range restriction problems. The evidence in general (Greenberg, 1987) and in this context (Cohen, et al., 1986) argues that student samples are acceptable for this type of experiment.

**Sample Size and Statistical Power:** Assuming typical targets for statistical significance (alpha set at .05 and beta set at .20) and a large effect size (typical for feedback experiments), the final size of at least 30 subjects per cell more than achieves the requisite power of .80 (i.e., 1-beta) using standard tables.
THREATS TO VALIDITY

Experiments versus Field Research

The existing evidence on strategic risk taking (including entrepreneurial risk taking) comes from field studies. Those studies paid little direct attention to perceived control, perceived risk or other antecedents of risky behavior. To understand the process underlying risky behavior mandates a more focused study which directly tests the hypothesized relationships.

Entrepreneurship and strategic management researchers have almost exclusively emphasized field research (e.g., questionnaires, archival data, interviews). They argue that the complexity of the phenomena of interest requires the richness of field research to be generalizable.

However, finding support in a controlled laboratory setting in this case actually broadens the generalizability of identified relationships. Marketing and industrial psychology have long found great value from experimentation on complex business-related phenomena (Greenberg, 1987). Controlling for spurious influences would be advantageous and simpler to obtain in an experiment. Controlling for the unknown biases introduced in field research, especially unconscious researcher influences, is even more difficult.

Even if phenomena do require field study, laboratory results help focus and refine the questions used in field
studies. For instance, if the results indicate that threat perceptions are important but opportunity perceptions are not, interviewers should emphasize threat perceptions. Similarly, experiments may suggest that questions about perceived opportunity can be better phrased by referring to the risk of 'missing the boat.'

Conditions for Valid Economic Experiments

Laboratory gambling is not always equivalent to "real" wagering. Even if subjects play for money, rarely are the stakes comparable. Gamblers may also gamble for more than financial reasons. This raises concerns about the validity of laboratory or paper and pencil gambling.

Therefore, this demands that any experimental design be particularly rigorous. The American Psychological Association (1985) offers some guidelines for effective, ethical research. Grether and Wilde (1984) also provide a useful framework to improve the validity of economic experimentation. A valid economic experiment requires two necessary conditions: non-satiation and saliency. In a non-satiated condition subjects always prefer more of the reward than less. Saliency means that subjects see clear connections between their behavior and the reward system. Two further conditions enhance the experiments' credibility: dominance and privacy. Dominance means that the costs of deciding are trivial relative to the rewards. Thus,
experimenters should avoid excessively burdening the subjects. One might attribute errant results to fatigue where the actual problem is a violation of dominance. Privacy means that a subject is unaware of the reward pattern for another. This avoids one subject's responses improperly affecting the responses of another. This experiment does not violate any of these conditions. For instance, subjects were compensated to clearly establish dominance and non-satiation.

Survey-based risk studies have a problem with low response rates and biased responses. Subjects almost always inflate estimates of risk taking, of general risk taking propensities and control perceptions (MacCrimmon and Wehrung, 1986). These biases argue that using an experiment is more valid than using surveys.

Decision theory researchers who study risk taking have more widely used laboratory experiments. Experimenters present subjects with decision situations and asked to choose (or to wager on one alternative) or to rate (or rank) the situations. As noted above, this study follows this model.

Implications for Experimental Design

Use of controlled experimentation increases the likelihood of conditions such as saliency and non-satiation. The experiment reduces bias from individual differences by
randomly assigning subjects to one of four experimental groups based on feedback treatment (positive/positive, positive/negative, negative/positive, negative/negative) or a control group (no performance feedback). The literature suggests a number of potential confounding factors (e.g., framing effects distorting the analysis).

Compensation

Equity dictates paying subjects at least minimum wage ($3.35 per hour). Compensation offers the best mechanism for increasing non-satiation, dominance and saliency. An apparent performance-based reward in the manner of Cohen, et al. (1986), provides additional incentive for sincere responses. This reward gives subjects some hope of winning a significant prize by adding an attractive lottery to the whole game. Two randomly chosen subjects receive a sizeable bonus, if and only if they did not exhibit insincere responses.

THE EXPERIMENTAL TASK

Introduction

This experiment presented subjects with risky decisions, monitored their perceptions of opportunity,
threat, and competence, and measured their risk taking behavior. The experiment manipulated subjects' perceived self-efficacy using positive and negative performance feedback (using reinforcement on the decisions as opposed to altering the task stimulus). Experimenters then re-measured control and risk perceptions and risk taking behavior. While subjects awaited performance feedback they completed a short battery of trait measures which past research had linked with risk taking behavior.

Briefing and Assignment of Subjects to Conditions

Subjects were randomly assigned to treatments (one of the four feedback conditions or the control group) and briefed that the research sought insights into who are "good decision makers."

Initial instructions carefully previewed the procedures, cautioned subjects to not discuss the experiment or their answers with anyone until debriefing was completed for all subjects. Two critical points were made. First, subjects were advised that skillful performance contributes most importantly to overall results. Second, instructions made no reference to risk, risk taking, opportunity, threat or control.

Subjects were advised that they would receive performance feedback based on a consensus of experts after a "warmup" round started the experiment. This feedback on
their results would guide them in the "real experiment."

Subjects completed questions after each set of gambles or
dilemmas to measure outcome variables (self-efficacy,
opportunity/threat perceptions, etc.).

Assignment to Conditions: Subjects were randomly
assigned subjects to either a no-feedback control group or
one of four treatment groups which received bogus
performance feedback. The treatment groups received either
strongly positive or strongly negative feedback for each of
the two decision types. All subjects received identical
instructions which make no mention of risk taking, risk,
opportunity or threat. (Instructions to control group
subjects made no reference to feedback.)

Experimental Tasks

Round 1: Subjects received two sets of risky decisions
('gambles' and 'dilemmas').

The gambles were drawn from the literature and have
been used by other researchers (e.g., Kahneman, et al.,
1982). One diagnostic gamble was included to test the
sincerity of respondents.
(Diagnostic) Do you prefer option E or option F? _____

E: 25% chance to win $240          F: 25% chance to win $250
75% chance to lose $760             75% chance to win $750

(Rational decision makers choose option B over option A.)

Similarly, the dilemmas were drawn from existing, validated instruments. We employed items from the ubiquitous Choice Dilemmas Questionnaire (Cartwright, 1970) and Krasner's revised version which was tailored specifically for entrepreneurship research (Krasner, et al., 1987; Hartley, 1987). Appendix A includes the entire instrument.

Round 2: After getting the feedback, subjects received a second round of the two types of risky decisions. Similar items were placed in each round.

MANIPULATION OF VARIABLES

Manipulating Perceived Self-Efficacy and Control

After Round 1: Subjects completed questions on their perceptions of opportunity, threat, self-efficacy, control and risk (including both the risk of loss and the risk of 'missing the boat'). Subjects then turned in their completed forms to the experimenter. While subjects completed a short battery of personality scales associated with risky behavior, the experimenter ostensibly evaluated the
subject's gamble and dilemma decisions by appearing to compare each response with an official-looking document.

Upon completion of the test battery, subjects then received explicit feedback on how "well" they performed. The treatment conditions used feedback reflecting superior, "well above average" results or inferior, "well below average" results on gambles. Performance feedback was independently repeated for dilemma decisions. Below are examples of this feedback as actually presented to subjects and using the standard form.

As the control condition entailed no feedback, these subjects were placed in a separate session. The test battery was given to subjects as 'a change of pace' before continuing.

As noted in Chapter 2.4, experimenters routinely and robustly manipulate perceived self-efficacy using performance feedback which includes quantitative results. Multidimensional feedback has clearly demonstrated robustness under experimental conditions. Subjects appear to distinguish between different feedback messages even if given simultaneously (Ilgen and Moore, 1987). The next two pages contain examples of the standard feedback form given to subjects.
Example of Positive Feedback (on both gambles and dilemmas):

DECISION-MAKING EXPERIMENT

Subject:_______ Day: _________ Time: ______

PERFORMANCE EVALUATION (from practice round):

Evaluation uses the consensus of experts on what constitutes good decisions for each practice round decision. This lets us tell you how many times you made a wise decision.

Choice Dilemmas:

In the practice round, you made a good choice in 6 out of 8 dilemmas. Congratulations!

Standard Gambles:

In the practice round, you made a good choice in 7 out of 8 gambles. Congratulations!

Please begin the main part of the experiment which uses dilemmas and gambles, similar to the practice round items.
Example of Negative Feedback (on both gambles and dilemmas):

DECISION-MAKING EXPERIMENT

Subject:__________  Day: _________  Time: ______

PERFORMANCE EVALUATION (from practice round):

Evaluation uses the consensus of experts on what constitutes good decisions for each practice round decision. This lets us tell you how many times you made a wise decision.

Choice Dilemmas:

In the practice round, you made a good choice in only 1 out of 8 dilemmas. Sorry!

Standard Gambles:

In the practice round, you made a good choice in only 2 out of 8 gambles. Again, sorry!

Please begin the main part of the experiment which uses dilemmas and gambles, similar to the practice round items.
MEASURING OUTCOME VARIABLES

MEASURING PERCEIVED SELF-EFFICACY (COMPETENCE)

Subjects estimated how many "good decisions" they would make out of ten. Following Bandura's prescription, subjects confirm this by next estimating their confidence in that estimate using a Likert scale. Prior self-efficacy research consistently supports the validity of this simple method (Bandura 1977, 1986).

Perceived Self-Efficacy: You have ten (10) "dilemma" decisions to make for real in ten minutes. How many good decisions would you make on these 10 "dilemmas"? On a scale from 1 to 14 how confident are you in this assessment?

(N.B. The unusual 14-point scale is used in Bandura's own research (1977, 1986).)

MEASURING PERCEIVED CONTROL

For exploratory purposes the experiment included questions beyond self-efficacy pertaining to various conceptions of perceived control. Following attribution theory (Cohen, 1960; Seligman and Schulman, 1987), subjects estimated what percentage of their results derive from chance, from skill and from effort. Following Langer (1983),
subjects estimated their perceptions of the degree of control they have in the situation.

Causal Attributions: "Performance on any task could result from ability (or lack of skill), effort (or lack), luck (good or bad) or some combination of these. Please make your best estimate as to what percentage of your performance is due to these three factors.

My performance on these dilemmas is the result of:

______% Ability/Skill
______% Luck/Chance
______% Effort

_________ = 100%"

PERCEIVED OPPORTUNITY AND PERCEIVED THREAT

Dutton and Jackson (1987) imply that the saliency of opportunity and threat perceptions permit simply asking subjects for these perceptions.

Opportunity Perceptions: On a scale from 0 to 100, how much of an opportunity were the dilemma-type decisions? (0 = very risky, 100 = not risky at all) _____
Threat Perceptions: On a scale from 0 to 100, how much of a threat were the dilemma-type decisions? (0 = very risky, 100 = not risky at all) ____

MEASURING PERCEIVED RISK

To corroborate the opportunity and threat perceptions subjects rated the risk of loss and the risk of missing an opportunity. Following Nutt (1986), subjects rated the riskiness of each exercise on a 0-100 scale ("0" = "not risky at all"; "100" = "extraordinarily risky."). Subjects similarly rated the risk of "missing the boat."

Perceived Risk of Loss: On a scale from 0 to 100, how risky were the dilemma-type decisions? (0 = very risky, 100 = not risky at all) ____

'Missing The Boat' Risk: On a scale from 0 to 100, how much risk is there of missing a significant opportunity in these dilemmas? (0 = no risk, 100 = very great risk) ____

MEASURING RISK TAKING BEHAVIOR

Following MacCrimmon and Wehrung (1986), we use the decision responses to calculate the pre-intervention
propensity to take risks (e.g., by simply counting the number of times the subjects chose the riskier option).

Finally, we asked for transparent self-reports as below which address their general risk taking propensity (which should not change with feedback).

General Risk Taking: On a 'dilemma' [or 'gamble' depending on the section] just like these you have a 50% chance of winning $X and a 50% chance of losing $X. You get to determine the stakes, $X.

What is the largest amount you would bet ($X) in such a wager on a 'dilemma'['gamble']? ______

In your estimation, what would the average person bet in such a wager? ______

FOLLOWUP

After Round 2: Subjects were again asked for their perceptions of opportunity, threat, the riskiness of their decisions and of their self-efficacy and control. Subjects were also asked debriefing questions: how they felt about doing the experiment and what they thought was the point of the experiment. As a check, subjects were asked if (and how) the feedback affected their self-efficacy perceptions.
Calculation of post-intervention risk taking behavior used the same measures but using subjects' decisions from the Round 2 gambles and dilemmas.

DEBRIEFING

Before receiving compensation subjects were required to attend a debriefing session where they were interviewed to make sure that the deception did not adversely affect them. Debriefing sessions explained the actual research program, solicited subject feedback, offered to provide results on their "risk taking propensities," if subjects so desired, and explained the need for mild deception. In particular, subjects receiving the bogus negative feedback were clearly advised that their performance feedback did not reflect their actual performance. Appendix C contains the script of the debriefing which was given orally and in writing.

PRETESTING

A pilot study using 32 business undergraduates found that the experiment was essentially sound. The major relationships in the model were supported at a statistically
significant level. Changes suggested by the pilot study included better instructions, increasing each battery from 6 to 8 items, a shortened list of perception questions, and a shortened battery of trait measures (to be given while subjects await feedback). The feedback manipulation proved quite robust while the experiment's actual intent was adequately disguised.

TESTING TRAIT MEASURES of RISK TAKING

Despite randomly assigning subjects to experimental conditions and controlling for framing effects, it is still possible that trait measures of risk taking propensity could provide an alternative explanation of risk taking behavior. To be supported, this competing (or complementary) hypothesis requires that one or more trait measures consistently and significantly correlate with risk taking behavior (particularly post-intervention behavior). Procedures followed APA guidelines (1985).

Trait measures will also be tested for moderator effects. A personality trait may enhance or inhibit the strength of subjects' responses. Change in perceptions or behavior would itself be a function of the trait variable, potentially inducing spuriously high or low correlations.
The review of the literature demonstrated that a variety of personality traits have been empirically associated with risk taking. Table 4 (p. 68) provides a short list of prospective dispositional measures which meet the criteria of being empirically linked with risky behavior, psychometric soundness and manageable in length. A brief description of proposed traits to investigate and the appropriate measures to be used. Also included is a recap of their potential direct and moderator effects will follow below to justify choice of these personality variables. Diagnostic items were included to identify insincere respondents. The entire battery required 10-15 minutes to complete.

PROPOSED DISPOSITIONAL MEASURES

Causal Attributions/Explanatory Style

Measure: Attributional Style Questionnaire, a measure of general optimistic explanatory style (Seligman and Schulman, 1987). It contains locus of control as a subscale.

Direct: We intend to manipulate perceptions of control and competence. Well-entrenched control attributions could prove too difficult to modify. Experimenters should get a detailed picture of the subjects' dominant attributional style including locus of control.
Desirability of Control

**Measure:** Desirability of Control (Burger, 1985).

**Direct:** MacCrimmon and Wehrung (1986) suggest that this might explain much of individual differences in risk taking.

**Moderator:** Differentially influences receptivity to feedback. Subjects with high desirability of control tend to prefer positive feedback and ignore negative feedback and vice-versa (Burger, 1985).

Bias toward Positive Outcome Expectancies

**Measures:** Carver and Scheier's Life Orientation Test of global optimism (1985) and the Lorsch and Morse Tolerance of Ambiguity scale used in upper echelon theory research (Govindarajan, 1985). Ambiguity tolerance has also seen wide use in entrepreneurship research (Brockhaus, 1986).

**Direct Effect:** Subjects' belief in positive (or negative) outcomes could bias them in risky decisions.

Predispositions toward Risky Behavior

**Measures:** Established scales that correlate with perceived control, perceived risk and/or risk taking include Sensation Seeking and Impulsivity. These find frequent usage in risk taking research (MacCrimmon and Wehrung, 1986).

**Direct Effect:** Subjects may exhibit excessively strong propensities toward risk taking, whether from personal
experience or social or cultural influence. This could suppress experimental effects.

Preference for Change

Measures: Innovativeness is measured by the Adaption-Innovation Inventory (Kirton, 1976). Another measure associated with risky behavior is future orientation (Gjesme, 1970; MacCrimmon and Wehrung, 1986).

Direct Effect: Subjects who prefer to change may perceive risky behavior as change, not as risk per se.

CHAPTER SUMMARY

Using experimental methods we sought to elicit within-subjects differences in risky behavior and perceived self-efficacy. Bogus performance feedback is intended to separately manipulate self-efficacy perceptions and risk taking for dilemmas and for gambles. Experimentation is clearly preferable to study this phenomenon. However, it requires great care. The experimental design satisfied Grether and Wilde's four conditions (1984) for a valid economic experiment.

The analysis was performed in three stages. First, we employed ANOVA tests to assess the direct effect of feedback on risk taking and self-efficacy. Second, we employed path
analysis to test the interrelationships of the variables measured: risk taking, self-efficacy, and perceptions of opportunity and threat (along with confirming variables). Third, we used correlational tests to identify any association between dispositional variables and risk taking. We also examined whether corroboratory variables significantly correlated with key measures.

The experimental format followed the following protocol. The pre-experiment activities consisted of acquisition of appropriate subjects, introduction and briefing of subjects. Subjects then began the experiment by completing an initial round of eight dilemmas followed by measurement of several perception variables. Next, they completed an initial round of eight gambles followed by measurement of the perception variables.

While awaiting promised feedback on their "warmup round" results, subjects completed a short personality battery which provided a distraction as well as information on dispositional variables. Subjects then received bogus performance feedback separately on gambles and dilemmas.

Subjects then completed a second round of eight dilemmas and eight gambles along with re-measurement of the perception variables for gambles and for dilemmas. Subjects were then debriefed and compensated for their participation.
CHAPTER V

RESULTS AND DISCUSSION

The model proposed in Chapter 3 (Figure 8, p. 97) was clearly supported by the experiment described in Chapter 4. Path analysis (Figures 16 through 18 below) illustrates that every hypothesized relationship was found to be statistically significant. Most importantly, the feedback manipulation was clearly efficacious without introducing spurious effects.

The following discussion analyzes the results for each of the three sets of hypotheses: (I) tests of the manipulation, (II) tests of the model itself and (III) corroboratory tests of dispositional influences and evidence of construct validity for the critical measures.

ANALYSIS I: FEEDBACK AND MANIPULATED VARIABLES [H1 and H2]

The experiment hinged upon the success of the feedback manipulation. The large sample size (a minimum of 30
subjects per cell) provided considerable statistical power. Performance feedback is typically a very robust manipulation (Ilgen and Moore, 1987). However, it was necessary to confirm that feedback had the desired effects. It was even more necessary to confirm that feedback had no undesired effects. This experiment combined the manipulative power of feedback with very sizeable statistical power. One hundred and fifty-three subjects each completed two sets of gambles and two sets of dilemmas. The potential problem was that feedback on dilemmas performance could contaminate results on gambles and vice-versa.

The first group of hypotheses were tested in several ways. First, analyses of variance demonstrated that performance feedback for gambles affected only risk taking and self-efficacy for gambles, not for dilemmas. Performance feedback for dilemmas affected only self-efficacy and risk taking for dilemmas, not gambles. Second, feedback appears to have appropriately manipulated within-subjects differences in subject behavior.

However, we first examine the mean change in risk taking and in self-efficacy by treatment condition (Table 10). Next, we then examine mean changes in all relevant variables for dilemmas and gambles separately (Table 11).
Table 10. Risk Taking and Self-Efficacy by Treatment Condition

<table>
<thead>
<tr>
<th>Feedback Treatment Condition</th>
<th>Dilemma Feedback: Positive Positive None Negative Negative</th>
<th>Gamble Feedback: Positive Negative None Positive Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Change in Risk Taking:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dilemmas Only:</td>
<td>+.23 +.19 .20 -.31 -.40</td>
<td></td>
</tr>
<tr>
<td>Gambles Only:</td>
<td>+.21 -.18 .16 -.08 -.26</td>
<td></td>
</tr>
<tr>
<td>Mean Change in Self-Efficacy:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dilemmas Only</td>
<td>+1.17 +.90 .07 -1.60 -1.77</td>
<td></td>
</tr>
<tr>
<td>Gambles Only</td>
<td>+2.17 -1.13 -.14 +1.30 -1.07</td>
<td></td>
</tr>
</tbody>
</table>
Table 11. Mean Change in Variables by Treatment Condition

**Feedback Treatment Condition**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Feedback Treatment Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dilemma Feedback: Positive Positive Negative Negative</td>
</tr>
<tr>
<td></td>
<td>Gamble Feedback: Positive Negative Positive Negative</td>
</tr>
<tr>
<td>Perceived Control:</td>
<td></td>
</tr>
<tr>
<td>Dilemmas</td>
<td>3.40 1.40 0.32 -9.19</td>
</tr>
<tr>
<td>Gambles</td>
<td>15.37 -11.14 11.61 -10.32</td>
</tr>
<tr>
<td>Opportunity/Threat Perceptions:</td>
<td></td>
</tr>
<tr>
<td>Opportunity Perceptions:</td>
<td></td>
</tr>
<tr>
<td>Dilemmas</td>
<td>4.92 -.93 -10.60 -10.92</td>
</tr>
<tr>
<td>Gambles</td>
<td>2.17 -7.30 1.88 -0.93</td>
</tr>
<tr>
<td>Threat Perceptions:</td>
<td></td>
</tr>
<tr>
<td>Dilemmas</td>
<td>-8.54 -3.56 5.00 3.15</td>
</tr>
<tr>
<td>Gambles</td>
<td>-9.38 -6.30 -9.40 1.85</td>
</tr>
<tr>
<td>Risk Perceptions:</td>
<td></td>
</tr>
<tr>
<td>Risk of Loss</td>
<td></td>
</tr>
<tr>
<td>Dilemmas</td>
<td>-3.60 -1.77 -4.19 2.42</td>
</tr>
<tr>
<td>Gambles</td>
<td>-11.30 -1.20 -2.10 12.90</td>
</tr>
<tr>
<td>'Missing the Boat' Risk</td>
<td></td>
</tr>
<tr>
<td>Dilemmas</td>
<td>-2.20 -5.33 0.42 -5.00</td>
</tr>
<tr>
<td>Gambles</td>
<td>3.37 5.70 3.06 4.19</td>
</tr>
<tr>
<td>Causal Attributions:</td>
<td></td>
</tr>
<tr>
<td>Ability</td>
<td></td>
</tr>
<tr>
<td>Dilemmas</td>
<td>2.63 3.60 -2.10 -0.48</td>
</tr>
<tr>
<td>Gambles</td>
<td>5.20 4.73 3.22 -0.48</td>
</tr>
<tr>
<td>Luck</td>
<td></td>
</tr>
<tr>
<td>Dilemmas</td>
<td>-2.60 -0.47 4.84 1.77</td>
</tr>
<tr>
<td>Gambles</td>
<td>-5.50 -5.57 -3.71 1.29</td>
</tr>
</tbody>
</table>
EFFECTS ON DILEMMAS BEHAVIOR

Risk taking and self-efficacy on dilemmas were significantly affected by dilemma feedback at a significance level of .0001, supporting H1a and H2a. However, feedback on gambles had no effect on dilemma-related behavior, supporting H1d and H2d. Figure 10 and 11 presents supporting ANOVA results. Post hoc Tukey and Scheffe tests confirmed that dilemma feedback affected only dilemma-related behavior while gamble feedback affected only gamble-related behavior. The control group did not significantly differ in dilemma-related behavior.

EFFECTS ON GAMBLERS BEHAVIOR

Risk taking and self-efficacy on gambles were significantly affected by gamble feedback at a significance level of .0001, supporting H1c and H2c. Feedback on dilemmas had no effect on gamble-related behavior, supporting H1b and H2b. Figures 12 and 13 presents supporting ANOVA results. The control group did not significantly differ in gamble-related behavior.
Positive feedback on gambles = ~~~~~~~~~~~

Negative feedback on gambles =

Change in Dilemma Risk Taking

\[ +.2 \]

\[ -.3 \]

Direction of Dilemma Feedback

\[ +.23 \]

\[ +.19 \]

\[ -.31 \]

\[ -.40 \]

**ANCOVA RESULTS:**

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>F</th>
<th>Pr&gt;F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dilemma Feedback</td>
<td>17.64</td>
<td>.0001</td>
</tr>
<tr>
<td>Gamble Feedback</td>
<td>0.04</td>
<td>NS</td>
</tr>
<tr>
<td>Interaction</td>
<td>0.02</td>
<td>NS</td>
</tr>
</tbody>
</table>

Overall R² = .13

Overall F = 5.90 (p<.001)

Figure 10. Effect of Feedback on Dilemmas Risk Taking
Positive feedback on gambles =
Negative feedback on gambles =

Change in Dilemma Perceived Self-Efficacy

![Diagram showing the effect of feedback on perceived self-efficacy for dilemmas.]

**ANOVA RESULTS:**

| SOURCE         | F     | P>|F| |
|----------------|-------|-----|
| Dilemma Feedback | 89.28 | .0001 |
| Gamble Feedback  | 0.70  | NS  |
| Interaction      | 0.00  | NS  |

Overall R² = .44
Overall F = 29.92
(p<.0001)

**Figure 11. Effect of Feedback on Perceived Self-Efficacy for Dilemmas**
Positive feedback on gambles =

Negative feedback on gambles =

Change in Gambles
Risk Taking

Direction of Dilemma Feedback

\[ +.15 \]

\[ -.24 \]

\[ +.21 \]

\[ -.17 \]

ANOVA RESULTS:

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>( \hat{\beta} )</th>
<th>( P &gt; \hat{F} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dilemma Feedback</td>
<td>0.82</td>
<td>NS</td>
</tr>
<tr>
<td>Gamble Feedback</td>
<td>8.52</td>
<td>.005</td>
</tr>
<tr>
<td>Interaction</td>
<td>0.00</td>
<td>NS</td>
</tr>
</tbody>
</table>

Overall \( R^2 = .07 \)
Overall \( F = 3.12 \) (\( p < .03 \))

Figure 12. Effect of Feedback on Gambles Risk Taking
Figure 13. Effect of Feedback on Perceived Self-Efficacy for Gambles

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>F</th>
<th>P&gt;</th>
<th>F</th>
<th>Overall R²</th>
<th>Overall F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dilemma Feedback</td>
<td>0.01</td>
<td>NS</td>
<td></td>
<td>.36</td>
<td>21.71</td>
</tr>
<tr>
<td>Gamble Feedback</td>
<td>8.52</td>
<td>.005</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction</td>
<td>0.04</td>
<td>NS</td>
<td></td>
<td></td>
<td>(&lt;.0001)</td>
</tr>
</tbody>
</table>
EFFECTS ON OVERALL DIFFERENCES (Dilemmas and Gambles)

We can test for within-subjects results by simply normalizing responses to dilemma and gamble items and pooling them. This gives us two risk taking scores and two self-efficacy scores for each subject. The ANOVA analysis tested the direct effects of feedback direction (positive or negative) and question format (dilemma or gamble) on risk taking and self-efficacy. Dilemma and gamble measures may not be fully comparable even after normalizing and we spuriously increase the statistical power. However, results showed no significant main effect for question format (whether dilemma or gamble) nor any interaction effect. However, results showed a significant main effect for the direction of feedback (positive or negative) on changes for both risk taking and perceived self-efficacy (Figures 14 and 15). Post hoc Tukey and Scheffe tests confirmed that only feedback had a main effect. The control group (no feedback) did not significantly differ from experimental groups on any variable. Means for groups receiving the same feedback on both exercises (both positive or both negative) were significantly different from zero on risk taking and perceptual variables in the expected directions. Means for groups receiving mixed feedback (positive on one, negative on the other) did not significantly differ from zero.
Change in Risk Taking

Positive feedback on gambles = +.3
Negative feedback on gambles = +.21
Negative Feedback
Positive Feedback

Direction of Dilemma Feedback

ANOVA RESULTS:

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>F</th>
<th>P  &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedback Direction</td>
<td>4.94</td>
<td>.03</td>
</tr>
<tr>
<td>(+/-)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question Format</td>
<td>0.44</td>
<td>NS</td>
</tr>
<tr>
<td>(dilemma/gamble)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interaction</td>
<td>0.22</td>
<td>NS</td>
</tr>
</tbody>
</table>

Figure 14. Effect of Feedback on Risk Taking:
Dilemmas and Gambles Combined
Positive feedback on gambles: +2.83
Negative feedback on gambles: -2.0

Change in Perceived Self-Efficacy

+2.0
-2.0

Negative Feedback
-30
-2.83

Positive Feedback
+2.47

Direction of Dilemma Feedback

SOURCE | F | Pr>F
Feedback Direction | 8.96 | .001
(+) | | |

ANOVA RESULTS:

Question Format 1.01 NS (dilemma/gamble)
Interaction 1.11 NS

Overall R2 = .39
Overall F = 20.81 (p<.001)

Figure 15. Effect of Feedback on Perceived Self-Efficacy: Dilemmas and Gambles Combined
DEBRIEFING CHECK ON FEEDBACK MANIPULATION

It is important to be clear whether subjects believed the feedback. At the end of the experiment, subjects answered several debriefing items which served to assess the perceived impact of the feedback on their responses. Subjects responded to questions on (a) whether the warmup round had any effect, (b) whether they believed the feedback was accurate, (c) how they felt about the experiment and (d) what they thought the experiment was about. If the manipulation was effective, subjects should have answered that the warmup round did have an effect, that the feedback was accurate, that the experiment induced no negative affect and that their guesses about the actual purpose of the experiment were incorrect. Appendix E contains subject comments on the first two questions.

Of the 153 subjects, 66 responded other than expected on at least one of these questions. Rather than delete these from the model as reported here, Appendix B contains the model with only the 87 subjects who answered appropriately. These results were even stronger than those reported here. The model is also tested using only the suspect 66 subjects. These results were much weaker, though several subjects who reported that the feedback was inaccurate did respond significantly to the manipulation.
CONTROL GROUP DIFFERENCES

The final consideration is whether the presence of feedback (or its absence) induces additional differences in subject responses. Thus a control group which received no feedback was measured on the same instruments as the treatment groups. In particular, the control group should not differ in its risk taking behavior from the mean of the treatment groups. Table 12 below compares mean changes for subjects receiving feedback and for subjects receiving no feedback on the measured variables.

Table 12 demonstrates that changes in the variables measured did not significantly differ between the treatment groups and the control (no feedback) group for the critical variables: risk taking, self-efficacy and opportunity and threat perceptions. Understandably, the control group showed significant differences on causal attributions, seeing performance on both gambles and dilemmas as decreasingly based on ability and increasingly based on luck. Also, the control group exhibited a significant increase in perceived personal control. These effects merit further research.

In conclusion, the feedback manipulation functioned as anticipated. Dilemma-related behavior was independent of performance feedback on gambles. Gamble-related behavior was independent of performance feedback on dilemmas.
Table 12. Mean Changes for Control Group and Treatment Groups: Dilemmas and Gambles

<table>
<thead>
<tr>
<th>Variable</th>
<th>No Feedback (control group)</th>
<th>Feedback Received (treatment groups)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Taking Behavior. D: 0.19</td>
<td></td>
<td>-0.02 (dilemmas)</td>
</tr>
<tr>
<td>Self-Efficacy G: 0.15</td>
<td></td>
<td>-0.05 (gambles)</td>
</tr>
<tr>
<td>Perceived D: 0.07</td>
<td></td>
<td>-0.34</td>
</tr>
<tr>
<td>Opportunity G: -0.14</td>
<td></td>
<td>0.17</td>
</tr>
<tr>
<td>(Strategic issue categorization)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived D: -7.19</td>
<td></td>
<td>-4.97</td>
</tr>
<tr>
<td>Threat G: -3.59</td>
<td></td>
<td>-0.75</td>
</tr>
<tr>
<td>Perceived D: 2.50</td>
<td></td>
<td>-1.66</td>
</tr>
<tr>
<td>Threat G: -5.25</td>
<td></td>
<td>-5.93</td>
</tr>
<tr>
<td>Perceived Control D: 10.64</td>
<td></td>
<td>-1.69*</td>
</tr>
<tr>
<td>Control G: 9.14</td>
<td></td>
<td>2.14*</td>
</tr>
<tr>
<td>(Risk Perceptions)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk of Loss D: 10.00</td>
<td></td>
<td>1.39</td>
</tr>
<tr>
<td>G: -1.00</td>
<td></td>
<td>0.76</td>
</tr>
<tr>
<td>Missing the Boat Risk D: -4.57</td>
<td></td>
<td>-2.30</td>
</tr>
<tr>
<td>G: -5.38</td>
<td></td>
<td>2.88*</td>
</tr>
<tr>
<td>(Causal Attributions)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability D: -3.00</td>
<td></td>
<td>0.89*</td>
</tr>
<tr>
<td>G: -2.62</td>
<td></td>
<td>3.82**</td>
</tr>
<tr>
<td>Luck D: 3.86</td>
<td></td>
<td>0.76**</td>
</tr>
<tr>
<td>G: 0.72</td>
<td></td>
<td>-4.40**</td>
</tr>
<tr>
<td>Effort D: -0.86</td>
<td></td>
<td>-1.33</td>
</tr>
<tr>
<td>G: 1.55</td>
<td></td>
<td>0.05</td>
</tr>
</tbody>
</table>

* Between-groups difference significant at .10
** Between-groups difference significant at .01
Having demonstrated that the manipulation worked as expected, we now address the remaining hypotheses, the model itself. Table 13 notes that risk taking and self-efficacy are significantly correlated for both dilemmas and gambles. However, the model hypothesizes that any relationship between perceived self-efficacy and risk taking operates through the intervening variables of opportunity and threat perceptions. Correlations between opportunity and threat perceptions are expected to be similarly spurious.

Figures 16 through 18 present the results of causal (path) analysis. These figures include only the significant paths (Asher, 1979) for dilemmas only (Figure 16), gambles only (Figure 17) and the difference between dilemmas and gambles together (Figure 18).

Opportunity/Threat Perceptions and Self-Efficacy [H3 and H4]

Changes in self-efficacy strongly correlated with changes in opportunity perceptions, strongly and inversely associated with changes in threat perceptions for dilemmas and for gambles (Table 13). However, the model shows that after statistically controlling for opportunity and threat perceptions, self-efficacy did not correlate with risk
taking. The results support Hypotheses 3 and 4 at the .001 level of significance.

Opportunity/Threat Perceptions and Risk Taking [H5 and H6]

Post-feedback changes in risk taking correlated significantly with changes in both perceived opportunity and inversely correlated with changes in threat perceptions for dilemmas and for gambles (Table 13). Hypotheses 5 and 6 were both supported at the .001 significance level.

Exploratory Causal Analysis [H7 and H8]

Table 13 separately presents means, standard deviations and correlations between the model variables for dilemmas and for gambles. However, causal analysis found no significant path (direct effect) between changes in perceived self-efficacy and changes in risk taking despite a significant zero-order correlation between the variables.

Causal analysis partitions the apparent influence of one variable on another into direct (or 'causal') and indirect ('spurious') A significant correlation thus can prove spurious if the correlation is explained by indirect paths through intervening variables.

Causal analysis begins by regressing variables of interest on all prior variables in the model. Table 14
presents hierarchical regression of risk taking on opportunity and threat perceptions and perceived self-efficacy. The regression beta weights correspond to the direct paths.

Table 15 lists the direct paths (beta weights) for the entire model. Causal analysis then deletes those paths which are not significant at the .01 level. Variables which do not contribute a significant direct path will generally not significantly improve the model in terms of adjusted R-squared and overall F. Thus, retaining only significant direct paths yields a parsimonious model.

The final path weights obtain from a regression which retains only the significant paths (Table 16). Figures 16 through 18 graphically present the final model for dilemmas, for gambles and overall (the difference between dilemmas and gambles).
Table 13. Means, Standard Deviations and Correlations

Correlations for Dilemmas:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean (S.D.)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Risk Taking</td>
<td>0.00 (0.68)</td>
<td>1.000</td>
<td>.320</td>
<td>-.403</td>
<td>.423</td>
</tr>
<tr>
<td>2. Perceived Opportunity</td>
<td>-4.81 (21.5)</td>
<td>---</td>
<td>1.000</td>
<td>-.007*</td>
<td>.473</td>
</tr>
<tr>
<td>3. Perceived Threat</td>
<td>-0.42 (20.8)</td>
<td>---</td>
<td>---</td>
<td>1.000</td>
<td>-.336</td>
</tr>
<tr>
<td>4. Perceived Self-Efficacy</td>
<td>-.26 (1.9)</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1.000</td>
</tr>
</tbody>
</table>

All correlations were significant at p=.001, N=153.

Correlations for Gambles:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean (S.D.)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Risk Taking</td>
<td>0.00 (0.69)</td>
<td>1.000</td>
<td>.335</td>
<td>-.222</td>
<td>.236</td>
</tr>
<tr>
<td>2. Perceived Opportunity</td>
<td>-1.67 (23.6)</td>
<td>---</td>
<td>1.000</td>
<td>.051*</td>
<td>.387</td>
</tr>
<tr>
<td>3. Perceived Threat</td>
<td>-5.53 (28.4)</td>
<td>---</td>
<td>---</td>
<td>1.000</td>
<td>-.290</td>
</tr>
<tr>
<td>4. Perceived Self-Efficacy</td>
<td>0.05 (1.86)</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>1.000</td>
</tr>
</tbody>
</table>

All correlations were significant at p=.001, N=153, except those marked with an asterisk (*).
Table 14. Results of Initial Regression Analysis: Stepwise Inclusion of All Hypothesized Model Variables

### Stepwise Model: Dilemmas

<table>
<thead>
<tr>
<th>Steps: Independent Variables Added</th>
<th>Adjusted $R^2$</th>
<th>Change in $R^2$</th>
<th>t-statistic *</th>
<th>(p level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Perceived Opportunity</td>
<td>.185</td>
<td>.185</td>
<td>2.84</td>
<td>(.0001)</td>
</tr>
<tr>
<td>2) Perceived Threat</td>
<td>.360</td>
<td>.175</td>
<td>-5.68</td>
<td>(.0001)</td>
</tr>
<tr>
<td>3) Perceived Self-Efficacy</td>
<td>.354</td>
<td>-.006</td>
<td>1.18</td>
<td>(n.s.)</td>
</tr>
</tbody>
</table>

Overall F, all variables = 19.59 (p<.0001)

Overall F, Final Model = 22.66 (p<.0001)

* for entering variable

### Stepwise Model: Gambles

<table>
<thead>
<tr>
<th>Steps: Independent Variables Added</th>
<th>Adjusted $R^2$</th>
<th>Change in $R^2$</th>
<th>t-statistic *</th>
<th>(p level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Perceived Opportunity</td>
<td>.102</td>
<td>.102</td>
<td>3.77</td>
<td>(.0003)</td>
</tr>
<tr>
<td>2) Perceived Threat</td>
<td>.156</td>
<td>.044</td>
<td>-2.87</td>
<td>(.005)</td>
</tr>
<tr>
<td>3) Perceived Self-Efficacy</td>
<td>.158</td>
<td>.002</td>
<td>1.18</td>
<td>(n.s.)</td>
</tr>
</tbody>
</table>

Overall F, all variables = 8.28 (p<.0001)

Overall F, Final Model = 11.68 (p<.0001)

* for entering variable
Table 15. Initial Path Coefficients
(all variables and paths included)

**Initial Coefficients for Dilemmas:**

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Risk Taking</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Perceived</td>
<td>.188</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opportunity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Perceived</td>
<td>-.383</td>
<td>.022*</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Threat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Perceived</td>
<td>.122*</td>
<td>.363</td>
<td>-.243</td>
<td>---</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Coefficients marked * are not significant at p=.10; otherwise all other coefficients significant at p=.001

**Initial Coefficients for Gambles:**

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Risk Taking</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Perceived</td>
<td>.276</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opportunity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Perceived</td>
<td>-.210</td>
<td>.093*</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Threat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Perceived</td>
<td>.030*</td>
<td>.349</td>
<td>-.272</td>
<td>---</td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Coefficients marked * are not significant at p=.10; otherwise all other coefficients significant at p=.001
### Table 16. Final Path Model: Decomposition Model

#### Causal Paths for Dilemmas:

<table>
<thead>
<tr>
<th>Bivariate Relationship</th>
<th>Causal Path</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct</td>
</tr>
<tr>
<td>Risk taking, perceived opportunity</td>
<td>.330</td>
</tr>
<tr>
<td>Risk taking, perceived threat</td>
<td>-.462</td>
</tr>
<tr>
<td>Perceived self-efficacy, perceived opportunity</td>
<td>.387</td>
</tr>
<tr>
<td>Perceived self-efficacy, perceived threat</td>
<td>-.282</td>
</tr>
</tbody>
</table>

(all direct paths are significant at p=.001)

#### Causal Paths for Gambles:

<table>
<thead>
<tr>
<th>Bivariate Relationship</th>
<th>Causal Path</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct</td>
</tr>
<tr>
<td>Risk taking, perceived opportunity</td>
<td>.320</td>
</tr>
<tr>
<td>Risk taking, perceived threat</td>
<td>-.462</td>
</tr>
<tr>
<td>Perceived self-efficacy, perceived opportunity</td>
<td>.338</td>
</tr>
<tr>
<td>Perceived self-efficacy, perceived threat</td>
<td>-.256</td>
</tr>
</tbody>
</table>

(all direct paths are significant at p=.001)
Changes in Perceived Self-Efficacy for Dilemmas

+.387

Change in Perceived Opportunity for Dilemmas

+.330

Change in Dilemma Risk Taking Behavior

-.462

Change in Perceived Threat for Dilemmas

-.282

Figure 16. Path Diagram of Dilemma Results
Changes in Perceived Self-Efficacy for Gambles

Change in Perceived Opportunity for Gambles

Change in Perceived Threat for Gambles

Change in Gamble Risk Taking Behavior

+.338

- .256

+.320

- .241

(signed paths only)

Figure 17. Path Diagrams of Gamble Results
As Table 16 and as Figures 16 and 17 suggest, no direct path exists between perceived self-efficacy and risk taking either for dilemmas or for gambles. Covariation between risk taking and self-efficacy is explained by the indirect paths through opportunity perceptions and threat perceptions. Hypothesis 7 is thus supported.

Similarly, causal analysis found no significant path (direct effect) between changes in opportunity perceptions and changes in threat perceptions for either dilemmas or gambles (Figures 16 and 17 and Table 15). This implies that both make unique contributions to explaining the variance in risky behavior. Theory suggests that riskiness and attractiveness should both influence risky decisions (Nygren, 1977; Slovic, et al., 1984; Vlek and Stallen, 1981). Again, the common influence of perceived self-efficacy induced a spurious correlation between opportunity and threat perceptions. Hypothesis 8 is thus supported.

Causal analysis also clearly verifies that changes in opportunity and threat perceptions are meaningfully associated with changes in risk taking, an overt behavior, giving further credence to the measures.

**DILEMMA-GAMBLE DIFFERENCES**

As a final confirmation of the model, path analysis is also applied to data which reflect the difference between
subject responses on the dilemma exercises and the gamble exercises. The measure of risk taking is simply the change in dilemma risk taking minus the change in gamble risk taking. Similarly, the perception variables (opportunity, threat, and self-efficacy) are the difference between the response for dilemmas and gambles. For instance, the intra-subject difference in self-efficacy is calculated by subtracting the change in gamble self-efficacy perceptions from the change in dilemma self-efficacy perceptions. Table 17 below reproduces the causal analysis (shown in Tables 13 through 16). Figure 18 graphically presents the final model.

Note that the final direct path weights are generally greater than for either gambles or dilemmas separately. This suggests that the differences in opportunity and threat perceptions (between gambles and dilemmas) are powerful explanators of the difference between gamble and dilemma risk taking. These results are even somewhat stronger than those for gambles or dilemmas separately.

This has important implications for the fundamental question of this study. If subjects perceive different levels of self-efficacy for gambles and dilemmas, they will have comparable differences in their opportunity and threat perceptions and will exhibit comparable differences in risk taking. Even though the dilemmas and gambles are highly similar, subjects will behave differently. Situational cues dominate dispositional influences.
Table 17. Path Model for Dilemma-Gamble Differences

Data for Dilemma-Gamble Differences:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean (S.D.)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Risk Taking</td>
<td>0.00 (0.92)</td>
<td>1.000</td>
<td>.426</td>
<td>-.342</td>
<td>.263</td>
</tr>
<tr>
<td>2. Perceived</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opportunity</td>
<td>-6.48 (36.4)</td>
<td></td>
<td>1.000</td>
<td>.196</td>
<td>.458</td>
</tr>
<tr>
<td>3. Perceived</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threat</td>
<td>-5.96 (40.7)</td>
<td></td>
<td></td>
<td>1.000</td>
<td>-.312</td>
</tr>
<tr>
<td>4. Perceived</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-Efficacy</td>
<td>-.20 (3.0)</td>
<td></td>
<td></td>
<td></td>
<td>1.000</td>
</tr>
</tbody>
</table>

All correlations were significant at p=.001, N=153

Stepwise Model: Dilemma-Gamble Differences

<table>
<thead>
<tr>
<th>Steps: Independent Variables Added</th>
<th>Adjusted R²</th>
<th>Change in R²</th>
<th>t-statistic *</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Perceived Opportunity</td>
<td>.185</td>
<td>.185</td>
<td>2.84 (.0001)</td>
</tr>
<tr>
<td>2) Perceived Threat</td>
<td>.360</td>
<td>.175</td>
<td>-5.68 (.0001)</td>
</tr>
<tr>
<td>3) Perceived Self-Efficacy</td>
<td>.354</td>
<td>-.006</td>
<td>1.18 (n.s.)</td>
</tr>
</tbody>
</table>

* for entering variable

Overall F, all variables = 11.93 (p<.0001)
Overall F, Final Model = 33.58 (p<.0001)

Causal Paths for Dilemma-Gamble Differences:

<table>
<thead>
<tr>
<th>Bivariate Relationship</th>
<th>Direct</th>
<th>Indirect</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk taking, perceived opportunity</td>
<td>.497</td>
<td>.048</td>
<td>.545</td>
</tr>
<tr>
<td>Risk taking, perceived threat</td>
<td>-.476</td>
<td>-.048</td>
<td>-.524</td>
</tr>
<tr>
<td>Perceived self-efficacy, perceived opportunity</td>
<td>.375</td>
<td>.062</td>
<td>.437</td>
</tr>
<tr>
<td>Perceived self-efficacy, perceived threat</td>
<td>-.262</td>
<td>-.062</td>
<td>-.324</td>
</tr>
</tbody>
</table>

(all direct paths are significant at p=.001)
Figure 18. Path Diagram of Overall Regression Results

Changes in Perceived Self-Efficacy

+0.375

Changes in Perceived Opportunity

+0.497

Change in Risk Taking Behavior

-0.262

Change in Perceived Threat

-0.476

(significant paths only)
A: Risk Taking Personality Versus Situational Risk Taking

Table 18 below shows that certain trait measures (locus of control, optimism, impulsivity, desire for control and sensation-seeking) correlated significantly with pre-feedback risk taking. However, no measure significantly correlated with post-feedback risk taking nor with changes in risk taking, supporting Hypothesis 9.

In further support of Hypothesis 9, the scales that should not have correlated with risky behavior (ambiguity tolerance, innovativeness and entrepreneurial intentions) were not significantly correlated with any measure of risk taking (or changes in risk taking). Similarly, neither categorization measure was associated with any dispositional measure.

There were no apparent moderator effects from personality measures. No personality measure correlated significantly with any of the changes in risk taking nor with changes in any of the perception variables.

In conclusion, the situational influence of manipulating perceived self-efficacy via performance feedback dramatically overrides dispositional influences.
Table 18. Correlations between Risk Taking and Trait Measures

<table>
<thead>
<tr>
<th>Trait</th>
<th>PRE-Feedback Risk Taking</th>
<th>POST-Feedback Risk Taking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimism</td>
<td>.15 (p&lt;.10)</td>
<td>.01 (ns)</td>
</tr>
<tr>
<td>Internal Control</td>
<td>.17 (p&lt;.10)</td>
<td>.07 (ns)</td>
</tr>
<tr>
<td>Desire for Control</td>
<td>.16 (p&lt;.10)</td>
<td>.08 (ns)</td>
</tr>
<tr>
<td>Sensation Seeking</td>
<td>.18 (p&lt;.10)</td>
<td>.00 (ns)</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>.16 (p&lt;.10)</td>
<td>-.01 (ns)</td>
</tr>
<tr>
<td>Entrepreneurial intent</td>
<td>.11 (ns)</td>
<td>-.03 (ns)</td>
</tr>
<tr>
<td>Innovativeness</td>
<td>.42 (p&lt;.01)</td>
<td>.29 (p&lt;.05)</td>
</tr>
<tr>
<td>Ambiguity Tolerance</td>
<td>-.02 (ns)</td>
<td>-.07 (ns)</td>
</tr>
</tbody>
</table>
B: Evidence of Construct Validity

Subjects responded to additional items which corroborated the central variables of the study. These corroboratory items consistently confirmed the direction and magnitude of the tested relationships (see Table 19).

Corroboratory Items—Control Perceptions

Changes in global perceived control correlated strongly with changes in self-efficacy, perceived opportunity, and causal attributions of ability. The changes correlated negatively with changes in perceived threat. The strength of these correlations suggests considerable overlap between perceived control and self-efficacy (Table 19). Hypothesis 10 is thus supported at the .01 level of significance.
Table 19. Correlations between Opportunity/Threat Perceptions and Risk Perceptions

<table>
<thead>
<tr>
<th>Perceived Opportunity</th>
<th>Perceived Threat</th>
<th>Perceived Risk of Missing the Boat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Perceived Risk of &quot;Missing the Boat&quot;</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n.s. (+)</td>
<td>-.22 (-)</td>
<td>*</td>
</tr>
<tr>
<td><strong>Perceived Risk of Loss</strong></td>
<td>.18 (-)</td>
<td>.21 (+)</td>
</tr>
</tbody>
</table>

(Results for Dilemmas Only)

<table>
<thead>
<tr>
<th>Perceived Opportunity</th>
<th>Perceived Threat</th>
<th>Perceived Risk of Missing the Boat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Perceived Risk of &quot;Missing the Boat&quot;</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+.28 (+)</td>
<td>-.22 (-)</td>
<td>*</td>
</tr>
<tr>
<td><strong>Perceived Risk of Loss</strong></td>
<td>n.s. (-)</td>
<td>+.19 (+)</td>
</tr>
</tbody>
</table>

(Results for Gambles Only)
Table 18. Correlations (and p-values): Perceived Control versus Related Perceptions

<table>
<thead>
<tr>
<th>(dilemmas only)</th>
<th>Perceived Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Self-Efficacy</td>
<td>0.22 (p&lt;0.001)</td>
</tr>
<tr>
<td>Perceived Opportunity</td>
<td>0.35 (p&lt;0.001)</td>
</tr>
<tr>
<td>Ability Attributions</td>
<td>0.06 (n.s.)</td>
</tr>
<tr>
<td>Perceived Threat</td>
<td>-0.12 (n.s.)</td>
</tr>
<tr>
<td>Luck Attributions</td>
<td>-0.03 (n.s.)</td>
</tr>
<tr>
<td>Perceived Risk of Loss</td>
<td>0.07 (n.s.)</td>
</tr>
<tr>
<td>'Missing the Boat' Risk</td>
<td>0.00 (n.s.)</td>
</tr>
</tbody>
</table>

Correlations for Dilemmas Only

<table>
<thead>
<tr>
<th>(gambles only)</th>
<th>Perceived Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Self-Efficacy</td>
<td>0.48 (p&lt;0.0001)</td>
</tr>
<tr>
<td>Perceived Opportunity</td>
<td>0.40 (p&lt;0.0001)</td>
</tr>
<tr>
<td>Ability Attributions</td>
<td>0.24 (p&lt;0.003)</td>
</tr>
<tr>
<td>Perceived Threat</td>
<td>-0.20 (p&lt;0.03)</td>
</tr>
<tr>
<td>Luck Attributions</td>
<td>-0.15 (p&lt;0.07)</td>
</tr>
<tr>
<td>Perceived Risk of Loss</td>
<td>-0.18 (p&lt;0.03)</td>
</tr>
<tr>
<td>'Missing the Boat' Risk</td>
<td>0.24 (p&lt;0.01)</td>
</tr>
</tbody>
</table>

Correlations for Gambles Only

(p-values given in parentheses)
Corroboratory Items--Risk Perceptions

Changes in the perceived risk of loss correlated significantly with changes in perceived threat and inversely with changes in perceived opportunity and self-efficacy. Changes in perceived risk of loss were also uncorrelated with changes in the perceived risk of 'missing the boat.' Similarly, changes in the perceived risk of 'missing the boat' correlated with changes in perceived opportunity and self-efficacy, and inversely with changes in perceived threat. This evidence supports the hypothesized relationships (H10 and H11) between opportunity and threat perceptions and between these perceptions and self-efficacy (Table 20).

More importantly, the results strongly argue that perceived opportunity and perceived threat are independent constructs, not merely inverses of one another. The same conclusion obtains for perceived risk of loss and perceived risk of 'missing the boat.'
Corroboratory Items—Causal Attributions

The greater the degree of perceived self-efficacy, the more likely subjects would view performance as depending on ability and less upon luck (vice-versa). Similarly, performance in a relatively controllable opportunity situation should be associated more with causal attributions of ability than with luck. Performance in a less controllable threat situation should be more associated with luck. Changes in the perception of luck as a causal agent was strongly influenced by negative feedback. It correlated strongly with changes in threat perceptions and perceived risk of loss, but negatively with opportunity perceptions. Changes in the perception of ability (as a causal agent) was strongly influenced by positive feedback. It also correlated strongly with changes in opportunity perceptions and perceived control while it correlated weakly with the perceived risk of 'missing the boat.' Changes correlated negatively with threat perceptions. (See Table 21 below.) These results further support Hypotheses 10 through 12.
Table 21. Causal Attributions versus Perceptions

<table>
<thead>
<tr>
<th>Causal Attributions of:</th>
<th>Ability</th>
<th>Luck</th>
</tr>
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<tr>
<td></td>
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<td>(external)</td>
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<td>Perceived Opportunity</td>
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<td>(p&lt;.05)</td>
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<td>Perceived Threat</td>
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<tr>
<td>(n=145)</td>
<td>(p&lt;0.02)</td>
<td>(p&lt;0.03)</td>
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<tr>
<td>Risk of Missing an Opportunity</td>
<td>-0.10</td>
<td>0.01</td>
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<tr>
<td>(n=141)</td>
<td>(p&lt;0.10)</td>
<td>(n.s.)</td>
</tr>
<tr>
<td>Perceived Risk of Loss</td>
<td>-0.02</td>
<td>0.11</td>
</tr>
<tr>
<td>(n=148)</td>
<td>(n.s.)</td>
<td>(p&lt;.10)</td>
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Correlations for Dilemmas Only

<table>
<thead>
<tr>
<th>Causal Attributions of:</th>
<th>Ability</th>
<th>Luck</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(internal)</td>
<td>(external)</td>
</tr>
<tr>
<td>Perceived Opportunity</td>
<td>0.14</td>
<td>-0.146</td>
</tr>
<tr>
<td>(n=145)</td>
<td>(p&lt;.05)</td>
<td>(p&lt;.05)</td>
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<tr>
<td>Perceived Threat</td>
<td>-0.19</td>
<td>0.17</td>
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<tr>
<td>(n=145)</td>
<td>(p&lt;0.02)</td>
<td>(p&lt;0.03)</td>
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<tr>
<td>Risk of Missing an Opportunity</td>
<td>-0.10</td>
<td>0.01</td>
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<tr>
<td>(n=141)</td>
<td>(p&lt;0.10)</td>
<td>(n.s.)</td>
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<tr>
<td>Perceived Risk of Loss</td>
<td>-0.02</td>
<td>0.11</td>
</tr>
<tr>
<td>(n=148)</td>
<td>(n.s.)</td>
<td>(p&lt;.10)</td>
</tr>
</tbody>
</table>

Correlations for Gambles Only

(p-values in parentheses)
Manipulation Checks

Other checks found nothing problematic, including diagnostic items incorporated within the risky decision batteries and the trait battery. Subjects appear to have been consistently careful and sincere in their responses. Similarly, changes in the perception and behavior variables were uniformly uncorrelated with any of the dispositional measures. Appendix E lists subject comments regarding their perceived accuracy and impact of the feedback and their perception of the experiment's purpose.

Finally, none of the measures were significantly associated with age, gender, major or honor student status.
Studies of entrepreneurial optimism suggest clues toward understanding a critical dimension underlying opportunistic behavior: perceived self-efficacy. High-risk, high-reward decisions made by entrepreneurs and others need not reflect a general disposition toward risk taking. They may instead reflect an optimism (or pessimism) based on situational cues about task competence.

This experiment yields one striking conclusion that is highly generalizable. If subjects perceive different levels of self-efficacy, they will have comparable differences in their opportunity and threat perceptions and exhibit comparable differences in risk taking behavior. Situational cues clearly dominate dispositional influences.

Past experiments have found between-subject differences in risk taking behavior. This is the first research to demonstrate within-subject differences and to demonstrate their antecedents. Also, research has typically manipulated the task stimulus, rather than reinforce actual decisions.

The first set of results clearly show that performance feedback, even bogus performance feedback will significantly influence risk taking. Positive feedback increases risk taking. Negative feedback decreases risk taking. Feedback has an even stronger influence on perceived self-efficacy.

The second set of results demonstrate that risky
strategic behavior reflects situational perceptions of self-efficacy. However, a closer look shows that self-efficacy has a limited direct effect. Self-efficacy perceptions directly influence perceptions of opportunity and threat. In turn, these directly influence risk taking.

Prior research shows that perceived risks, not the 'objective' risks, motivate decision makers. Thus, they consider both opportunities and threats in a situation, much as they consider both the risk of missing an attractive opportunity (Dickson and Giglierano's 'missing the boat' risk) and the risk of loss. The literature on risk perceptions noted that a sense of situational competence (perceived self-efficacy) or control should underlie not only perceptions but also the potential rewards. The statistical results completely support the hypothesized model.


Self-efficacy is a proven, useful educational mechanism (Bandura, 1986). This results of this research argue that
it should serve equally well in management education, training and development.

Further tests of this model should provide researchers with better perspectives on the antecedents and correlates of strategic issue categorization. They will also shed light on the process of new venture initiation. For instance, one could measure the effect of role models on the perceived feasibility of a new venture in terms of how the role models alter self-efficacy perceptions. This study tentatively suggests that entrepreneurs might greatly inform us about high-risk, high-reward decisions. Entrepreneurs' optimism based on self-efficacy demonstrates the critical importance of situational influences on strategic decision making.

The implications lead to further questions: how do situational and personality factors influence decisions to accept an opportunity and launch a new venture? How do past experiences influence opportunistic behavior? Do they affect causal attributions? Do dispositional influences play any role? This research takes only the first step. Chapter 6 evaluates prospects for future research directions in greater detail.

A farther reaching question is how these phenomena fit into the risk-return decision model used in economics and finance. Does increasing opportunity perceptions increase expected return, decrease expected variability, or both?
CHAPTER VI

FUTURE RESEARCH DIRECTIONS

The highly promising results of this study demonstrate that researchers can identify and measure significant antecedents of opportunity recognition and risk taking behavior. The results also suggest several intriguing directions for future research efforts.

The experiment demonstrated that subjects can have different perceptions and behavior in different situations based on situational cues. Performance feedback clearly alters subjects' perceptions of self-efficacy on a situation by situation basis. Changes in perceived self-efficacy influences changes in opportunity and threat perceptions and, in turn, risk taking behavior. These within-subjects differences argue that these conclusions should generalize to a broad range of circumstances.

Thus, this research provides a useful methodology for further exploration of important issues in decision making. However, this is not to say that techniques cannot be improved and measures and constructs cannot be refined. If we can, this methodology could explore additional issues of Weick's environmental enactment and of March and Simon's bounded rationality.
Figure 8. Hypothesized Model of Opportunistic Behavior

Performance Feedback $\rightarrow$ Change in Perceived Self-Efficacy $\rightarrow$ Change in Perceived Opportunity $\rightarrow$ Change in Risk Taking Behavior $\rightarrow$ Change in Perceived Threat $\rightarrow$ Performance Feedback

(with expected directions of relationships)
Replication and Extension

The strength of the results argues for extension of this study. This can be accomplished by testing the model (Figure 8, repeated above) in different situations and different decision domains. These extensions should explore different dimensions of the decision process. For instance, we can vary the manipulation. Instead of giving differential feedback for question format (gambles versus dilemmas), we could give feedback for business-related versus personal decisions (or, moral/ethical decisions versus financial).

Extensions can address different domains. Do feedback-induced changes in self-efficacy affect moral and ethical decisions? Do they affect decisions involving other decision makers in competitive (e.g., business simulations) or cooperative (e.g., prisoner's dilemma) arenas?

There are alternative ways to measure risk taking propensity which require information about decision makers' utility curves. The Arrow-Pratt coefficient of risk-aversion is calculated directly from subjects' utility curves. Hey's measure of optimism/pessimism requires utility curves estimated from two different domains (or by two different measures of utility). Given two domains with differential feedback the design could explicitly test Hey's theoretical proposition that optimism is independent of risk-aversion (Hey, 1986). After calculating Hey's measure from the two
utility curves one could test whether optimism is indeed independent of risk-aversion. Other models which have been proposed to explain decision making could also be tested (e.g., Bernard's multiplicative model (1986) and Keynes' information-based model tested in Brady and Lee, 1989).

Replication should include improved (or different) measures of risky behavior. McCord and deNeufville (1986) argue that the most unbiased method of estimating utility curves entails use of duplex gambles (i.e., choose between two uncertain options instead of between a certain and an uncertain option). Duplex gambles (or dilemmas) are easily incorporated into any of the proposed extensions. Alternately, item analysis should be intriguing. The model may not hold for certain kinds of decisions. We can test items which all specifically deal with a particular issue: new product development or, more directly, entrepreneurship.

Finally, people rarely make only one or two decisions then stop. What effects would result from more repetitions of the decision-feedback-decision cycle?

Opportunity Recognition

Examining Figure 8 above indicates that while self-efficacy is strongly correlated with risk taking, this relationship is explained by intervening variables of
opportunity (and threat) perceptions. We should further investigate opportunity and threat perceptions, seeking to identify other antecedents and correlates.

First, we need to explore how opportunity and threat perceptions are related to the constructs of risk and return as used by economists. Increasing perceived self-efficacy may increase expected return or decrease expected variability. Or, increasing opportunity perceptions may increase expected return, decrease expected variability, or both. It may well be that the risk-return model may better explain risk taking (and its link to perceived self-efficacy). An important experiment would be to include subjective measures of perceived reward and perceived economic risk (variability). Other analyses would include examination of the existing data to see if feedback significantly changed variance in responses (examine changes in the second moment). If we have utility curve information we can also examine changes in risk-return tradeoffs.

Next, the perceived risk literatures (Slovic, et al., 1984; Vlek and Stallen, 1981; Oglethorpe and Monroe, 1987) suggest a variety of correlates and antecedents of perceived riskiness and perceived acceptability of risks. The design could explicitly assess the impact of these variables in a variety of strategic decision making contexts. For example, perceived risk is inversely related to the familiarity of the risky situation, an easily manipulated variable. Why is
it that known fears are perceived as less risky than unknown fears? Does it derive from a greater perception of control or self-efficacy? We can employ the model to attempt explanation of these related phenomena.

Strategic issue categorization theory posits that opportunities are positive, controllable situations and threats are negative, uncontrollable situations (Dutton and Jackson, 1987). This aspect of the theory is testable by experiments which directly vary these two dimensions.

One simple experiment would be to test the model and the expected influence of feedback on self-efficacy and risk taking in situations which are explicitly labeled as 'opportunity' or 'threat.' Research should examine how opportunity (or threat) recognition influences other strategic decisions. Within a firm, could a situation be an opportunity for a marketing manager but a threat for a production manager? If so, does the model (Figure 8) apply?

Research could explore other critical strategic variables such as corporate mission or distinctive competence. Are strategic actions perceived more as an opportunity if they agree with their mission statements or their distinctive competence?

Finally, researchers could study archival information (perhaps through content analysis (Bowman, 1984)) to identify if self-efficacy or control perceptions existed to
a greater degree in historically opportunistic firms than in strategically-cautious firms.

Perceived Self-Efficacy

Management research has long neglected self-efficacy despite its proven predictive power in other contexts. Researchers should carefully investigate self-efficacy on a wide range of strategic and managerial behaviors and decisions. Does the process always follow this model or are there instances of direct influence? For example, innovation acceptance is a function of self-efficacy (Ellen, 1987). Before a technological innovation is accepted and used by workers or managers they must believe they are capable of successfully using it. Do they also see it as an opportunity (or not as a threat)? Given the model, perhaps innovation-adopters see the existing alternative as a threat.

We need to look at self-efficacy differences at a more specific level. For a given strategic behavior where do managers require strong levels of self-efficacy? Managers' perceived self-efficacy will vary across functional areas, across product-markets and over time. There are obvious human resource management implications. Training and development programs should use perceived self-efficacy to
promote skill acquisition. Self-efficacy might also serve as a useful hiring criterion.

Measures and Methods

It would be useful to attempt development of a better measure of perceived 'missing the boat' risk. It appears that the measure used here yielded weaker than expected correlations with perceived opportunity. If perceived risk of loss is often multidimensional, 'missing the boat' risk may also be. For example, in Silicon Valley it is often asserted that the risk to one's social status may be greater if one does not launch a new and sexy product than if s/he tries and fails. However, we might find in more traditional areas that a failed new venture carries a social stigma.

We must also consider other enrichments to the model. How do changes in self-efficacy and in opportunity and threat perceptions relate to changes (if any) in subjects' causal attributions? Bandura (1986) considers perceived control to be closely related to self-efficacy. We can explicitly test this by examining whether perceived self-efficacy and perceived control make independent contributions to opportunity and threat perceptions. More sophisticated statistical methodology could be brought to
bear. A between-group LISREL design could compare the positive and negative feedback groups.

'High Stakes' Decision Making

Very little research in economics or management has investigated decisions to "bet the farm." While it is difficult to identify actual high stakes decisions (particularly in advance), these results argue that the role of opportunity perceptions are extremely crucial. It may be possible to establish appropriate laboratory conditions to use the model to research this topic. However, research probably must go into the field, armed with questions about self-efficacy and control perceptions. Business historians (and other historians and political scientists) would strongly suggest investigating archival data for signs of such perceptions.

Entrepreneurship

Research needs to further study what areas of self-efficacy influence new venture initiation. We can easily employ this model to do so. For instance, role models may encourage entrepreneurship by increasing self-efficacy. Many
alleged influences on entrepreneurs (role models, parental businesses, etc.) are mediocre predictors of entrepreneurial behavior. If such an environmental influence fails to alter competence (or control) perceptions then it is unlikely to encourage entrepreneurial behavior. We can also test the model itself by examining whether this environmental influence affects opportunity and threat perceptions.

These results offer clear questions to ask entrepreneurs and the proper way to ask them (i.e., in terms of self-efficacy or control perceptions). Again, researchers can examine self-efficacy at a more specific level: perceived self-efficacy at the various critical entrepreneurial skills identified by the literature. These self-efficacies can be related to success or failure of firms, growth rates, type of firm, industry, or stage of the life cycle. How do these self-efficacies influence perceptions of new venture desirability, feasibility, probability of launch, expected growth and expected chances of success?

Researchers can compare entrepreneurs' self-efficacy to the efficacy perceived by their venture capitalists, identifying where one is far more optimistic than others.

Finally, after exploring these other avenues, entrepreneurial attitudes and intentions could be compared to personality measures. Cursory examination of the scales included here found three scales were strongly associated
with entrepreneurial attitudes and intentions: innovativeness, explanatory style, and desirability of control. These scales have never seen use in entrepreneurship research and thus merit eventual consideration.

First, however, there is much to be done to further research into opportunity recognition and into applying perceived self-efficacy to entrepreneurship and management research. Not matter how generalizable this study might be, it was but the first, tentative step in that direction.
APPENDICES
APPENDIX A

ORIGINAL RESEARCH INSTRUMENT
Choice Dilemmas

Please quickly and carefully read each of these eight "choice dilemmas" before answering.

(#1)

Another firm has approached your company for a joint venture in a new market for both parties. No antitrust or other legal difficulties are expected. If you choose to accept the joint venture, you can very likely expect a 14% return after taxes. If you choose to compete, you will gain either a large market share or a small market share. A large market share will yield a 22% after tax return. A small market share will yield a return of 10% after taxes. In either case, the total investment is the same.

The consensus is that you have a 33% chance of achieving a large market share. If your chances of attaining a large market share were 99% you'd likely compete rather than accept the joint venture offer. If the chances of doing so were only 1%, you'd probably accept the venture offer. As the chances of winning increased, there would be a point at which you'd decide to refuse the joint venture. What is this switchover point? That is, what is the lowest chance of getting a large market share that would cause you to decide to compete instead of taking the joint venture offer? (That is, higher probabilities reflect more caution; lower probabilities reflect more aggressiveness.)

(#2)

A close friend's firm controls a patent on a tool which could revolutionize the do-it-yourself home repair business. The startup costs for this venture will run about $900,000. By stretching, she could raise the needed funds. Or, she could bring in one or more external partners who would each get 10% of the company for each $100,000 they invest.

What percentage of the initial capital would you advise her to put up herself?

(#3)

Mr. J is an American captured by the enemy in World War II and placed in a prisoner of war camp. Conditions in the camp are quite bad with long hours of hard physical labor and a barely sufficient diet. Many prisoners have died of malnutrition and disease. After spending several months in this camp, Mr. J notices a possibility of escape. He could conceal himself in a supply truck that shuttles in and out of camp. Of course, there is no guarantee that the escape would prove successful. Recapture by the enemy could well mean execution.

What is the minimum probability of success you would require before you would advise Mr. J to try the escape?
In the midst of a declining market for your products, your company has the opportunity to introduce a new product. This will result in either a very large market share or a very small market share. No quality control or legal difficulties are expected. If you choose to continue with your current product, you can very likely expect a negative 12% return. If you choose to introduce the new product and gain a large market share, you can expect a negative return of only 10%. If you gain a small market share, you can expect a negative return of 22%. In either case, the total investment is the same.

The consensus is that you have a 33% chance of achieving a large market share. If your chances of attaining a large market share were 99%, you’d likely choose to introduce the new product. If the chances of doing so were only 1%, you’d probably reject the new product. As the chances of succeeding increased, there would be a point where you’d decide to introduce the new product.

What is this switchover point? That is, what is the lowest chance of gaining a large market share that would prompt you to introduce the new product? ______%  
(Again, higher probabilities reflect more caution; lower probabilities reflect more aggressiveness.)

You own a large well-established business. Your business has an opportunity which entails the possibility of an enormous return. It also offers the possibility of losing half of the firm’s entire net worth. Similar opportunities in the past have been a ‘50-50’ proposition. That is, you probably have a 50% chance of making a very large gain and a 50% chance of losing half of your net worth.

What kind of return is necessary for you to accept this investment? (Please express the required return as a multiple of your company’s net worth.) ______ times my firm’s net worth.  
(Note: requiring a larger multiple reflects more caution.)
Mr. A, an electrical engineer, who is married with one child, has been working for a large electronics firm since graduating from college five years ago. He is assured of a lifetime job with a modest, though adequate, salary and liberal retirement benefits. On the other hand, it is very unlikely that his salary will increase much more than the cost of living before he retires. While attending a convention, Mr. A is offered a job with a small, newly founded company which has a highly uncertain future. The new job pays more to start and would offer the possibility of a share in the ownership if the company survived. Imagine you are advising Mr. A.

What is the lowest probability that the newly founded company will succeed which you would consider acceptable to make it worthwhile for Mr. A to take the new job?

A classmate is considering expanding her/his business. She has only two choices. She can (A) build a new plant in her home country with the expectation of a safe, but moderate return on investment of 10% after taxes. Or, (B) she can build in a neighboring country with an unstable political history, but with a riskier, but higher expected return on investment of 30% after taxes. At what probability of success would you recommend (B) to your classmate? (Again, higher probabilities reflect more caution; lower probabilities reflect more aggressiveness.)

You are offered an large investment which offers a 75% chance of making a very sizeable return but also offers a 25% chance of losing half of your net worth.

What kind of return is needed to accept this investment? (Please express the required return as a multiple of your net worth.) ____ times my net worth.

Thanks! Please turn the page.
Please consider the set of 8 dilemma decisions you are about to make. Answer the following questions about your decisions.

On a scale from 0 to 100, how risky are these dilemma-type decisions? (0 = very risky, 100 = not risky at all) _____

You have ten (10) "dilemma" decisions to make for real in ten minutes. How many good decisions would you make on these 10 "dilemmas"? _____ How confident are you in this assessment you just made? Please mark the appropriate box below.

Not Confident At All 0 1 2 3 4 5 6 7 8 9 Completely Confident

On a scale from 0 to 100, how much control will you have over these dilemma-type decisions? (0 = none; 100 = complete control) _____

On a scale from 0 to 100, how much chance is there in your decisions of missing a significant opportunity in these dilemmas? (0 = no chance of missing an opportunity, 100 = very great chance of missing an opportunity) _____

On a 'dilemma' just like these you have a 50% chance of winning $X and a 50% chance of losing $X. You get to determine the stakes, $X. Assume the wager is "for real."

What is the largest amount you would bet ($X) in such a wager on a 'dilemma'? _____

In your estimation, what would the average person bet in such a wager? _____

Performance on a task can be the result of ability, effort, luck or some combination of these. Please estimate what percentage (if any) of your performance on these dilemma decisions will be due to each of these three factors. The three percentages must add up to 100%.

My performance on these dilemmas is the result of:

_____% Ability/Skill
_____% Luck/Chance
_____% Effort
( = 100%)
Standard Gambles

These items are called "standard gambles." Please read each quickly and carefully and select only one option.

(#1) An epidemic of a rare Asian virus has infected 600 of your people, including yourself. You must choose between two mutually exclusive courses of treatment. Your usually reliable experts have estimated the consequences if you go with Treatment A or if you choose Treatment B. You can choose only one and you must choose immediately.

Which option do you choose, A or B? _______

A: 400 people die for certain.
B: One-third chance that nobody will die
Two-thirds chance that 600 will die.

(#2) Consider the following two boxes: Box I contains 100 balls, each either red or black, but the precise composition of the box is unknown to you. Box II contains exactly 50 red balls and exactly 50 black balls.

Do you prefer A or B? _______

A: Lose $1000 if a red ball is drawn from Box I.
B: Lose $1000 if a red ball is drawn from Box II.

(#3) You are considering a price increase for your product.

<table>
<thead>
<tr>
<th>POSSIBLE ACTIONS</th>
<th>EXPECTED OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. DO NOT raise price</td>
<td>100% certainty that competitors WILL NOT raise price and that you WILL NOT LOSE any customers. Profit = + $200,000</td>
</tr>
<tr>
<td>B. DO raise price</td>
<td>50% chance that competitors WILL raise prices and that you WILL NOT LOSE customers. Profit = + $600,000 50% chance that competitors WILL NOT raise price and that you WILL LOSE customers. Profit = - $100,000</td>
</tr>
</tbody>
</table>

PLEASE CHOOSE: A or B (circle one)
You have been asked to buy a lottery ticket for $5. You have a 10% chance of winning $100. Would you buy such a ticket?  YES  NO (please circle one)

You are considering a price increase for your product. Economic conditions are such that you will likely experience a loss this quarter.

POSSIBLE ACTIONS

A. DO NOT raise price

100% certainty that competitors WILL NOT raise price and that you WILL NOT LOSE any customers.

Profit = - $400,000

B. DO raise price

50% chance that competitors WILL raise prices and that you WILL NOT LOSE customers.

Profit = - $220,000

50% chance that competitors WILL NOT raise price and that you WILL LOSE customers.

Profit = - $600,000

PLEASE CHOOSE:  A  or  B (circle one)

You have a 10% chance of losing $1000. Insurance against this possible loss costs $50. Would you buy the insurance?  YES  NO (please circle one)

Do you prefer option A or option B?

A: sure loss of $750, or

B: 75% chance to lose $1000

25% chance to lose nothing

Do you prefer gamble A or gamble B?

A: 75% chance to lose $750

25% chance to win $250

B: 25% chance to win $260

75% chance to lose $740

Thanks! Please make sure all items were answered then give this booklet to the experimenter.
Please consider the set of 8 gamble decisions you are about to make.
Answer the following questions about your decisions.

On a scale from 0 to 100, how risky are these gamble-type decisions?
(0 = very risky, 100 = not risky at all) ______

You have ten (10) "gamble" decisions to make for real in ten minutes. How many good decisions would you make on these 10 "gambles"? ______  How confident are you in this assessment you just made? Please mark the appropriate box below.
Not Confident At All 0 0 0 0 0 0 0 0 Completely Confident

On a scale from 0 to 100, how much control will you have over these gamble-type decisions? (0 = none; 100 = complete control) ______

On a scale from 0 to 100, how much chance is there in your decisions of missing a significant opportunity in gamble-type decisions? (0 = no chance of missing an opportunity, 100 = very great chance of missing an opportunity) ______

On a 'gamble' just like these you have a 50% chance of winning $X and a 50% chance of losing $X. You get to determine the stakes, $X. Assume the wager is "for real."

What is the largest amount you would bet ($X) in such a wager on a 'gamble'? ______

In your estimation, what would the average person bet in such a wager? ______

Performance on a task can result from ability, effort, luck or some combination of these. Please estimate as to what percentage (if any) of your performance on these gamble decisions will be due to each of these three factors. The three percentages must add up to 100%.

My performance on these gambles is the result of:

_______% Ability/Skill
_______% Luck/Chance
_______% Effort
(= 100%)
Choice Dilemmas

Please quickly and carefully read each of these eight "choice dilemmas" before answering.

(#1)

You are offered an large investment which offers a 25% chance of losing half of your net worth but also offers a 75% chance of making a larger, very sizeable return. What kind of return is needed to accept this investment? (Please express the required return as a multiple of your net worth.)

____ times my net worth.

(Higher multiples reflect more caution; lower multiples reflect a more aggressive strategy.)

(#2)

Your firm is threatened by a lawsuit for patent violations. The firm who is suing you proposes a settlement which will cost your firm $800,000. If the case goes to court and you lose, the total cost will be $1,600,000. If you win the court case, you incur only legal costs.

The consensus is that the chance of losing the case is 50%. If your chances of winning were 99%, you'd likely go to court. If the chances of winning were only 1%, you'd probably accept the settlement. As the chances of winning increased, there would be a point at which you'd refuse the settlement.

What is this switchover point? That is, what is the lowest probability of winning that would prompt you to take the case to court? (Once again, higher probabilities reflect more caution; lower probabilities reflect more aggressiveness.)

(#3)

A schoolmate has the opportunity to buy the mail order division of the large firm where she has worked as an executive. (The division will definitely be sold to someone.) You believe that she is a competent manager. For years she has talked to you of her desire to run her own operation. To raise the funds needed, she must mortgage her house, cash in her life insurance and lower her living standards by giving up club memberships. She will trade down her car and give up most other discretionary spending. She awaits the report of a respected management consulting firm, experts in mail order. This report will indicate the probability that this division can prosper on its own. You feel sure that even if she succeeds, she will be at risk and in debt for three years. She also has the possibility of emerging independent with a net worth many times what she could otherwise expect. If unsuccessful, she could only hope to limp along for years with a reduced standard of living, maybe even bankruptcy.

Considering these possibilities, you would advise her not to proceed unless the predicted odds for success are at least which of the following: ____

0%  10%  20%  30%  40%  50%  60%  70%  80%  90%  100%
A neighbor, with whom you have had a friendly relationship for years, is bored with his law practice and wants to start his own business around his hobby. Before he can know whether the business can succeed, he will have given up practicing law, his partnership in his law firm and will have invested most of his net worth and seven years of his life. Should he make a go of it, he will become a wealthy man as you define that and as he defines it. Should he fail he will have to start over from scratch, borrowing money from friends and family, older and wiser. He has total belief in his ability to make it.

What odds for success would you require before you would recommend that he go for it?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Amid a declining market for your product, your company has the opportunity to enter a new market. Doing so will result in either a very large market share or a very small market share. No quality control or legal difficulties are expected. If you choose to continue in your current market, you can very likely expect a negative 12% return. If you choose to enter the new market and gain a large market share, you can expect a negative return of only 10%. Gaining a small market share will lead to a negative return of 22%. Either way, the total investment is the same.

The consensus is that you have a 33% chance of achieving a large market share. If your chances of attaining a large market share were 99%, you'd likely choose to enter the new market. If the chances of doing so were only 1%, you'd probably reject entering the new market. As the chances of winning increased, there'd be a point where you would decide to enter the new market. (That is, higher probabilities reflect more caution.)

What is this switchover point? That is, what is the lowest chance of gaining a large market share that would prompt you to enter the new market?

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Ms. A, a division vice-president in a large diversified firm, is evaluating the possibility of a major change in the production system. The change should cut production costs. The current system utilizes easily available raw materials but the conversion process is expensive. The new system being considered has been proven to have a less expensive conversion process. However, it utilizes a raw material whose price is unpredictable. If the price of \( R \) were not to exceed $10 per pound, the new system would definitely be cost effective. Otherwise, it might even increase costs above the current level. Ms. A must now decide whether to adopt the new manufacturing system or continue with the old.

Imagine that you are advising Ms. A. What is the lowest probability that you would consider acceptable for Ms. A to adopt the new manufacturing system?

Mr. E, a division vice-president in a large diversified firm, is evaluating the possibility of attempting a new strategy in terms of product quality, packaging, and price for his main product line. The current strategy is satisfactory but the new strategy could lead to a substantial increase in sales as compared to what is expected from the current strategy. On the other hand, the new combination of product quality, packaging and price has never been tried before. Sales might even fall substantially below those expected from the firm's existing strategy. Mr. E must now decide whether to adopt the new strategy or to continue with the current one.

Imagine that you are advising Mr. E. What is the lowest probability that you would consider acceptable for Mr. E to adopt the new strategy?

You have recently started a new venture. Your business has an opportunity which entails the possibility of an enormous return. It also offers the possibility of losing half of the firm's entire net worth. Similar opportunities in the past have been a '50-50' proposition. That is, you probably have a 50% chance of making a very large gain and a 50% chance of losing half of your net worth.

What kind of return is necessary for you to accept this investment? (Please express the required return as a multiple of your company's net worth.) \( \text{_____ times my firm's net worth.} \)

(Note: Higher answers reflect more caution.)

Thanks! Please turn the page.
Please consider the set of 8 dilemma decisions you are about to make. Answer the following questions about your decisions.

On a scale from 0 to 100, how risky are these dilemma-type decisions? (0 = very risky, 100 = not risky at all) ____

You have ten (10) similar dilemma decisions to make for real in ten minutes. How many good decisions would you make on these 10 dilemmas? ____

How confident are you in this assessment you just made? Please mark the appropriate box below.

Not Confident At All 1 2 3 4 5 6 7 8 9 0 Completely Confident

On a scale from 0 to 100, how much control did you have over these dilemma decisions? (0 = none; 100 = complete control) ____

On a scale from 0 to 100, how much chance is there in your decisions of missing a significant opportunity in these dilemmas? (0 = no chance of missing an opportunity, 100 = very great chance of missing an opportunity) ____

On a dilemma decision just like these you have a 50% chance of winning $X and a 50% chance of losing $X. You get to determine the stakes, $X. Assume the wager is "for real."

What's the largest amount you would bet ($X) in such a wager on a dilemma? ____

In your estimation, what would the average person bet in such a wager? ____

Performance on a task can result from ability), effort, luck or some combination of these. Please estimate what percentage (if any) of your performance on dilemma-type decisions is due to each of these three factors. The three percentages must add up to 100%.

My performance on these dilemmas is the result of:

_______% Ability/Skill
_______% Luck/Chance
_______% Effort
( = 100%)
Standard Gambles

These items are called “standard gambles.” Please read each quickly and carefully and select one option (A or B).

(#1) An epidemic of a rare Asian virus has infected 600 of your people, including yourself. You must choose between two mutually exclusive courses of treatment. Your usually reliable experts have estimated the consequences if you go with Treatment A or if you choose Treatment B. You must choose immediately.

Which option do you choose, A or B? ______

A: 200 people will be saved for certain.
B: One-third chance that 600 people will be saved
   Two-thirds chance that no people will be saved.

(#2) Would you accept the following wager? YES NO (pick only one)

90% chance of losing $50
10% chance of gaining $1000

(#3) You are considering a price increase for your product. Economic conditions are such that you will likely experience a loss this quarter.

POSSIBLE ACTIONS  EXPECTED OUTCOMES

A. DO NOT raise price 100% certainty that competitors WILL NOT raise price and that you WILL NOT LOSE any customers.
   Profit = - $200,000

B. DO raise price 50% chance that competitors WILL raise prices and that you WILL NOT LOSE customers.
   Profit = + $100,000
   50% chance that competitors WILL NOT raise price and that you WILL LOSE customers.
   Profit = - $600,000

PLEASE CHOOSE: A or B

(#4) Which do you choose, A or B? ______

A: 5% chance of saving 100 lives
   95% chance of saving no lives

B: 10% chance of saving 45 lives
   90% chance of saving no lives
(5) You are considering a price increase for your product.

**Possible Actions** | **Expected Outcomes**
--- | ---
A. DO NOT raise price | 100% certainty that competitors WILL NOT raise price and that you WILL NOT LOSE any customers. Profit = + $400,000
B. DO raise price | 50% chance that competitors WILL raise prices and that you WILL NOT LOSE customers. Profit = + $600,000

50% chance that competitors WILL NOT raise price and that you WILL LOSE customers. Profit = + $220,000

**PLEASE CHOOSE:** A or B

(6) Consider the following two boxes: Box I contains 100 balls, each either red or black, but the precise composition of the box is unknown to you. Box II contains exactly 50 red balls and exactly 50 black balls.

Do you prefer A or B? _____

A: Win $1000 if a red ball is drawn from Box I.
B: Win $1000 if a red ball is drawn from Box II.

(7) Do you prefer option A or option B? _____

A: sure loss of $7500, or B: 75% chance to lose $1000 and 25% chance to lose nothing

(8) Do you prefer option E or option F? _____

E: 25% chance to win $240 75% chance to lose $760
F: 25% chance to win $250 75% chance to lose $750

**Thanks!! Please quickly and carefully answer the following questions.**
Please think about the set of 8 gamble decisions you are about to make. Answer the following questions about your decisions.

On a scale from 0 to 100, how risky were your gamble-type decisions? (0 = very risky, 100 = not risky at all) ______

You have ten (10) "gamble" decisions to make for real in ten minutes. How many good decisions would you make on these 10 "gambles"? ______

How confident are you in this assessment you just made? Please mark the appropriate box below.

Not Confident At All [ ] 0 0 0 I 3 E 1 I Z [ ] 1 I 1 0 [ ] 3 O E 3 0 E 3 [ ] Completely Confident

On a scale from 0 to 100, how much control did you have over these gamble decisions? (0 = none; 100 = complete control) ______

On a scale from 0 to 100, how much chance is there in your gamble decisions of missing a significant opportunity in these gambles? (0 = no chance of missing an opportunity, 100 = very great chance of missing an opportunity) ______

On a 'gamble' just like these you have a 50% chance of winning $X and a 50% chance of losing $X. You get to determine the stakes, $X. Assume the wager is "for real."

What's the largest amount you would bet ($X) in such a wager on a 'gamble'? ______

In your estimation, what would the average person bet in such a wager? ______

Performance on a task can result from ability, effort, luck) or some combination of these. Please estimate what percentage (if any) of your performance on gamble-type decisions will be due to each of these three factors. The three percentages must add up to 100%.

My performance on these gambles is the result of:

_____% Ability/Skill
_____% Luck/Chance
_____% Effort

( = 100%)
Did the warmup exercise have any effect on your performance on the exercise just completed?

Was the feedback useful? How accurate was it? (briefly)

How do you feel about the exercise? (briefly)

What was the experiment about? (briefly)
APPENDIX B

FEEDBACK EFFECTIVENESS:

DIFFERENCES IN MODEL RESULTS
This appendix demonstrates differences in the effectiveness of the feedback manipulation between subjects who perceived the feedback to have been accurate and subjects who did not (debriefing item #2). The best comparison is to test the model separately for these two groups. Based on the overall model, regressions were run using risk taking behavior as the dependent variable and perceived opportunity and perceived threat as the independent variables. As seen below, the subsample who appeared to completely 'buy' the manipulation (N=117) demonstrated much stronger statistical results than the total sample (N=153). The subsample who did not completely do so (N=36) had results much weaker than the overall sample.

Subsample 1: Feedback Manipulation Perceived Effective

N=117
Overall F = 25.88 (p<.0001)
Adjusted R-Square = .564

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<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Opportunity</td>
<td>5.94</td>
<td>p&lt;.0001</td>
</tr>
<tr>
<td>Perceived Threat</td>
<td>-5.63</td>
<td>p&lt;.0001</td>
</tr>
</tbody>
</table>

Subsample 2: Feedback Manipulation Not Perceived Effective

N=36
Overall F = 1.62 (p<.20)
Adjusted R-Square = .034

<table>
<thead>
<tr>
<th>variable</th>
<th>t-statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Opportunity</td>
<td>-.143</td>
<td>p&lt;.89</td>
</tr>
<tr>
<td>Perceived Threat</td>
<td>-.850</td>
<td>p&lt;.40</td>
</tr>
</tbody>
</table>
DEBRIEFING

Thanks for assisting us with this project. We have a handout explaining what exactly we are trying to learn about. You may pick one up as you leave. We will be glad to answer any of your questions. The single most important thing you should know is this. The feedback we gave you about your performance on the warmup items was completely bogus. There is NO expert consensus on the 'right' answers. Those of you who received negative feedback should realize that the alleged 'expert' opinion was, in fact, random. We repeat, the feedback was bogus. (Some of you didn't receive any feedback at all. You were the control group.)

Many people who seem to be risk-takers don't see themselves that way. Skiers don't see a steep ski slope as risky. Skydivers don't see parachuting as risky. Entrepreneurs don't see their new ventures as particularly risky either, no matter what the odds seem to be.

Risk-takers see themselves as having control over the situation. It's not that they think they can beat the odds, it's that they think they can change the odds. This appears equally true for entrepreneurs.

We cannot create entrepreneurs in the laboratory. We did feel we could create risk-takers. At the very least, we could create changes in the amount of risk you perceived. We tried to do this by changing the amount of control you perceived in the task. We measured your sense of control, your risk perceptions and your actual risk-taking. We did NOT measure how skillfully you made decisions then give you feedback. We actually gave you feedback randomly. Either we told you how 'wonderfully' you'd done so far or how 'miserably.' Thus, it was also important to have a control group which received no feedback.

Theory says that feedback changes your opinion of how much control you have and how competent you are. In turn, we expect that these changes in perceived control cause changes in how risky you rate a situation as being. We also expect changes in your perceptions of how much risk there was of missing an opportunity. Changes in these perceived risks should then bring changes in how much risk you actually take.

You've just taken part in the very first stages of an exciting experiment; one that nobody has ever done before. If the results support the theory, this really will be very important research. Thanks again for your patience and your invaluable assistance. We couldn't have done it without you! Again, thanks!

Norris Krueger
Professor Norris Krueger
445 Reid Hall
APPENDIX D

PERSONALITY SCALES
These surveys will address how students at MSU view the world: their preferences, values, etc. There are no particular right or wrong answers. We think you may find the results to be interesting and we will make the results available to any student. If any question is too personal or stressful to answer you are not required to answer it.

We ask that you answer as completely as possible and as quickly as possible. First impressions are usually best anyway. Read each statement, decide on the appropriate answer and mark the answer accordingly. If you find that the choice of answers do not adequately reflect your opinion, use the one which is closest to the way you feel (even if you "feel strongly both ways").

I appreciate your participation and hope you enjoy the results. Thanks again!

Section I. Attributional Style Questionnaire (Seligman and Schulman)

Please vividly imagine yourself in the following situations. If such a situation happened to you, what do you feel would have caused it? Events may have many causes, we want you to pick only one—the major cause if this event happened to you. Please write this cause in the blank provided, then answer some questions about the cause. To summarize, we want you to:

1. Read each situation and vividly imagine it happening to you.
2. Decide what would be the major cause of the situation if it happened to you.
3. Write one cause in the blank provided and answer three questions about the cause.
4. Go on to the next situation.

A: You have been looking for a job unsuccessfully for some time.
1. Please write down the one major cause _____________________________.
2. Is the cause of your unsuccessful job search due to something about you or to something about other people or circumstances? (circle one number)
   Totally due to other people or circumstances 1 2 3 4 5 6 7  Totally due to me
3. In the future when looking for a job, will this cause again be present? (circle one number)
   Will never again be present 1 2 3 4 5 6 7  Will always be present
4. Does the cause just influence job hunting or does it also influence other areas of your life?
   Influences just this particular situation 1 2 3 4 5 6 7  Influences all situations in my life

B: You become very rich.
1. Please write down the one major cause _____________________________.
2. Is the cause of your becoming very rich due to something about you or to something about other people or circumstances? (circle one number)
   Totally due to other people or circumstances 1 2 3 4 5 6 7  Totally due to me
3. In the future if you would become very rich, will this cause again be present? (circle one number)
   Will never again be present 1 2 3 4 5 6 7  Will always be present
4. Does the cause just influence getting very rich or does it also influence other areas of your life?
   Influences just this particular situation 1 2 3 4 5 6 7  Influences all situations in my life

C. You give an important talk in front of a group; the audience reacts negatively.
1. Please write down the one major cause _____________________________.
2. Is the cause of the negative reaction due to something about you or to something about other people or circumstances? (circle one number)
   Totally due to other people or circumstances 1 2 3 4 5 6 7  Totally due to me
3. In the future when getting a negative reaction from an audience, will the cause again be present? (circle one number)
   Will never again be present 1 2 3 4 5 6 7  Will always be present
4. Does the cause just influence audience reactions or does it also influence other areas of your life?
   Influences just this particular situation 1 2 3 4 5 6 7  Influences all situations in my life
D: You can't get all the work done that others expect of you.

1. Please write down the one major cause ________________________.

2. Is the cause of your not getting all your work done due to something about you or to something about other people or circumstances? (circle one number)
   - Totally due to other people or circumstances 1 2 3 4 5 6 7
   - Totally due to me

3. In the future when you don't get all your work done, will this cause again be present?
   - Will never again be present
   - Will always be present

4. Does the cause just influence completing your work or does it influence other areas of your life?
   - Influences just this particular situation 1 2 3 4 5 6 7
   - Influences all situations in my life

E: You apply for a position that you want very badly (e.g., important job, graduate school admission) and you get it.

1. Please write down the one major cause _________________________________.

2. Is the cause of your successful application due to something about you or to something about other people or circumstances? (circle one number)
   - Totally due to other people or circumstances 1 2 3 4 5 6 7
   - Totally due to me

3. In the future when successfully applying, will this cause again be present?
   - Will never again be present
   - Will always be present

4. Does the cause just influence successfully applying or does it influence other areas of your life?
   - Influences just this particular situation 1 2 3 4 5 6 7
   - Influences all situations in my life

F: You get a raise.

1. Please write down the one major cause ____________________________.

2. Is the cause of your getting a raise due to something about you or to something about other people or circumstances? (circle one number)
   - Totally due to other people or circumstances 1 2 3 4 5 6 7
   - Totally due to me

3. In the future when getting a raise, will this cause again be present?
   - Will never again be present
   - Will always be present

4. Does the cause just influence getting a raise or does it also influence other areas of your life?
   - Influences just this particular situation 1 2 3 4 5 6 7
   - Influences all situations in my life

Section II: [Innovativeness: Kirton Adaptive-Innovative Inventory (Kirton, 1984)]

On these 32 items please imagine that you have been asked to consistently present to others a certain image of yourself for a long time. Please rate the difficulty of doing so as follows:

-2 = Very Easy to Consistently Present to Others
-1 = Fairly Easy
0 = Neither Easy or Hard
+1 = Fairly Hard
+2 = Very Hard to Consistently Present to Others

1) Has original ideas
2) Proliferates ideas
3) Is stimulating
4) Copes with several new ideas at the same time
5) Will always think of something when stuck
6) Would sooner create than improve
7) Has fresh perspectives on old problems
8) Often risks doing things differently
9) Likes to vary set routines at a moment's notice
10) Prefers to work on one problem at a time
11) Can stand out in disagreement against group
12) Needs the stimulation of frequent change
13) Prefers changes to occur gradually
14) Is thorough
15) Masters all details painstakingly
16) Is methodical and painstaking
17) Enjoys detailed work
18) Is a steady “plodder”
19) Is consistent
20) Imposes strict order on matters within own control
21) Fits readily into “the system”
22) Conforms
23) Readily agrees with the team at work
24) Never seeks to bend or break the rules
25) Never acts without proper authority
26) Is prudent when dealing with authority
27) Likes the protection of precise instructions
28) Is predictable
29) Prefers colleagues who never “rock the boat”
30) Likes bosses and work patterns which are consistent
31) Works without deviation in a prescribed way
32) Holds back ideas until obviously needed

Section III: [Impulsivity and Venturesomeness (Eysenck, 1965); Sensation-Seeking (Zuckerman)]

Instructions: Please answer each question with a “YES” or a “NO” following the questions. There are no right or wrong answers, and no trick questions. Work quickly and don’t think too long about the exact meaning of questions.

1) Would you enjoy water skiing?
2) Usually do you prefer to stick to brands you know are reliable (as opposed to trying new ones on the chance of finding something better)?
3) Do you quite enjoy taking risks?
4) Would you enjoy parachute jumping?
5) Do you often buy things on impulse?
6) Do you often do and say things without stopping to think?
7) Do you often get into a jam because you do things without thinking?
8) Do you think hitch-hiking is too dangerous a way to travel?
9) Do you like diving off the high board?
10) Are you an impulsive person?
11) Do you welcome new, exciting experiences or sensations, even if they’re a little frightening and unconventional?
12) Do you usually think carefully before doing anything?
13) Would you like to learn to fly an airplane?
14) Do you often do things on the spur of the moment?
15) Do you often speak without thinking things completely out?
16) Do you often get involved in things you later wish you could get out of?
17) Do you get so ‘carried away’ by new and exciting ideas, that you don’t think of possible snags?
18) Do you find it hard to understand people who risk their necks climbing mountains?
19) Do you sometimes like doing things that are a bit frightening?
20) Do you occasionally need to use a lot of self-control to keep out of ‘trouble’?
21) Would you agree that almost everything enjoyable is considered immoral or illegal?
22) Generally do you prefer to enter cold water gradually rather than diving or jumping right in?
23) Are you often surprised at people’s reactions to what you do or say?
24) Would you enjoy the sensation of skiing very fast down a high mountain slope?
25) Do you think an evening out is more successful if it’s spontaneous (unplanned or arranged at the last moment)?
26) Would you like to go scuba diving?
27) Would you enjoy driving a motorcycle fast?
28) Do you prefer to work quickly, without bothering to continually check?
29) Do you often change your interests?
30) Before making up your mind, do you consider all the advantages and disadvantages?
31) Would you like to go spelunking (cave exploring)?
32) Would you prefer to not have a job involving quite a bit of danger?
33) Do you prefer to ‘sleep on it’ before making decisions?
34) When people shout at you, do you often shout back?
35) Do you usually make up your mind quickly?
36) Does being out on a cold day invigorate you (as opposed to wanting to get inside quickly)?
Section IV: ["Desirability of Control" scale (Burger, 1985)]

Please read each of the following statements carefully. Respond quickly with the degree to which you believe that the statement applies to you. For all items a response from 1 to 7 is required. Write the number that best reflects your belief, using the following anchors:
1 = The statement doesn't apply to me at all;
2 = The statement usually doesn't apply to me;
3 = Most often, the statement doesn't apply;
4 = I am unsure whether it applies to me, or that it applies to me about half the time;
5 = The statement applies to me more often than not;
6 = The statement usually applies to me;
7 = The statement always applies to me.

1) I prefer a job where I have a lot of control over what I do and when I do it.
2) When I see an opportunity I prefer to do something about it rather than wait for the perfect moment.
3) I try to avoid situations where someone else tells me what to do.
4) I would prefer to be a leader rather than a follower.
5) I enjoy being able to influence the actions of others.
6) I am careful to check everything on an automobile before I leave for a long trip.
7) Others usually know what is best for me.
8) I enjoy making my own decisions.
9) I enjoy having control over my destiny.
10) I would rather someone else took over the leadership role when I'm involved in a group project.
11) I consider myself to be generally more capable of handling situations than others are.
12) I'd rather run my own business and make my own than to someone else's orders.
13) I like to get a good idea of what a job is all about before I begin.
14) When I see a problem I prefer to do something about it rather than sit by, thinking about a better solution.
15) When it comes to orders, I would rather give them than receive them.
16) I wish I could push off many of life's daily decisions on someone else.
17) When driving, I try to avoid putting myself in a situation where I could be hurt by someone else's mistake.
18) I prefer to avoid situations where someone else has to tell me what it is I should be doing.
19) There are many situations in which I would prefer only one choice rather than having to make a decision.
20) I like to wait and see if someone else is going to solve a problem so that I don't have to be bothered by it.

Section VI: [Q1-Q8: Life Orientation Test (Carver and Scheier); Q9-Q14: Future Orientation (Grimsje); Q15-Q18: Ambiguity Tolerance (Lorsch and Morse)]

Please answer the following 18 items by selecting the number closest to how you feel:

3 = strongly agree 2 = agree 1 = disagree 0 = strongly disagree

1) In uncertain times, I usually expect the best.
2) If something can go wrong for me, it will.
3) I always look on the bright side of things.
4) I'm always optimistic about my future.
5) I hardly ever expect things to go my way.
6) Things never work out the way I want them to.
7) I'm a believer in the idea that "every cloud has a silver lining."
8) I rarely count on good things happening to me.
9) I am not so very much concerned about things a little ahead in time.
10) I think about the future only to a small extent.
11) Half a year seems to me a long time.
12) I reflect a great deal about the future and I feel it is rapidly approaching.
13) Usually I feel time is going too fast.
14) The most interesting life is to live under rapidly changing conditions.
15) Adventurous and exploratory people go farther in this world than do systematic and orderly people.
16) When planning a vacation, people should have a schedule to follow if they are really going to enjoy themselves.
17) Doing the same things in the same places for a long period of time makes for a happy life.
18) I have been thinking a lot about what I am going to do in the future.
APPENDIX E

MANIPULATION CHECK: SUBJECT COMMENTS
SUBJECT COMMENTS REGARDING FEEDBACK EFFECTS

The following pages list subject responses to the two primary manipulation check items (listed below) where subjects answered something other than 'yes' or 'no.'

The responses are grouped by feedback condition. (The no-feedback control condition subjects did not complete these items.) Only 54 subjects offered such comments.

Questions referenced below:

(a) "Did the warmup exercise have any effect on your performance on the exercise just completed?"

(b) "Was the feedback useful? How accurate was it?"
FEEDBACK CONDITION: Positive on Dilemmas, Positive on Gambles

a) made me rush more
b) great, thought I did better

a) The questions seemed to be of a different style or caliber. I didn't really see too much of a correlation.
b) Yes, because I didn't really pay too much attention to it before completing the second section. But I chose the same answers anyway unless of course it was rigged to try to make me change my answers!

a) yes-thought back on answers, answered previously when making the decisions here
b) yes-gave me an ego boost

a) Primo [sic]
b) It gave me more confidence in decision making.

b) It was accurate, but made me more 'aware' of the decisions I made in this exercise. (Made me think more & think back)

a) Yes, it gave me a glimpse [sic] of what was expected.
b) Very accurate to my expectations.

b) Useful. It showed me my decisions are fairly correct.

a) Yes, I went through these faster & with more confidence in my ability
b) Yes, it let me know I was on the right track initially.

a) some
b) made me want more

a) yes, began to get worn out & complacent about my answers

a) Yes! It helped me put into perspective differently worded questions that were essentially the same. It also gave a base with which to work from.
b) The feedback was useful in that it gave me an idea of how experts think relative to myself. It didn't necessarily make me think I was wrong in all circumstances of disagreement. It was, probably, quite accurate given the relative time that was taken to make these decisions.

a) no, I used the same basic line of thought for all questions
b) not much. I probably would not change my line of decision-making no matter what the feedback said.
FEEDBACK CONDITION: Positive on Dilemmas, Negative on Gambles

b) I think it was accurate. It was useful. I'm not one for gambles.

b) yes-I don't know

b) yes, it helped me re-evaluate my decisions in the particular situation.

b) yes, fairly accurate

b) yes-gave a range to go by

b) Yes, it was pretty close

b) Yes, I knew how well I did or how poorly I did in the second case

b) Yes- not very - I don't know what I'm doing

a) Yes-I hesitated each time
b) no-because it didn't give which answers were right/wrong

a) Yes, it let me know what kind of questions to expect. 

b) The feedback told me how I failed on the first part but did not influence my decisions here. As far as accuracy, I don't know.

a) got my mind warmed up for the exercise
b) feedback was useful-seemed accurate to me

b) Somewhat useful and relatively accurate

a) Yes, it made me sick of answering questions
b) No, it may be accurate but I don't know why.

a) Yes, it helped me on the gamble questions.

b) Yes, it helped me on gamble questions. I don't know about the accuracy.

a) Yes, I was more cautious with the gambles and more confident with the 1st set.

b) Yes, I would say it was very accurate.

a) you bet

b) didn't read it too closely- OK, I guess

b) Yes, I don't know.

b) Yes; Seemed to be fairly accurate
FEEDBACK CONDITION: Positive on Gambles, Negative on Dilemmas

b) yes, I guess that it was pretty accurate (I didn't do well on dilemmas & I really dislike them)

a) would've preferred getting the same questions
b) probably a good assessment [sic]

a) yes, gave more confidence in one part, less in the first part.
b) made me pay more attention to the rest of the testing
b) yes, I really don't know but probably "fairly" accurate

a) Yes, because it was very similar in ? format
b) Yes, I think it showed I should take a little more risk, which is an accurate assumption of my nature.

a) a little
b) yes, I assume it was accurate

b) no, but I don't know...

b) I don't know. In the dilemas, I felt I had some personal control over the outcome. In gambling I felt I had almost no control.

b) Not very, it seems these questions of chance don't have wrong or right answers and I would trust my own judgement on risk over an expert [N.B. this subject had one of the largest differential changes of all!]

b) Not particularly-would like to see what answers were correct. I would presume it was accurate.

b) no, not very accurate-too many variables involved.

b) I don't believe the feedback was correct. There are no "experts" in this field, who know what answer is best.

b) yes. I don't know for sure.

a) yes-not much but a little
b) yes-hard to tell how accurate since you have to trust the experimenter

a) Not really-I felt that I really need to know more about what you can invest in starting a business or whatever.
b) Yes-I believe it was accurate.
FEEDBACK CONDITION: Negative on Gambles, Negative on Dilemmas

a) no, I don't think so
b) pretty accurate

b) I could be a bit too aggressive.

a) I don't think so
b) No, I'm sure it was accurate, I'm just not good at these types of questions.

a) yes, a little. I was a little more cautious.
b) Not really. Who are these experts and every decision is different.

b) yes—maybe I was a bit too cautious.

b) ? I guess I understood the questions less than I thought I did!

b) Thought I'd do better.

b) did change the way I answered so [sic] of these questions

b) I guess, I assume fairly

b) Yes, helped with reading

a) Yes, with the results I'm apparently a terrible strategic manager
b) Feedback was a little useful but not in great detail

a) I hope the warm-up had no effect.
b) I don't know, you tell me how accurate YOUR feedback was

a) yes (I hope)
b) If the feedback was accurate, it was useful. If not accurate, I would tend to skew my decisions on the second exercise.

a) No, it just allowed me to answer the questions again
b) Yes, not extremely accurate, we all have different strategies for handling dilemmas
BIBLIOGRAPHY


