THE CONFLUENCE OF RATIONAL AND LEARNING LENS VIEWS OF STRATEGIC DECISION MAKING

By

JILL RENEE HOUGH

Bachelor of Science
Oklahoma State University
Stillwater, Oklahoma
1982

Master of Science
Oklahoma State University
Stillwater, Oklahoma
1984

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the degree of
DOCTOR OF PHILOSOPHY
December, 1999

THE CONFLUENCE OF RATIONAL AND LEARNING

LENS VIEWS OF STRATEGIC DECISION MAKING

Thesis Approved:

____
Thesis Adviser

____

____

____

____

____
Dean of the Graduate College

ACKNOWLEDGMENTS

A number of individuals helped make this dissertation possible. My committee, Professors Margaret White, Wayne Meinhart, Gary Frankwick, Catherine Sleezer, and Bill Warde, provided valuable insight and constructive guidance at each stage of the research process. Dr. Ellen Van Velsor and Betty Williams of the Center for Creative Leadership introduced me to the Looking Glass simulation and made it possible for me to use this environment as a research setting. Dr. Emile Robert of VIMA International generously provided data, insight, and encouragement. The inspiration to pursue this degree came from the example of my father, Dr. Tom Smith, and the loving support of my mother, Betty Smith. Finally, my greatest debt is owed to my wonderful husband Jeff who stood beside me throughout this adventure and helped me remember the really important things in life.

TABLE OF CONTENTS

Chapter Page

I. INTRODUCTION 1

Purpose of the Study 2
Significance of the Study 4
Definition of Strategic Decision Processes and Strategic Decisions 6
Organization of the Study 7

II. REVIEW OF THE LITERATURE 9

Strategic Decision Making Background 9
The SDM Process 10
The Decision Making Context 12
Overarching Models of SDM 14
Environmental Context 16
Dimensions of the Environment 16
Relationship Between the Environment and SDM Process Characteristics 17
Environmental Relationships to Managerial Actions 24
Decision-Maker Characteristics as Part of the Organizational Context 25
Relationships between Decision-Maker Characteristics and SDM Processes 26
Strategic Decision Making Process Outcomes 30
Composite Model 33
Theoretical Basis 34
Research Hypotheses and Research Questions 37
Chapter Summary 44

III. METHODOLOGY 46

Sample 46
Decision Making Environment 47
Measures 51
Environmental Context 51
Decision-Maker Characteristics 52
Managers' Actions 54
SDM Process Characteristics 55
Process Outcome 56

Chapter Page

Control Variables 58
Research Design 58
Chapter Summary 63

IV. RESULTS 64

Descriptive Statistics 64
Assumption Tests 67
Threats to Validity 70
Tests for Normality 77
Tests for Linearity 78
Tests for Equality of Variance 79
Summary of Assumptions 81
Hypothesis Tests 82
H1a, H1b: SDM Process Characteristics and Process Outcomes by Environment 82
H2a: Mean Differences of Managerial Actions between Environments .. 85
H2b: Relationship between Managerial Actions and SDM Process Characteristics 89
H3a and H3b: Relationships between Managerial Actions and Decision-Maker Characteristics 90
H4: SDM Process Characteristics and Process Outcomes 92
Examination of Research Questions 94
Chapter Summary 101

V. DISCUSSION AND CONCLUSIONS 104

Review of Empirical Results 105
Effects of the Environment 105
Decision-Maker Characteristics 107
Process Outcomes 107
The Confluence of Rational and Learning Lens Views 108
Explanation of Non-hypothesized Results 109
Functional Assignment and Industry Experience 109
MBTI Preferences 113
Decision Context 114
Contributions and Implications 116
Potential Contributions 116
Implications for Managers 118
Implications for Research 118
Limitations 120
Future Research 122
Conclusions 124

Chapter Page

BIBLIOGRAPHY 125

APPENDICES 135

A List of Empirical Studies Concerning the Strategic Decision-Making Process, its Antecedents, and Outcomes 135

B Looking Glass, Inc. Organization Chart 138

C Embedded Issues for the Advanced Products Division, Industrial Glass Division, and the Commercial Glass Division 140

D Internal Review Board (IRB) Form 142

LIST OF TABLES

Table Page

1. Update to Priem, Rasheed, and Kotulic (1995) Comparison of Rationality, Environmental Dynamism, and Performance Outcomes 19

2. Studies of Strategic Decision Making Considering Decision-Maker Characteristics 27

3. Strategic Decision Making Studies that Include Process Outcomes 32

4. Synthesis of the Terminology of Chaffee (1985), Hitt and Tyler (1991), Rajagopalan et al. (1998), and Rajagopalan and Spreitzer (1997) 34

5. Summary of Variables Proposed by Hypotheses and Research Questions 44

6. Some Environmental Differences among Looking Glass Divisions 52

7. Overall and Organization Sample Demographics 65

8. Distribution of Personality Type within the Overall Sample 66

9. Pearson Correlations, Means, and Standard Deviations for the Overall Sample 68

10. Mean Differences in Participant Age by Home Organization, Environment, LGI Functional Assignment, and LGI Position 71

11. Mean Differences in Participant Years of Occupational Experience by Home Organization, Environment, LGI Functional Assignment, and LGI Position 72

12. Frequency Table of Participant Education Level by Home Organization, Environment, LGI Functional Assignment, and LGI Position 73

13. Results of Brown-Forsythe Tests for Equality of Variance 80

14. Spearman Correlation Coefficients and P Values for the Relationship between Team Informity and Decision Quality by Environment 84

Table | Page

15. Type III F Statistics for Scanning Completeness across Environments 87

16. Scanning Completeness Mean Differences between Environments by Position 88

17. Spearman Correlation Coefficients and P values for the Relationship between Scanning Completeness and Team Informity Partialing Sensing/Intuiting 89

18. Type III F Statistics, Degrees of Freedom, P Values, and Mean Differences for Scanning Completeness by Sensing/Intuiting Categories 91

19. Type III F Statistics, Degrees of Freedom, and P Values for Internal Scanning by Thinking/Feeling Categories in the Overall Sample ... 92

20. Cell Sizes, Spearman Correlation Coefficients, and P Values for Team Informity and Decision Quality by Decision within Environment...... 93

21. General Linear Models for Environment Effects on Team Informity and Decision Quality 95

22. Fit Comparison Between Fixed Effect Models and Mixed Effects Models........ 96

23. Summary of the Mixed Effects Models... 97

24. Summary of the Mixed Effects Models with Covariates 100

25. Summary of Support for Hypotheses by Sample 103

LIST OF FIGURES

Figure Page

1. Research Model for Determinants of SDM Process Outcomes 33

2. Rational Lens View of SDM 35

3. Learning Lens View of SDM 35

4. Graphic Depiction of Research Design 60

5. Research Model for Determinants of SDM Process Outcomes 84

CHAPTER I

INTRODUCTION

Strategic decision making drives the strategic management process. Through environmental scanning, strategy formulation, strategy implementation, and evaluation and control, strategic decision making (SDM) provides the mechanism for moving organizations through the process of managing long-run performance. Strategic decisions guide a) what information to gather from the external and internal environments, b) how to utilize this information, c) what strategies should be implemented, d) which actions should be taken to implement the strategy, and e) how the organization should respond to the results of its actions.

SDM research has been extensive, exhibiting both depth and breadth. Early research examined "how" decisions are approached by focusing on the decision process. Models of rational (March & Simon, 1958), boundedly rational (Cyert & March, 1963), political (March, 1962), and garbage can (Cohen, March & Olsen, 1972) decision making have been proposed. Attention also has been directed toward the role played by managerial cognitions (e.g., Bateman & Zeithaml, 1989) and the tools used by management groups to evaluate alternatives (e.g., Schweiger, Sandberg & Ragan, 1986; Schwenk, 1984).

Studies of the early process models have been supplemented by empirical studies focusing on the decision-making context. These contextual factors include the environment (e.g., Fredrickson, 1984; Fredrickson & Mitchell, 1984; Judge & Miller, 1991; Priem, Rasheed & Kotulic, 1995), the organization (e.g., Bateman & Zeithaml, 1989; Fredrickson, 1985), the decision-makers (e.g., Fredrickson & Iaquinto, 1989; Hitt

& Tyler, 1991), and the decision itself (e.g., Fahey, 1981; Hickson, Butler, Cray, Mallory & Wilson, 1986).

The body of SDM research provides a depth of understanding about the ways in which rational and political processes operate in tandem to affect the course of strategic decision making (Eisenhardt & Zbaracki, 1992). Research has also provided breadth in terms of the contextual factors studied. In spite of these contributions, research in the field has been described as fragmented (Rajagopalan, Rasheed, Datta & Spreitzer, 1998), non-cumulative (Dean, Sharfman & Ford, 1991), and disconnected from the mainstream strategy concern of improving performance (Eisenhardt & Zbaracki, 1992).

In response to these criticisms, some authors have offered more complete, or overarching, models for organizing and conducting SDM research (e.g., Bell, Bromiley & Bryson, 1998; Dean, Sharfman & Ford, 1991; Rajagopalan, Rasheed & Datta, 1993; Rajagopalan, Rasheed, Datta & Spreitzer, 1998). The models are described as overarching because they integrate antecedent and outcome variables associated with the SDM process. Despite the appeal of integrative research, tests of these models have been limited, thereby leaving many unanswered questions. This study proposes and tests a model, consistent with the integrative approach, that enhances understanding concerning the relative contribution of various contextual factors to decision outcomes.

Purpose of the Study

The literature includes four overarching models of strategic decision-making processes. The "basic" model of SDM proposed by Bell, Bromiley, and Bryson (1998) depicts relationships among the organization's context, the decision content, the decision process, and outcomes. However, the generalized nature of the model provides limited guidance in terms of specific research agendas. Dean, Sharfman, and Ford (1991) proposed a more detailed, multiple-context model for studying how organizations make strategic decisions and the factors that influence this process. Their model includes the decision process and its relationship to four contextual factors—the environment, the organization, the team, and the problem. Rajagopalan, Rasheed, and Datta's (1993) integrative model subsumed Dean, Sharfman, and Ford's model. Their integrative framework includes environmental factors, organizational factors (including characteristics of the top management team), and decision-specific factors as contextual factors affecting decision process characteristics. A contribution of this model was the addition of process and economic outcomes. This model was later updated by Rajagopalan, Rasheed, Datta, and Spreitzer (1998) to reflect the mediating effects of managerial cognitions and actions between contextual factors and process characteristics. Rajagopalan et al. labeled this framework the multi-theoretic model of SDM.

The overarching, integrative SDM models are complex and include many factors assumed to interact in ways that contribute to decision outcomes. Testing the assumptions and paths of such models can provide insight into factors that make the strongest contributions to effective strategic decisions. Yet, the complexity inherent in these models presents a challenge to testing all of the assumptions and paths in a single study. Thus, this study narrowly focuses on two areas proposed by the models as important contributors to process outcomes—the environmental context and decision-maker characteristics and actions.

The importance of the environmental context has been described as a rational lens view of SDM while the significance of the decision maker has been described as a learning lens view (Rajagopalan & Spreitzer, 1997). The integrative approach suggests that these views should operate in tandem (Rajagopalan, Rasheed, Datta & Spreitzer, 1998). Thus, the purpose of this study is to examine the confluence of rational and learning lens views of SDM.

Significance of the Study

This study offers both theoretical and practical significance. The theoretical significance is explored first.

Reviews of the literature by Dean, Sharfman, and Ford (1991), Eisenhardt and Zbaracki (1992), and Rajagopalan, Rasheed, and Datta (1993) call for more extensive research to link findings from previous studies of SDM. Studies are needed that demonstrate breadth in terms of the factors considered while simultaneously examining theoretical explanations. This study takes a step in this direction. Theoretically, this study combines the rational and learning lens views of SDM and empirically tests the relationships among context, managerial actions, process characteristics, and process outcomes.

Furthermore, this effort seeks to add to understanding in the areas of environmental context, decision-maker characteristics, and process outcomes. With respect to the environmental context, this study examines the moderated effect of the environment on the relationship between SDM process and SDM process outcomes and the effects of the environment on managerial actions (see reviews by Rajagopalan et al., 1993 and Rajagopalan et al., 1998). While some studies have considered the effects of the external environment on various outcomes, the results have been mixed thereby preventing generalizations (Papadakis & Barwise, 1998; Rajagopalan et al., 1993;

Sharfman & Dean, 1991). By studying moderated and indirect relationships in three different controlled environmental contexts, this study can provide insight into the role that the external environment plays in the SDM process and ultimately in decision outcomes.

With respect to decision-maker characteristics, this study links the individual decision-making style of managers to the group decision-making process. Although several studies have used Hambrick and Mason's (1984) upper-echelon theory to examine demographics and personality traits in the context of SDM, the results have been inconclusive. This study focuses on one decision-maker characteristic that has shown great promise. Studies using Jung's (1921/1971) psychological types, a measure of cognitive style (Stumpf & Dunbar, 1991), have consistently shown significant results with respect to individual decision-making processes and individual outcomes (e.g., Brockmann & Simmonds, 1997; Hunt, Krzystofiak, Meindl & Yousry, 1989; Nutt, 1990; Stumpf & Dunbar, 1991). A promising area for study is the connection between psychological type and a group's SDM process. By examining the link between manager psychological type and group process, this study can provide insight into how individual decision-making preferences affect group decision processes.

Finally, this study examines decision quality in light of the environmental context. Calls have been issued for additional normative studies that explore the relationship between process and outcomes using context as either an antecedent or moderator of the relationship (Eisenhardt & Zbaracki, 1992; Rajagopalan, Rasheed & Datta, 1993). While studies have examined outcomes such as the likelihood of adoption (Nutt, 1986, 1990) and decision speed (Eisenhardt, 1989; Judge & Miller, 1991) in different environmental contexts, decision quality has been ignored.

In addition to theoretical contributions, this study offers at least three opportunities to extend practical understanding of the SDM process. First, the relative importance of the environmental context has implications for the amount of effort executives should devote to environmental scanning. Second, top management team selection (and/or development efforts) would benefit from identifying the cognitive and behavioral characteristics that lead to more effective decision making. Finally, research has answered questions concerning "how" strategic decisions are made but executives want to know the circumstances and actions that can lead to more effective decisions.

In summary, this study examines the relationships between environmental and decision-maker context, managerial actions, SDM process, and outcomes thereby addressing some key questions left unanswered by previous studies. The study also has practical relevance with respect to scanning efforts, team composition, and the determinants of effective strategic decisions.

Definition of Strategic Decision Processes and Strategic Decisions

Strategic decision making (SDM) processes deal with the question of "how" strategic decisions are made (Rajagopalan, Rasheed & Datta, 1993). Given some stimulus, the decision making process consists of a stream of actions that culminate in a commitment to action (Fredrickson, 1985; Mintzberg, Raisinghani & Theoret, 1976; Nutt, 1984, 1993; Sharfman & Dean, 1997). Emerging developments that may affect the organization's strategy, referred to as strategic issues (Ansoff, 1980; Dutton, Fahey & Narayanan, 1983), provide the catalyst for setting the SDM process in motion.

Many adjectives have been used in the literature to define the domain of strategic decisions. Mintzberg et al. (1976) identified three descriptors: importance, commitment of resources, and the precedent setting nature of the decision. Researchers have added nuances of meaning to the strategic decision characteristic of importance by augmenting Mintzberg et al.'s description with terms such as "significant", "substantial", "high stakes", "all pervading", and "organization-wide consequences" (e.g., Eisenhardt, 1989; Dean & Sharfman, 1993a, 1993b, 1996; Fredrickson, 1985; Hickson et al., 1986; Miller, 1997). Researchers have also emphasized the "ambiguity", "complexity" and "ill-structured nature" of the information and decision processes employed in reaching a strategic decision (e.g., Amason, 1996; Mason & Mitroff, 1981; Schweiger, Sandberg & Ragan, 1986; Schwenk, 1984). While numerous descriptors have been used to differentiate strategic decisions from other types of decisions, there seems to be general agreement in the literature that strategic decisions are defined by their importance and their unstructured nature.

This study relies on the definition offered by Ashmos, Duchon, and McDaniel (1998: 49), which is consistent with the ideas of importance and lack of structure. Strategic decisions are "those nonroutine, important decisions that involve allocating organizational resources to enable the organization to achieve or maintain a competitive advantage."

Organization of the Study

The next chapter provides a review of the literature concerning unanswered questions in the areas of environmental context, decision-maker characteristics, and process outcomes. This review is followed by the presentation of a SDM model, specific hypotheses, and related research questions that address concerns identified in the literature. Chapter three presents the research methodology including descriptions of the sample, the decision-making environment, the measures, and the methods used for analyzing the data. The remaining chapters present the results, provide a discussion of the results, and draw conclusions.

CHAPTER II

REVIEW OF THE LITERATURE

Strategic decisions are characterized by their importance and lack of structure (Mintzberg, Raisinghani & Theoret, 1976; Shrivastava & Grant, 1985). In today's dynamic marketplace, such decisions and the process for reaching them—strategic decision making (SDM)—can have both short- and long-term effects for the firm.

Given the importance of strategic decisions, it is not surprising that a substantial body of research has developed. The first section of this chapter provides a brief overview of the research by discussing studies that have focused on the SDM process. Studies that have expanded the scope of process research by including contextual variables are also mentioned. The next three sections review streams from the SDM literature that form the basis of this study: the environmental context, individual decision-maker characteristics, and process outcomes. After examining these three areas of research, a model is presented that allows investigation of some issues that remain unanswered by the research literature. The theoretical underpinning for this model is also articulated. Finally, specific hypotheses and research questions are proposed.

Strategic Decision Making Background

Since several SDM reviews have been published (e.g., Eisenhardt & Zbaracki, 1992; Rajagopalan, Rasheed & Datta, 1993; Schwenk, 1995), this section overviews how this study fits within the broader scope of SDM research. As described in Chapter I, two types of strategic decision making studies have made strong contributions to the literature. The first emphasizes the SDM process itself while the second considers the context surrounding the process.

The SDM Process

The literature on the SDM process includes descriptive process models such as rational (e.g., March & Simon, 1958), boundedly rational (e.g., Cyert & March, 1963), political (e.g., Quinn, 1980), and garbage can (e.g., Cohen, March & Olsen, 1972) decision making. These models have been examined primarily through the use of case studies that demonstrate the existence of the process or document the observed stages (see the review by Eisenhardt & Zbaracki, 1992). The process literature also includes the interactive processes used in decision making (e.g., dialectical inquiry, devils advocacy, and consensus).

Economics provided the basis for early decision making research. Theories of utility maximization and economic man led to models of rational decision making (e.g., March & Simon, 1958) that assume decision-makers use well-defined objectives to gather information and generate alternatives. From these alternatives, the decision-maker selects the optimal alternative. Thus, effective decisions result from the use of systematic processes. Recognizing that numerous constraints may affect the absolute rationality of the decision-making process, models of bounded rationality were advocated as more realistic representations of actual decision making processes (e.g., Cyert & March, 1963). These models acknowledge that personal constraints, social conditions, and resource limitations place boundaries on managerial decision making. Managers must search for a high quality decision under the existing constraints.

Political incremental models (e.g., Quinn, 1980), in contrast to the rational and boundedly rational models, emphasize the coalitional process required to resolve potentially conflicting goals of various decision-makers. From this perspective, successful decisions are those supported by the most powerful individuals or coalitions.

In an attempt to explain decision making under complexity and ambiguity, Cohen, March, and Olsen (1972) introduced the garbage can model of decision making. In stark contrast to the systematic nature of rational models, garbage can models emphasize the random nature of interactions among people, opportunities, problems, and solutions. As a result, garbage can approaches ignore decision effectiveness by focusing solely on observed variation in the decision-making process.

Descriptions of the various models have depended on case study research (Eisenhardt & Zbaracki, 1992). For example, Allison's (1971) review of the 1962 Cuban Missile Crisis uncovered aspects of rational and boundedly rational decision processes. Case studies were also used by Pettigrew (1973) to examine a retailer's decision to purchase a computer system and by Olsen (1976) to examine the selection of a university dean. These studies revealed evidence of political and garbage can decision making respectively.

Case studies have also been used to explore the stages, or the steps, of rational and boundedly rational models. Examples from the literature include Mintzberg, Raisinghani, and Theoret (1976), Nutt (1984), and Shrivastava and Grant (1985). Based on case studies from 25 organizations, Mintzberg et al. uncovered three phases of the SDM process: identification, development, and selection. After reviewing decisions from 78 service organizations, Nutt identified five types of decision processes and the steps associated with each type. Shrivastava and Grant's analysis of 32 organizations considering computerization revealed four types of SDM processes. While these studies assisted in understanding how managers approach decision making, they provided little insight into what constitutes an effective versus ineffective decision process.

In contrast to the descriptive process models mentioned thus far, empirical methods have been used to examine the "tools" or interactive processes used to facilitate decision making. Dialectical inquiry, devil's advocacy, and consensus approaches have been compared in terms of their ability to generate alternatives (Schweiger & Sandberg, 1989; Schwenk, 1984), time spent in meetings (Schweiger, Sandberg & Rechner, 1989), group satisfaction (Schweiger, Sandberg & Rechner, 1989; Schwenk, 1984), and decision quality (Schweiger & Sandberg; 1989; Schweiger et al., 1989). These studies conclude that the cognitive conflict introduced by approaches such as devil's advocacy and dialectical inquiry produces more effective decisions than processes that include affective conflict. Furthermore, consensus approaches have produced less effective decisions than those incorporating cognitive conflict.

The Decision Making Context

In addition to understanding the processes employed, the stages traversed and the tools used, researchers have sought to understand the factors that influence strategic decisions. In contrast to the case study approach which dominates the process literature, empirical approaches dominate the literature on SDM context. James Fredrickson was one of the first researchers to include contextual factors in empirical examinations of the SDM process. Suggesting that environment was a major threat to rationality, Fredrickson (1984; Fredrickson & Iaquinto, 1989; Fredrickson & Mitchell, 1984) conducted separate longitudinal studies of decision making in stable and unstable environments. Results indicated that rationality was positively associated with firm performance in stable environments but exhibited a negative relationship in unstable environments.

Acknowledging that decisions are motivated by some stimuli, Fredrickson (1985) studied the effects of decision motive and past performance. His concept of decision motive was analogous to framing; that is he was concerned with the differences in actions motivated by "problems" and "opportunities." With respect to past performance, Fredrickson was interested in how slack would affect process comprehensiveness, or the exhaustiveness and inclusiveness of organizational decision processes. He suggested that a) limited resources, resulting from low levels of past performance and b) issues framed as problems would lead to more comprehensive processes. In an executive sample, neither hypothesis was supported leading Fredrickson to conclude that these contextual factors were not important.

By the last half of the 1980s, several researchers began including contextual factors in empirical studies of SDM. Models included factors such as decision topic (Hickson et al., 1986), decision uncertainty (Nutt, 1986), results of past decisions (Bateman & Zeithaml, 1989), organization structure (Miller, 1987), organization size (Fredrickson & Iaquinto, 1989), and characteristics of the executive team (Fredrickson & Iaquinto, 1989). More recently specific calls for systematic research into contextual factors have been issued (Dean, Sharfman & Ford, 1991; Rajagopalan, Rasheed & Datta, 1993). As a result, overarching models have been presented as guides for systematizing further study of SDM. These models help clarify the categories of contextual variables and the potential influence on managerial actions, SDM processes, and process outcomes.

Overarching Models of SDM

Published reviews of the literature show that SDM research has been limited in scope (Eisenhardt & Zbaracki, 1992; Rajagopalan, Rasheed & Datta, 1993; Schwenk, 1995). Studies are commonplace that focus exclusively on the process, specify single contextual variables, or ignore outcomes. While many researchers have lamented the paucity of integrative research (e.g., Bower, 1998; Eisenhardt & Zbaracki, 1992; Papadakis & Barwise, 1998), others have presented overarching models to serve as guides for more integrative research (e.g., Bell, Bromiley & Bryson, 1998; Dean, Sharfman & Ford, 1991; Rajagopalan, Rasheed & Datta, 1993; Rajagopalan, Rasheed, Datta & Spreitzer, 1998).

Bell, Bromiley, and Bryson (1998) proposed a four-element framework, consisting of context, content, process, and outcome. Context is shown as the exogenous (or independent) variable, content and process are mediating variables, and outcomes serve as the endogenous (or dependent) variable. While the model does not provide a direct path from context to outcomes, it does include many interrelationships between the other variables. Likening SDM research to leadership studies, the authors stressed that definitive models for SDM research do not, and can not, exist. However, they do believe that broad frameworks such as theirs should serve as a guide for the design of more integrative research.

In contrast to this broad approach, Dean, Sharfman, and Ford (1991) presented a model emphasizing the environment, organization, problem, and team contexts. Their model did not include outcome variables thereby providing no insight into the effectiveness of strategic decisions.

To facilitate analysis and synthesis of past empirical research, Rajagopalan, Rasheed, and Datta (1993) presented an integrative framework. Their framework depicts three contextual factors (i.e., environment, organization, and decision-specific factors) that affect decision processes, which in turn affect process and economic outcomes. Contextual variables were also shown to moderate the relationship between the decision process and decision outcomes.

Two similarities can be noted between the three models. First, each model emphasizes the importance of including multiple contextual factors. Second, the models reflect published research studies rather than a specific theoretical perspective.

Breaking free of frameworks based on previous research, Rajagopalan and colleagues (1998) reconceptualized their 1993 work into a multi-theoretic model of SDM. This was accomplished by including managerial cognitions and actions as a transfer mechanism between the three categories of contextual factors (i.e., environment, organization, and decision-specific factors) and the SDM process. The theoretical basis for their model and the proposed relationships relied on Chaffee's (1985) linear, adaptive, and interpretive views of strategy. Their model addresses the research agendas proposed by several authors (Dean, Sharfman & Ford, 1991; Eisenhardt & Zbaracki, 1992; Papadakis & Barwise, 1998; Rajagopalan, Rasheed & Datta, 1993; Schwenk, 1995). In particular, it explores the effect of context, addresses the influence of top managers (both as an organizational context factor and in terms of cognitions and actions), emphasizes the relevance of strategic decisions by focusing on outcomes, and suggests the need for integrative research that simultaneously addresses context, managerial actions, process, and outcomes.

Keeping this broad research agenda in mind, the following literature review seeks to uncover specific research needs with respect to the environmental context, decision-maker characteristics as part of the organization context, and process outcomes. The review is followed by a model that is consistent with the multi-theoretic model of Rajagopalan et al. (1998) and that allows for systematic study of some questions left unanswered by the accumulated knowledge in the field.

Environmental Context

A critical component of the strategic decision-making process is the external environmental context. Given that the purpose of strategic decisions is the achievement or maintenance of competitive advantage (Ashmos, Duchon & McDaniel, 1998), firms must compare their internal strengths and weaknesses to the opportunities and threats presented by the external environment. This intelligence gathering process is the first step in strategy formulation (Andrews, 1980) and the starting point for organizational decision making (March & Simon, 1958). This section begins by overviewing the dimensions of the external environmental context that are most frequently referenced in the literature. Then, the relationship between the environment and SDM processes is described. Finally, the relationship between the environment and managerial action is examined.

Dimensions of the Environment

Following an extensive review of the literature, Aldrich (1979) identified six dimensions of the external environment. However, it was not until Dess and Beard (1984) that the dimensions would be examined in a systematic manner. Using the five Aldrich dimensions which applied to profit-making firms, Dess and Beard found that three dimensions, which they named munificence, dynamism, and complexity, represented the environment more parsimoniously.

Other than disagreements concerning nuances of measurement (Hart & Branbury, 1994; Sharfman & Dean, 1991), the three dimensions proposed by Dess and Beard (1984) have survived continued scrutiny. Generally the three dimensions have come to be understood as follows: Munificence refers to the existence of excess resources, dynamism to the unpredictability of change, and complexity to the number of different factors observed in the environment and the level of interconnectedness among factors (Sharfman & Dean, 1991).

In summary, three dimensions (munificence, dynamism, and complexity) have been used to represent the external environmental context. In addition to studying the dimensions of the environment, scholars have also considered its relationship to the SDM process. The next section demonstrates an almost exclusive focus on dynamism in the SDM literature. While munificence and complexity offer fertile ground for SDM research, this study focuses on clarifying unanswered questions with respect to environmental dynamism.

Relationship Between the Environment and SDM Process Characteristics

The literature addressing the relationship between the environment and the SDM process is composed of both descriptive and normative studies. Descriptive studies consider context as an antecedent to SDM process characteristics and they detail what happens during the SDM process. An example of a descriptive study is Dean and Sharfman's (1993a) examination of how low munificence and high levels of competition affect procedural rationality. In contrast, normative studies explore the relationship between process and outcomes using context as either an antecedent or moderator of the relationship. By including outcomes in their models, normative models provide insight into the most effective environment-process combinations. An example of a normative study is Eisenhardt's (1989) examination of the process factors leading to decision making speed and improved organizational performance in dynamic environments.

A review of the environment-SDM literature provides two important insights. First, the environment-SDM literature has focused on normative research. This is in stark contrast to the descriptive nature of much of the SDM process literature. While thirteen normative studies were identified, only three studies were located that could be classified as descriptive (i.e., Dean & Sharfman, 1993a; Papadakis, Lioukas & Chambers, 1998; Sharfman & Dean, 1997). Second, the normative literature has focused exclusively on the dynamism dimension (Rajagopalan, Rasheed & Datta, 1993; Rajagopalan, Rasheed, Datta & Spreitzer, 1998) with only one known exception that examined munificence and dynamism (i.e., Goll & Rasheed, 1997).

Priem, Rasheed, and Kotulic (1995) critically examined the mixed results obtained from normative environmental-SDM research. Table 1 updates the literature they reviewed. It compares rationality, environmental dynamism, and performance by summarizing the characteristics of nine studies. As shown in the table, results have demonstrated negative, positive, and moderated relationships between rationality and performance outcomes in dynamic or unstable environments.

TABLE 1

Update to Priem, Rasheed, and Kotulic (1995)
Comparison of Rationality, Environmental Dynamism, and Performance Outcomes

	Fredrickson (1984); Fredrickson & Mitchell (1984)	Fredrickson & Iaquinto (1989); Iaquinto & Fredrickson (1997)	Miller & Friesen (1983)
Sample	109 executives in 27 firms in an unstable (saw mills & planing) industry and 152 executives in 38 firms in a stable industry (paint and coatings)	Subsamples of the original 65 firms; 45 in the 1989 study and 57 in the 1997 study	50 Canadian firms in 15 industries and 36 US firms
Data collection method	Questions based on a "decision-scenario"	Questions based on a "decision-scenario"	Questionnaires for Canadian firms, expert scoring of case histories for the US sample
Inference procedure	Deductive	Deductive	Deductive
Data analysis techniques	Partial correlations	Partial correlations; Regression	Product moment correlations
Controls	Size	Size	Small and diversified firms eliminated
Generalizability	Limited, since only one industry from each type of environment was included	Limited, since only one industry from each type of environment was included	Good, since sample includes firms in multiple industries
Operationalization of Rationality	Primary responsibility, breadth of participation, breadth of expertise, willingness to go outside for information, breadth of outside sources, expenditures, method for deciding, breadth of techniques	Primary responsibility, breadth of participation, breadth of expertise, willingness to go outside for information, breadth of outside sources, expenditures, method for deciding, breadth of techniques	Futurity, integration, analysis, multiplexity, industry expertise
Operationalization of Performance	ROA, sales growth	ROA, sales growth	Sales growth, growth in ROE
Relationship	Negative	Negative	Positive
Findings	Rational decision processes associated with superior economic performance in stable environments and inferior economic performance in unstable environments	Longitudinal extension provided continued support for original hypotheses. Higher agreement on process comprehensiveness found in unstable environments.	For high performing firms, increases in dynamism are accompanied by increases in planning rationality; For low performing firms, no significant relationship existed between rationality & performance.

TABLE 1 (Continued)

	Eisenhardt (1989)	Judge & Miller (1991)	Glick, Miller & Huber (1993)
Sample	Eight firms in the micro-computer industry	86 executives in 32 firms including 32 CEOs (10 in biotechnology, 10 in textiles, and 12 in hospitals)	Members of top management teams of 79 SBUs
Data collection method	CEO interviews, semi-structured interviews with TMT members, questionnaires and secondary sources	Interviews and archival data	Questionnaires and secondary sources
Inference procedure	Inductive	Deductive	Deductive
Data analysis techniques	Pattern analysis, profile comparison, theory building from case study	Regression for each industry	Regression
Controls	Industry	Size, decision importance	Industry, munificence
Generalizability	Limited, since single industry sample	Moderate, since sample contains three industries with varying rates of environmental change; but only one industry within each type & only a small number of firms within each industry	Good, since sample includes firms in industries that vary greatly in terms of turbulence
Operationalization of Rationality	Number of alternatives, use of experienced counselors, use of real time information, integration among decisions	Number of alternatives considered	Comprehensiveness questionnaire based on Fredrickson (1984)
Operationalization of Performance	Sales trend and ROS	ROA, sales growth	Open systems effectiveness, profitability
Relationship	Positive	Moderated	Moderated
Findings	Speed and comprehensiveness characterize effective strategic decisions in high velocity environments. (High velocity environments are also dynamic.)	Number of alternatives considered is positively associated with decision speed in high velocity environments; not significant ($p<.05$) in moderate or low velocity; No moderating effects between decision speed & performance detected	Comprehensiveness is positively related to profitability in turbulent environments but not significant in low turbulence

TABLE 1 (Continued)

	Priem, Rasheed & Kotulic (1995)	Dean & Sharfman (1996)	Goll & Rasheed (1997)
Sample	101 small manufacturing firms in various industries	52 decisions from 24 firms in 16 industries	111 large manufacturing firms in various industries
Data collection method	Questionnaires concerning overall decision-making process	Structured interviews and survey	Questionnaires concerning overall decision-making process; Archival performance data
Inference procedure	Deductive	Deductive	Deductive
Data analysis techniques	Moderated Regression	Moderated Regression	Moderated Regression
Controls	Size		Size
Generalizability	Good, since sample includes firms in multiple industries	Good, since sample includes firms in multiple industries	Good, since sample includes firms in multiple industries
Operationalization of Rationality	Rationality scale from Miller (1987) including analysis, future orientation, explicitness of strategy; and scanning devices	Extensiveness of scanning and analysis; Focus on crucial information	Systematic search, use of OR techniques, explanation of proposed changes, participative decision-making
Operationalization of Performance	Executive perceptions of ROS and ROA as compared to competitors	Decision effectiveness	ROA and ROS
Relationship	Moderated	Moderated	Moderated
Findings	Positive relationship between rationality and performance in dynamic environment; No relationship in low or medium dynamism environments	Moderating effect of instability on rationality-effectiveness relationship was not significant	Positive relationship between rationality and performance in dynamic environment; No relationship in low dynamism environments; Munificence also acts as a moderator

Fredrickson and his colleagues have consistently observed a negative relationship between rationality and firm performance in unstable environments and a positive relationship in stable environments (Fredrickson, 1984; Fredrickson & Iaquinto, 1989; Fredrickson & Mitchell; Iaquinto & Fredrickson, 1997). These researchers reasoned that the uncertainty of unstable environments is inconsistent with rational decision processes, which tend to be exhaustive or comprehensive in nature. On the other hand, noncomprehensive decision processes provide for flexible, low-cost, fast decisions that are more consistent with unstable environments.

Overall, the remaining group of studies seems to support environmental moderation of the relationship between rationality and performance. In particular, results indicate a positive relationship between rationality and performance outcomes in dynamic environments and a non-significant relationship in stable environments. Eisenhardt (1989) demonstrated that success in dynamic environments required use of real-time information, consideration of more alternatives, and the integration of various decisions. She reasoned that contradictory research (e.g., Fredrickson, 1984) equated rationality with complex, time-consuming planning processes while her observations indicated that successful firms in dynamic environments used concrete plans stored in the shared mental maps of decision-makers. These shared mental maps and parallel decision processing rather than a time-consuming, linear decision-making process enhanced decision speed. In addition to the reasoning offered by Eisenhardt, methodological concerns have also been raised concerning the stability versus instability of the two industries studied by Fredrickson (Glick, Miller & Huber, 1993).

Table 1 also illuminates an area that has received limited attention. Most studies have used the firm as the unit of analysis thereby providing insight into overall decision-making processes (e.g., Glick, Miller & Huber, 1993; Goll & Rasheed, 1997; Priem, Rasheed & Kotulic, 1995). Only three studies used actual organizational decisions as the unit of analysis (Dean & Sharfman, 1996; Eisenhardt, 1989; Judge & Miller, 1991). These studies produced inconclusive results concerning the moderating effects of the environment. Eisenhardt's sample of firms from an unstable environment, left the question of moderating effects unanswered. However, Judge and Miller's group analysis of three different environments supported moderation. Their results supported a positive relationship between rationality and firm performance in dynamic environments and non-significant results in moderate and stable environments. Finally, neither moderation nor main effects were supported by Dean and Sharfman's study on the effects of environmental dynamism on the relationship between procedural rationality and decision effectiveness.

In addition to the conflict concerning moderating effects, the process outcomes studied have been limited to decision speed and perceived decision effectiveness. Studies are needed that examine environmental effects on the relationship between decision processes and a broader range of process outcomes. Additional studies should address outcomes, such as decision quality, that can be directly related to the decision-level process.

Papadakis, Lioukas, and Chambers (1998) used a descriptive, rather than normative, approach in their examination of the relationship between the environment and SDM process characteristics. Using a decision-level of analysis, they found surprising results in an exploratory study of context to SDM process. Various indicators of decision-specific characteristics, top management characteristics, environmental context, and organizational factors were related to seven different indicators of SDM process, including rationality, extent of financial reporting, rule formalization, hierarchical decentralization, lateral communication, politicization, and problem-solving dissension. Results indicated that most SDM process characteristics were affected by several decision-specific factors, several organizational factors, at least one top management characteristic, but none of the three dimensions of the external environment. Decision-specific characteristics had the most influence on SDM process of all the factors considered. The decision characteristics examined in Papadakis et al.'s study included type of decision, magnitude of impact, uncertainty, threat/crisis, pressure, familiarity, and planned versus ad hoc. Only one normative environmental-SDM study has controlled for any decision-specific characteristics (i.e., Judge & Miller, 1991). This suggests the need to control for decision-specific factors in studies of environmental dynamism.

Environmental Relationships to Managerial Actions

In contrast to the number of studies relating the environment to SDM process characteristics, there is little literature that addresses the effect of the environment on individual manager actions in the context of strategic decisions. As noted previously, most environmental-SDM studies were conducted at the organizational-level of analysis therefore precluding examination of individual manager actions. Furthermore, those studies directed at the decision-level focused on the overall SDM process thereby ignoring individual actions. Rajagopalan et al. (1998) suggested that the lack of research in this area is a result of over-dependence on linear views of strategy, which treat managerial actions as a "black box."

Theoretically, environment has been proposed as an important determinant of managerial discretion or "latitude of action" (Hambrick & Finkelstein, 1987). Although not tested at the level of individual actions in the SDM context, there is support for the link between the environment and actions such as CEO scanning (Daft, Sormunen & Parks, 1988), changes to organizational scanning systems (Yasai-Ardekani & Nystrom, 1996), and strategic reorientation (Lant, Milliken & Batra, 1992; Miller & Friesen, 1980).

In summary, normative studies have dominated the literature examining strategic decision processes in the environmental context. At the level of overall strategic decision-making process, support seems to be building for a positive relationship between rationality and firm performance in dynamic environments and non-significant relationships in moderate or stable environments. The relationship at the decision-level of analysis across multiple decision process outcome variables remains uncertain. An area of environmental research receiving little attention is the connection to individual managerial actions.

Decision-Maker Characteristics as Part of the Organizational Context

According to inertial theory (Romanelli & Tushman, 1986), organizational factors such as structures, systems, and resources constrain future decision-making. The influence of organizational factors is acknowledged in the SDM literature through the inclusion of organizational context in integrative models of SDM (e.g., Dean, Sharfman & Ford, 1991; Rajagopalan et al., 1993; Rajagopalan et al., 1998).

The organizational context has also received significant attention in the empirical SDM literature. A review of 46 empirical SDM articles revealed 22 studies that included the organizational context (See Appendix A for a list of these studies. In addition to identifying whether each study examined organizational context, Appendix A identifies the inclusion of environmental context, decision factors, process characteristics, process outcomes, and firm outcomes). Research has shown that organizational factors affect how managers use information, which in turn affects actions (e.g., Daft & Lengel, 1984). Empirical studies have examined variables such as structure (e.g., Miller, 1987; Wally & Baum, 1994), firm size (e.g., Iaquinto & Fredrickson, 1997), past performance (e.g., Ashmos, Duchon & McDaniel, 1998; Fredrickson, 1985), slack resources (e.g., Bateman & Zeithaml, 1989; Sharfman & Dean, 1997), goals (e.g., Bourgeois & Eisenhardt, 1988), and organization learning systems (e.g., Shrivastava & Grant, 1985).

The majority of the organizational context studies include decision-maker characteristics. Research in this area can be classified as demographic characteristics, personality traits, and preferred decision style. Table 2 summarizes 12 SDM studies that have included decision-maker characteristics.

Relationships between Decision-Maker Characteristics and SDM Processes

Hambrick and Mason (1984) criticized the early SDM research for focusing on the flow of information while ignoring the people involved in decision-making. Introducing what has come to be known as upper-echelon theory, Hambrick and Mason viewed organizational outcomes as reflections of the cognitive base of the organization's individual, upper-echelon decision-makers. Due to the difficulty in measuring cognitive bases, observable characteristics (or demographics) were proposed as indicators of the complex perceptual processes used by managers. As a result, observable characteristics have become popular antecedents in strategy research including studies of top management team social integration and communication, strategic orientation, and strategic change (e.g., Smith, Smith, Olian, Sims, O'Bannon & Scully, 1994; Thomas, Litschert & Ramaswamy, 1991; Wiersema & Bantel, 1992).

Of the 12 SDM studies including decision-maker characteristics, shown in Table 2, six have used demographics. Only three of these studies have reported significant effects. The significance of four different CEO demographic characteristics (i.e., age, functional background, experience, and level in the organization) led Hitt and Tyler

TABLE 2

Studies of Strategic Decision Making Considering Decision-Maker Characteristics

	Demographics	Personality and/or Style	Other Context	Process	Outcomes
Henderson & Nutt, 1980; Nutt, 1986; Nutt, 1990		Decision style	*Internal context; Industry;* Decision uncertainty		Likelihood of adoption
Fredrickson & Iaquinto, 1989	Executive team change in tenure and *Continuity*			Comprehen-siveness	
Hunt et al., 1989		Decision style		Decision strategy	
Hitt & Tyler, 1991	*Level of education*; Age; Functional background; Experience; Level in organization	*Risk propensity; Cognitive complexity*	Industry; Decision criteria	Evaluation of acquisition targets	
Stumpf & Dunbar, 1991		Decision style		Biases in action	Action Radicalness
Glick, Miller & Huber, 1993	*Diversity in terms of: age, tenure, and functional background*		Structural diversity	Comprehen-siveness; (also Cognitive diversity)	Firm performance
Wally & Baum, 1994		Propensity to act; Risk propensity; Cognitive complexity	Structure		Decision pace
Brockmann & Simmonds, 1997	*CEO age; Job tenure;* Industry tenure	Decision style		Use of tacit knowledge	
Iaquinto & Fredrickson, 1997	*TMT size; TMT tenure*		*Past performance;* Firm size; Environment	TMT agreement on comprehen-siveness	Firm performance
Papadakis, Lioukas & Chambers, 1998	*Education*	*Risk propensity; Need for Achievement; Aggressiveness*	*Environment context;* Decision characteristics; Organization context	Comprehen-siveness; Politicization; (plus 5 other unique process variables)	

Note: *Italics* indicate a non-significant relationship between antecedent and process variables.

(1991) to claim support for the importance of managers in decision-making processes. However, their study examined manager's ratings of various acquisition candidates. Therefore, they were not focused on a strategic decision, defined as a commitment to action; rather they examined the evaluation of alternatives.

Brockmann and Simmonds (1997) also examined CEO demographics. Their study on the use of tacit knowledge was unable to support age and job tenure as process predictors but did find significance for industry tenure. This finding supports the influence of industry environment on cognitive process.

In contrast to the two studies just discussed, Fredrickson and Iaquinto (1989; Iaquinto & Fredrickson, 1997) examined top management team demographics rather than individual characteristics. Team demographics were not significant in the cross-sectional study of agreement on comprehensiveness but team tenure was significant in the longitudinal study of comprehensiveness.

Overall, these studies reveal that significant results have been found only in cases where a) evaluations rather than decisions were studied, b) industry was purported to explain the significance, and c) team demographics were studied longitudinally. Given these results, the effects of individual demographics on SDM do not seem to be generalizable and are not examined in this study.

Three studies attempted to directly measure individual cognitive bases by examining personality. However, design differences and mixed results prohibit generalizability. Risk propensity and cognitive complexity were not supported as predictors of alternative evaluation (Hitt & Tyler, 1991) and neither risk propensity, need for achievement nor aggressiveness were supported as antecedents of decision process

(Papadakis, Lioukas & Chambers, 1998). Yet, propensity to act, risk propensity, and cognitive complexity were supported as predictors of decision pace when process variables were ignored (Wally & Baum, 1994). Thus, significant effects have been found only in the absence of process variables. Again, the lack of generalizability suggests that personality traits may not be the most important decision-maker characteristic for inclusion in integrative models of SDM.

In contrast to the mixed results found for both demographic and personality variables, significant results are consistently found for the effects of decision style. Trait-orientations, such as traditional personality theory, focus on "structures or systems inside people" (Hogan, 1991: 875). In contrast, personality typologies shift the focus from an enduring structure to the individual's preferred cognitive processes—or style.

Research using decision style has employed Jung's (1921/1971) theory of psychological types. Jung suggested that individuals exhibit preferences for perceiving and judging their world. In terms of perceiving preferences, individuals favor either sensing or intuiting. Sensors, those individuals with sensing preferences, favor specific, detailed information that is observed with the physical senses. Intuitors, on the other hand, favor general, holistic information from which patterns can be extracted. Jung also proposed that individuals develop either thinking or feeling preferences for use in judging information. Thinkers stress rational, logical, and analytical reasoning processes whereas feelers emphasize values and the impact on others when making judgments. Arguing that the dimensions of perception and judgment were separate, Jung (1921/1971) suggested that crossing the two dimensions leads to four personality types: sensing/thinking (ST), sensing/feeling (SF), intuiting/thinking (NT), intuiting/feeling (NF). These four types have become known as decision styles (Henderson & Nutt, 1980).

Although studies have consistently supported decision style as an important contextual variable in SDM, two areas remain unexplored. First, as shown in Table 2, decision style studies have focused on the individuals' decisions thereby ignoring SDM processes which involve complex interactions among managers (Lessard & Zaheer, 1996). Second, studies have not included decision style in normative examinations of the process. This leaves unanswered the question of whether decision-maker characteristics have an affect on decision quality. This study explores these two areas.

Strategic Decision Making Process Outcomes

As Eisenhardt and Zbaracki (1992) pointed out, most traditional research in strategic decision making (SDM) has been descriptive in nature (e.g., Cohen, March & Olsen, 1972; Hickson et al, 1986). Descriptive studies were necessary to demonstrate that managers did not depend solely on classic economic models of choice. In contrast to descriptive research, normative models reveal the predictors and moderators of *effective* decisions across a broad range of outcome measures.

Outcomes can be examined at the process or organization level. At the organization level, most studies have depended on economic outcomes such as return on assets and sales growth (e.g., Fredrickson, 1984; Fredrickson & Mitchell, 1984; Fredrickson & Iaquinto, 1989; Judge & Miller, 1991; Priem, Rasheed & Kotulic, 1995). Others have used outcomes targeted to a specific industry such as Thomas, Clark, and Gioia's (1993) measures of occupancy, admissions, and profit per discharge for the hospital sector. Appendix A shows nine studies which have examined organization level outcomes.

Although firm-level outcomes may be used to examine overall decision processes, they provide little information on the effectiveness of specific decisions or specific decision processes. And while improved firm performance is the fundamental goal of strategy processes, it is problematic to relate process variables directly to firm performance due to the potential for numerous confounds. However, as shown in Table 3, at least 18 studies have examined process outcomes. In general, the outcome variables employed in these studies can be classified into one of six categories: adoption, characteristics of the choice, decision pace, decision quality, decision effectiveness, and group satisfaction. Studies using the outcome variables of adoption, choice characteristics, and group satisfaction provide no information on whether the decision provides benefit to the organization.

Focusing on the remaining studies, two omissions become evident. First, studies have not examined decision quality in different environmental contexts. Furthermore, the only two studies directly testing for environmental effects on decision outcomes produced mixed results. While Dean and Sharfman (1996) found significant direct effects between environmental favorability and decision effectiveness, Judge and Miller (1991) were unable to support the moderating effect of environmental velocity between alternative generation and decision speed. Second, studies have not examined the relationship between decision-maker characteristics, group decision processes, and decision outcomes. This gap was also noted in the previous section. Therefore,

TABLE 3

Strategic Decision Making Studies that Include Process Outcomes

	Context Variables	Process Variables	Process Outcomes
Henderson & Nutt, 1980; Nutt, 1986; Nutt, 1990	• Organization environment • Information source • Decision Uncertainty • Decision style		• Likelihood of adoption (choice)
Bourgeois & Eisenhardt, 1988	• Clear goals • Decision triggers	• Rationality • Comprehensiveness • Political behavior	• Speed of decision
Bateman & Zeithaml, 1989	• Feedback on past decisions • Feedback on firm slack • Decision Frame		• Level of reinvestment
Eisenhardt, 1989	• High velocity environment	• Use of real time info • Alternative generation • Conflict • Counselor input	• Pace of decision
Schweiger & Sandberg, 1989		• DI, DA, consensus • Number, validity & importance of assumptions	• Quality of recommendations
Schweiger, Sandberg & Rechner, 1989		• Dialectical inquiry • Devil's advocacy • Consensus • Meeting time	• Decision quality • Group reaction & satisfaction
Judge & Miller, 1991	• Board experience • Environmental velocity	• Number of alternatives generated	• Decision speed
Stumpf & Dunbar, 1991	• Decision style	• Biases in managerial action	• Action radicalness
Daft, Bettenhausen & Tyler, 1993	• Industry • Information sources		• Low cost vs differentiation strategy
Nutt, 1993		• 4 types of formulation processes	• Duration • Effectiveness
Wally & Baum, 1994	• Individual differences • Organization structure		• Pace
Rodrigues & Hickson, 1995	• Availability and criticality of information	• Several process variables	• Decision success
Amason, 1996		• Cognitive Conflict • Affective Conflict	• Decision quality • Commitment and understanding of decision • Affective acceptance
Dean & Sharfman, 1996	• Environment stability and favorability	• Procedural rationality • Politics	• Decision effectiveness
Lessard & Zaheer, 1996	• Incentives • Service vs functional orientation	• Cross-functional processes • Flexibility processes	• Effectiveness
Nutt, 1998	• Claim origination • Claim Type	• Direction toward solution	• Adoption • Effectiveness • Development time

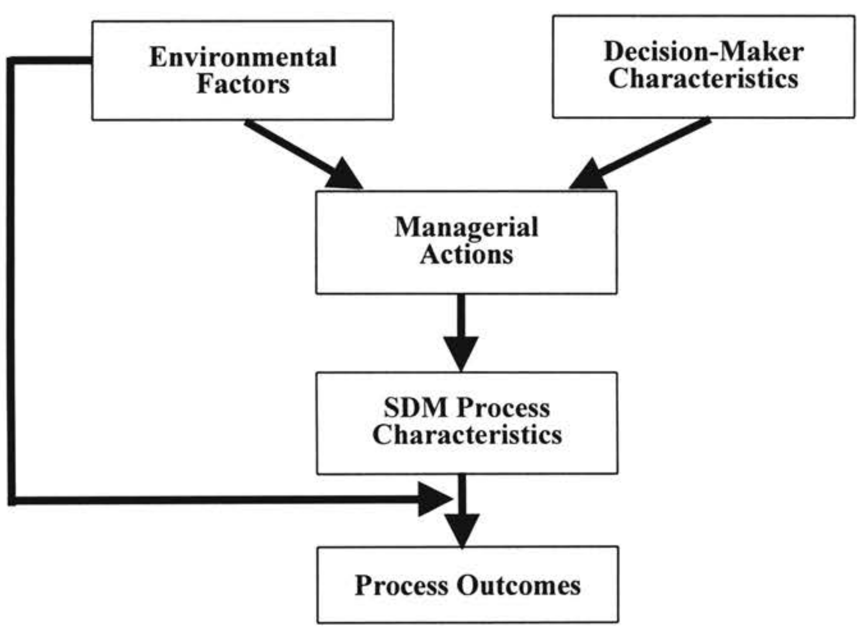
studies are needed that a) investigate decision quality in different environmental contexts and b) explore process outcomes when both individual managerial actions and group process variables are modeled.

Composite Model

To summarize, the three previous sections highlighted the need for research that a) examines environmental effects at the decision level of analysis, b) includes decision-specific factors when examining SDM context, c) explores links between the environment and managerial actions, d) examines links between the individual characteristic of decision style and SDM process characteristics, e) tests the effect of decision style on decision outcomes, f) examines the effects of environmental factors on decision quality, and g) tests models which include contextual factors, managerial actions, process characteristics, and process outcomes. Figure 1 presents a research model that can be used to study each of these needs.

FIGURE 1

Research Model for Determinants of SDM Process Outcomes



Theoretical Basis

Three traditions are found in strategic decision-making research. Hitt and Tyler (1991) identified the traditions using the terms rational normative, deterministic, and strategic choice; Rajagopalan and Spreitzer (1997) suggested that process research can be classified according to rational, learning, and cognitive lenses; Rajagopalan et al. (1998) referred to Chaffee's (1985) views of strategy when they identified the theoretical traditions as linear, adaptive, and interpretative. Although these authors used different terminology, they referred to the same three theoretical traditions. Table 4 shows the relationships among terms.

TABLE 4

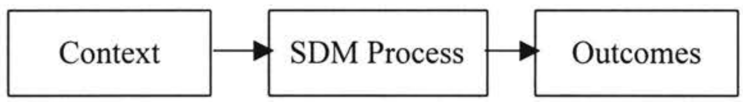
Synthesis of the Terminology of Chaffee (1985), Hitt and Tyler (1991), Rajagopalan et al. (1998), and Rajagopalan and Spreitzer (1997)

	Tradition 1	Tradition 2	Tradition 3
Chaffee (1985) and Rajagopalan et al. (1998)	Linear	Adaptive	Interpretive
Hitt and Tyler (1991)	Deterministic	Rational Normative	Strategic Choice
Rajagopalan and Spreitzer (1997)	Rational	Learning	Cognitive

Using the language of Rajagopalan and Spreitzer (1997), the research model shown in Figure 1 can be explained using the rational and learning lens traditions of SDM. The rational view of strategy suggests that the SDM process is a sequential, planned process that reflects the demands of the context. That is, clear alternatives lead to reasoned choices. From this perspective, models of SDM emphasize that the SDM process is directly affected by contextual factors. This is shown in Figure 2. Emphasizing the role played by the external environment, research in this tradition views industry structure as a critical determinant of SDM processes and outcomes (e.g., Fredrickson, 1984; Fredrickson & Mitchell, 1984). This tradition is reflected in the research model for this study, depicted in Figure 1, by the arrow showing that the environment moderates the relationship between SDM process characteristics and process outcomes.

FIGURE 2

Rational Lens View of SDM

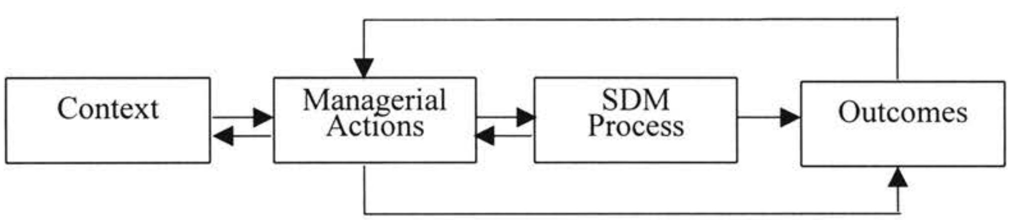


Models in the tradition of the learning lens emphasize the need for managers to analyze external and internal environments to objectively determine the decisions that will lead to the organization's long-term success. Unlike the sequential, planned process of the rational lens view, the learning lens view emphasizes an iterative or evolutionary process where managers learn through a series of small steps or actions (Rajagopalan & Spreitzer, 1997).

The model shown in Figure 3 represents the learning lens perspective. It suggests that managerial actions mediate the effects of contextual conditions on the SDM process. Contextual conditions are defined broadly and may include factors such as the

FIGURE 3

Learning Lens View of SDM



environment, the organization, the decision-maker, and the decision. Thus, the SDM process is understood through the pattern of actions that managers undertake to cope with the context. Unlike the rational view, the boundary between the context and the manager is permeable. That is, there is two-way interaction between the context and the manager where the context may affect manager actions *and* manager actions may affect the context. Managers attempt to understand the context by gathering and analyzing information and may affect the context through coalitional processes. Actions are also affected by the process and the process outcomes. Research from this perspective often emphasizes the role of objectives and formal planning processes (e.g., Hitt & Tyler, 1991).

In this study (see Figure 1), the learning lens perspective is reflected by the addition of managerial actions as the direct antecedent of SDM process characteristics. Managerial actions, therefore, become mediators between contextual factors and the SDM process. Decision-maker characteristics, an element of the organizational context, are also included as predictors of managerial actions. The inclusion of managerial actions and decision-maker characteristics provides a partial test of the learning lens view. A longitudinal study would be necessary to test the learning loops.

From the perspective of the cognitive lens, the ways in which managers interpret and enact their environments has the greatest impact on the SDM process. In effect managerial cognitions help explain differences in managerial actions. Therefore, models in this tradition show contextual factors having a direct affect on managerial cognitions, managerial cognitions affecting managerial actions, and managerial actions having return effects on the context. In addition, the learning links from the SDM process and outcomes affect managerial cognitions rather than directly affecting managerial actions.

The cognitive view has received a great deal of attention and support in the SDM literature (e.g., Dutton & Jackson, 1987; Schwenk, 1988; Walsh, 1995) and should not be discounted. However, the unanswered questions relating to the environmental context, decision-maker characteristics as an element of the organizational context, the role of managerial actions, and the effects on process outcomes can be explained using only the rational and learning lens views. Thus, this study narrowly focuses on the rational and learning lens views of SDM.

Research Hypotheses and Research Questions

The integrative models include a broad range of SDM process characteristics representing a multitude of process perspectives including rationality, politicization, and conflict. As noted in the review of the SDM literature, rationality has dominated much of the empirical research concerning the environmental context, decision-maker characteristics, and process outcomes. Thus, in an attempt to add additional depth to our understanding of these areas, this study focuses on rationality. This section presents specific hypotheses related to the composite research model presented in Figure 1.

Decision rationality is conceived as the collection and analysis of information for the purpose of selecting the best alternative (Bourgeois & Eisenhardt, 1988; Dean & Sharfman, 1993b; Fredrickson, 1984). Rationality includes the concept of comprehensiveness which represents the "extent to which an organization attempts to be exhaustive or inclusive in making and integrating strategic decisions" (Fredrickson & Mitchell, 1984: 402) or the "extent to which an upper-echelon executive group utilizes an extensive decision process" (Miller, Burke & Glick, 1998: 40). Dean and Sharfman (1993a) were careful to point out that rationality in the SDM literature does not depend on the utility maximization principles of early rational models (e.g., March & Simon, 1958). Rather it is "intended" or "procedural" rationality which is "characterized by an attempt to collect the information necessary to form expectations about various alternatives, and the use of this information in the final decision" (Dean & Sharfman, 1993a: 589).

Two perspectives have been advanced on the role of the environment in the relationship between rationality and outcomes. One perspective suggests that rationality leads to lower levels of performance in dynamic environments. The fast and uncertain pace of dynamic, or unstable, environments requires fast decisions made with limited data. As a result, there is no time to execute fully rational or comprehensive decision making processes (Fredrickson & Mitchell, 1984). The stable environment, on the other hand, provides more certain information and exhibits more predictability thereby benefiting from the discovery of cause-and-effect relationships and the flexibility of incremental decision processes (Fredrickson, 1984).

The opposing perspective suggests that the unpredictability of dynamic environments actually causes decision-makers to accelerate information collection and analysis so that decisions can be responsive to rapidly changing circumstances. "A dynamic environment must be studied more carefully and diligently to afford executives with an adequate degree of mastery" (Miller & Friesen, 1983: 223). Firms must actually employ greater rationality in unpredictable environments to understand the extent and interconnectedness of environmental issues and increase performance (Goll & Rasheed, 1997).

As noted earlier in this chapter, the majority of the literature has supported the latter view but has produced inconclusive results. Eisenhardt (1989) supported a positive relationship between comprehensiveness and decision speed in dynamic environments. Extending these results, Judge and Miller (1991) demonstrated positive effects in dynamic environments but non-significant effects in moderate and stable environments. Non-significant results in the less dynamic environments were attributed to the diminished need for fast decisions in these environments. In contrast, Dean and Sharfman (1996) found non-significant effects between rationality and decision effectiveness in all environments. However, their results were strongly influenced by the inclusion of an environmental favorability factor that did exhibit greater influence on decision effectiveness in unstable environments than in stable environments.

Despite these inconclusive results, there is growing support for the idea that the increased information gathering and analysis of rational processes leads to a greater understanding of complex, unstable environments and therefore promotes higher quality decisions. However, the greater predictability of moderate and stable environments may already be modeled in the shared cognitive schemas of managers thereby requiring limited search and analysis to reach an effective decision (Walsh, 1995).

Fredrickson and Mitchell's (1984) examination of analytic comprehensiveness, a measure of rationality, indicated that information collection is the sole indicator of rationality found to be significantly related to firm performance across the four stages of SDM (i.e., situation diagnosis, alternative generation, alternative evaluation, and decision integration). Likewise, Dean and Sharfman's (1993b) development of scales for procedural rationality and politicality showed information search having the highest correlation (.824) with the rationality factor and no correlation with the politicality factor (.018). Due to the apparent importance of information collection, this study focuses on the information collection aspect of rationality. This leads to the following hypotheses:

Hypothesis 1a: Rationality in collecting information will be positively related to SDM quality in dynamic environments.

Hypothesis 1b: Rationality in collecting information will not be related to SDM quality in moderate and stable environments.

Environmental scanning is the means by which top managers perceive the environment (Daft, Sormunen & Parks, 1988). It is the "activity of acquiring information" (Aguilar, 1967:1) and "involves simply an *exposure to* and *perception of* information" (p. 18, emphasis in original). As such, scanning is closely related to decision rationality in the collection of information. Discrimination between the two concepts occurs at the level of process output. In the context of SDM, rationality in collecting information is a group process leading to analysis of multiple alternatives for the purpose of selecting the best alternative (Bourgeois & Eisenhardt, 1988; Dean & Sharfman, 1993b; Fredrickson, 1984). Scanning, on the other hand, is generally an individual managerial action that requires gathering information from the environment for the purpose of providing relevant information for group decision processes. Thus, scanning precedes the decision process.

From an information processing perspective, the unpredictability of the dynamic environment causes managers to search for additional information that can be used in the analysis of alternative courses of actions (Daft & Lengel, 1984). This additional information is used as an aid to the identification of strategic issues (Dutton & Jackson,

1987) and the development of cognitive schema (Walsh, 1995). Less information may slow the decision making process by encouraging time-consuming planning processes rather than the use of real-time information (Eisenhardt, 1989). However, dynamic environments require fast decisions to capitalize on opportunities and avoid threats (Eisenhardt, 1989). Therefore,

Hypothesis 2a: Scanning completeness will be greater in dynamic environments than in moderate or stable environments.

Organizational level interpretation processes depend on information shared among top managers (Daft & Weick, 1984). Yet, individuals perceive and interpret information differently (Dutton & Jackson, 1987). Thus, scanning at the individual level should have direct effects on information collection and analysis at the group level. As individuals increase their scanning activities, more information from various individual perspectives will be available for use by the group. This suggests the following hypothesis.

Hypothesis 2b: Higher levels of rationality in collecting information will be associated with higher levels of scanning completeness.

The processes of perceiving and interpreting the environment provide the basis for strategic choice (Hambrick & Mason, 1984). Furthermore, individuals develop preferences for executing these processes (Jung, 1921/1971). Jung proposed that managers favor one of two methods for perceiving information—sensing or intuiting. As the term implies, sensors prefer information that can be personally observed with at least one of the five senses (Myers, 1993). They prefer information that is specific, detailed, concrete, and can be used in the present (Barr & Barr, 1989). Sensors seek to reconcile ambiguity in their environment. Conversely, intuitors prefer abstract information from which patterns can be extracted (Myers, 1993). This has been demonstrated through studies of field independence-dependence which revealed the superior ability of intuitors to extract figures from a complex background (Carey, Fleming & Roberts, 1989; Corman & Platt, 1988). Given the sensors desire to reduce ambiguity and the intuitors dislike for well-defined situations, sensors would be expected to scan the environment for additional information whereas intuitors would prefer to consider possibilities based on information already gathered.

Thinking versus feeling preferences focus on how individuals judge or interpret their environment. Individuals preferring thinking use objective information in a rational, problem-solving process (Myers, 1993). Thinkers use analytic skills to probe deeply into issues (Barr & Barr, 1989). By comparison, feelers prefer to use person-centered values in decision making (Myers, 1993). Although feeling is an interpretive process, the inherent concern with the values and opinions of individuals suggests that feelers will initiate contact with others. This contact represents a form of information gathering and when the individuals are part of the feeler's organization it may be considered internal scanning. This scanning process should lead to the discovery of information held by others and previously unknown to the feeler. Taken together these arguments suggest the following hypotheses.

Hypothesis 3a: Higher levels of scanning completeness will be found when decision-makers have sensing preferences.

Hypothesis 3b: Higher levels of internal scanning will be found when decision-makers have feeling preferences.

Rationality in decision making refers to the desire to "make the best decision possible" (Dean & Sharfman, 1993a: 589) given environmental, organizational, managerial, and decision-specific constraints. As additional information is gathered and interpreted, cognitive schemas are updated. Managers use these mental representations of cause-and-effect relationships in determining how best to adapt the organization to the existing environment. Effective interaction among managers, each of whom use different cognitive schemas, encourages discussion and challenges the different perspectives found within the group (Amason, 1996; Mason & Mitroff, 1981). Research has shown that this type of "conflict" leads to higher quality decisions than does individual decision making (Schweiger & Sandberg, 1989). In contrast, less information collection and analysis leads to a less accurate understanding of the decision context, therefore leading to lower quality decisions. Based on these arguments, the following hypothesis is proposed.

Hypothesis 4: *Higher levels of decision quality will be associated with higher levels of rationality in collecting information.*

Hypotheses 1a and 1b propose that environmental dynamism moderates the relationship between the SDM process of rationality in collecting information and the SDM process outcome of decision quality. These hypotheses represent the rational lens view of SDM which suggests that fit between the environmental context and SDM processes leads to more effective outcomes. In contrast, hypothesis 2b proposes that managerial actions have an effect on SDM processes. In turn, hypotheses 2a, 3a, and 3b propose relationships between contextual variables, such as environment, decision-maker characteristics, and managerial actions. Together the set of hypotheses which consider managerial actions are representative of the learning lens view of SDM. While these two views are proposed to operate in tandem (Rajagopalan et al., 1998), their relative influence is unknown. Thus, the following research questions are posed.

Question 1: *To what extent does the environment predict variation in SDM processes and SDM outcomes?*

Question 2: *To what extent does the addition of decision-maker factors and managerial actions account for variation left unexplained by the environment?*

Table 5 summarizes the hypotheses and research questions presented above.

TABLE 5

Summary of Variables Proposed by Hypotheses and Research Questions

Hypothesis or Question (Relationship)	Environment	Decision-Maker Characteristic	Managerial Action	SDM Process Characteristic	Process Outcomes
H1a (positive)	Dynamic			Rationality in collecting information	Decision Quality
H1b (non-significant)	Moderate or Stable			Rationality in collecting information	Decision Quality
H2a (positive)	Dynamic		Scanning Complete-ness		
H2b (positive)			Scanning Complete-ness	Rationality in collecting information	
H3a (positive)		Sensing Preference	Scanning Complete-ness		
H3b (positive)		Feeling Preference	Internal Scanning		
H4 (positive)				Rationality in collecting information	Decision Quality
Q1	Dynamic, Moderate, & Stable			Rationality in collecting information	Decision Quality
Q2	Dynamic, Moderate, & Stable	Sensing/ Intuiting and Thinking/ Feeling Preferences	Scanning Complete-ness and Internal Scanning	Rationality in collecting information	Decision Quality

Chapter Summary

Following a review of the SDM literature related to the environmental context, decision-maker characteristics, and process outcomes, this chapter relied on the rational and learning lens perspectives of strategic decision making in developing the conceptual framework, hypotheses, and research questions examined by this study. From the perspective of the rational lens, the environment explains variation in the SDM process and outcomes. In contrast, the learning lens suggests that the inclusion of managerial actions in the SDM model explains significantly more variation than environmental factors alone. The methodology presented in the next chapter describes the process used to investigate these assertions and the set of hypotheses regarding specific SDM links between environment, decision-maker characteristics, managerial actions, the SDM process, and process outcomes.

CHAPTER III

METHODOLOGY

This study examines strategic decision making from both rational and learning lens views. The rational lens suggests that the environment exerts influence on the relationship between strategic decision processes and process outcomes. From the perspective of the learning lens, the SDM process is understood through the pattern of actions that managers undertake to cope with the context.

Grounded by these two views, Chapter II presented a research model that graphically depicts proposed relationships between context, managerial actions, SDM process, and process outcomes. The research model is not intended as a fully specified model of SDM. Rather the model offers a preliminary examination of how the rational and learning lens views operate together to influence SDM process outcomes. Chapter II also specified four hypotheses that suggest specific relationships between the components of the model and two research questions that explore the amount of variance explained by each of the two views. This chapter describes the sample, decision making environment, measures, and analytical techniques used to evaluate the research hypotheses and research questions.

Sample

The sample for this study was drawn from managers attending executive development programs offered by an international consulting firm specializing in organizational change efforts and leadership development programs for senior management. Such programs provide an opportunity to gather data from a wide variety of organizations and types of managers (Nutt, 1990).

This study is based on responses from 364 senior managers and executives from 3 Fortune 100 companies who attended 32 development programs during 1997 and 1998. Programs were conducted exclusively for managers from one of the three organizations. While managers attending a specific development program worked for the same organization, many worked at different locations or in different divisions. The first organization, represented by 216 managers, is a diversified technology company that generates approximately fifty percent of its revenue from the defense sector. The second organization, represented by 104 managers, is focused on financial services. The third organization, represented by 44 managers, explores, produces, transports, and markets various forms of energy.

Decision Making Environment

The research model presented in Chapter II includes decision-level process outcomes thus requiring that the decision become the unit of analysis. However, the non-routine nature of strategic decisions (Ashmos, Duchon & McDaniel, 1998) makes it difficult to generate large samples from field studies. This observation can be supported by reviewing empirical studies where typical decision-level sample sizes range from 10 (Eisenhardt, 1989) to 163 (Nutt, 1993). One study was based on 352 decisions but required a number of years to amass (i.e., Nutt, 1998).

Behavioral simulations provide research settings that can provide reasonable sample sizes and that can control potentially confounding variables while simultaneously maintaining contextual relevance. Given the relatively low number of behavioral simulations used in research (Gist, Hopper & Daniels, 1998), a definition of the method follows.

> A behavioral simulation is a constructed (versus natural) research setting in which human participants interact with each other and/or a confederate in an experience that is characteristic of one found naturally in organizations, because important contextual factors (e.g., tasks, physical setting, etc.) have been construed realistically. The behavioral simulation models environmental aspects yet maintains the element of human choice (Gist, Hopper & Daniels, 1998: 253).

Researchers can increase sample sizes through repeated administration of the behavioral simulation (referred to as a "simulation" from this point forward) with different subjects. However, the researcher must be concerned with the generalizability of the sample to the population of interest. This necessitates careful consideration of targeted participants. With strategic decision making, top-level managers are the population of interest. Executive development programs offer a unique opportunity to repeatedly administer a simulation to this population.

In addition to concerns regarding sample size, decision making research has been hampered by the lack of control over potentially confounding variables such as environment, information availability, and decision content. This has prompted calls for the use of research methods that allow for more control of the context (Rajagopalan et al., 1993; Schwenk, 1995). Simulations effectively address contextual concerns and "achieve parity in relevance with studies conducted in moderately altered natural contexts" such as contexts altered by the introduction of survey instruments (Gist, et al., 1998: 259). Contextual variables, including environment, information availability and decision content, can be built into a simulation thereby making simulations an "excellent research vehicle" (McCall & Lombardo, 1982: 540).

As noted, simulations conducted in the context of executive development programs overcome typical objections to laboratory, or non-field studies. These objections include the use of non-generalizable samples such as college students and the artificiality of the context (Locke, 1986). Participants attending development programs are members of the population of interest and the context is designed to reproduce the behaviors of the real world environment (Dutton & Stumpf, 1991).

Looking Glass Incorporated (LGI) is a behavioral simulation initially designed as a research environment in the late 1970s by the Center for Creative Leadership. Partially funded by the Office of Naval Research, the goal of the project was to create a simulated environment where real managers could be observed in a controlled but realistic setting (McCall & Lombardo, 1982). In addition to an extensive review of the literature, experts from organization science (such as Karl Weick and Henry Mintzberg), finance, and industry were consulted to ensure the validity of the simulation. Not until the simulation was actually tested with real managers did the designers realize its potential value as a management development tool (McCall & Lombardo, 1978).

Subsequent research demonstrated the validity of the simulation. Content validity was supported by a) a design based on the problems and issues faced by practicing managers and b) the observed correlation between the activities engaged in by simulation participants and those reported in studies of actual organizations (McCall & Lombardo, 1979; VanVelsor, Ruderman & Phillips, 1989). Construct validity was supported by examination of the fit between managerial activity patterns (e.g., percent of time spent with colleagues, formality in terms of number of memos written, etc.) and environmental uncertainty (McCall & Lombardo, 1979). At least four recent studies have used LGI as a research environment (Chatman & Barsade, 1995; Chatman, Polzer, Barsade & Neale, 1998; Gibson, 1999; Gynawalli, 1997). CCL continues to update and validate the simulation to reflect current business environments.

The simulated organization, Looking Glass Incorporated (LGI), is a $600 million, privately-held glass manufacturer composed of three strategic business units (SBUs). Forty five hundred people are employed by LGI at nine different locations. The Advanced Products Division (APD) is responsible for products such as capacitors, optical fibers, and liquid crystal displays. The Industrial Glass Division (IGD) produces industrial piping, automobile glass, and specialty products such as insulated glass. The Commercial Glass Division (CGD) produces casings for incandescent and florescent lights as well as flat glass. The top management team of LGI consists of 21 managers including a president; a vice president for each SBU; directors of sales and marketing, manufacturing, and product development for each SBU; and two to three plant managers per business unit. An organization chart is provided in Appendix B. This study focuses on the top management team from each SBU (i.e., Vice President, Director of Sales and Marketing, Director of Manufacturing, and Director of Product Development.)

The home organization identified the person filled the role of president, typically the person from the largest home division. All other positions are participant-selected following an LGI briefing. Following the briefing, managers receive reports and memos pertaining to their job. They are asked to spend at least two hours that evening preparing for a bi-monthly, day-long staff meeting between managers of the three SBUs. Participants are cautioned that the simulation is not a competition; rather, it is a real-time opportunity to propel this glass company forward strategically. Participants arrive the next morning to find offices, phone lists, and meeting rooms available for their use as they gather additional information, conduct meetings, and make decisions on approximately twelve major issues per division. An issue may be ignored, postponed or acted upon. When the issue is acted upon it becomes a decision. Issues range from the security of confidential information to the potential sale of an existing plant. Appendix C contains a list of the major issues facing each division.

Measures

Measures for environmental context, decision-maker characteristics, managers' actions, SDM process, and process outcomes are discussed in this section. With the exception of decision-maker characteristics, all measures are objective measures of the decision making environment. This contrasts with survey measures that ask for managers' perceptions of the environment, their actions, decision rationality, or process outcomes. Rather, these objective measures are based on the information each manager reported knowing at the end of the simulation, the decisions made during the simulation, and scoring rules provided by academic and industry experts.

Environmental Context

The dynamism dimension uncovered by Dess and Beard (1984) was dominated by measures of instability where instability is evidenced by environmental change that is unpredictable and that heightens uncertainty for managers. This conceptualization of dynamism is consistent with Duncan's (1972) conceptualization of dynamic environments. Duncan defined dynamic environments as those characterized by factors that are in a continual process of change while static environments are evidenced when factors remain basically the same.

Since the three external environments of the LGI business units were designed based on Duncan's (1972) conceptualization of dynamic versus static environments, three levels of environmental dynamism may be inferred. APD was designed to operate in a volatile, or dynamic, environment with their main objective being specialization in the precision market with an emphasis on customer service. IGD's environment is moderate with a focus on responding to customer tastes. CGD's goal of reducing costs to maintain market position places it in a stable environment. Other design elements for the three environments are shown in Table 6.

In this study, environment is a fixed effect based on the three different SBU environments.

TABLE 6

Some Environmental Differences among Looking Glass Divisions*

	Advanced Products (Dynamic Environment)	Industrial Glass (Moderate Environment)	Commercial Glass (Stable Environment)
Customers	High percentage military, many independents and smaller customers	Customers respond to consumer taste, military contracts	A few large customers of long standing
Technology	Fast-changing, highly sophisticated	Part stable, part exotic	Relatively stable, straightforward
Markets	Feast and famine, largely unpredictable	Both stable and volatile	Primarily slow, steady growth—quite predictable
Competition	Many competitors, often vicious and fast-changing	Mixed	Few competitors, relationships well established

*Reproduced from McCall and Lombardo (1982)

Decision-Maker Characteristics

Decision style is used to operationalize decision-maker characteristics in this study. Decision style is the combination of how people gather information and the judgments they make with respect to this information. Research has operationalized this construct as the combination of Sensing/Intuiting and Thinking/Feeling preferences as measured by the Myers-Briggs Type Indicator (Brockmann & Simmonds, 1997; Henderson & Nutt, 1980; Hunt et al., 1989; Nutt, 1986, 1990; Stumpf & Dunbar, 1991). This study uses the two components of decision style, information gathering and information judgment, as indicators of individual managers' characteristics and therefore antecedents to individual managers' actions.

Prior to attending the executive development seminar, managers fill out and return Form G of the Myers-Briggs Type Indicator (MBTI). The form includes 126 forced-choice items of which only 93 are used to determine scores for the Extaversion/Introversion (EI), Sensing/Intuiting (SN), Thinking/Feeling (TF), and Judging/Perceiving (JP) scales. The remaining items are considered filler items. Factor analysis has been used to demonstrate construct validity (Thompson & Borrello, 1986). This study utilizes only the SN and TF scales, which provide information on the manager's decision style.

MBTI scores may be reported on either a continuous scale or as a dichotomous preference. Research indicates that continuous scores are more reliable than dichotomous categories (Gardner & Martinko, 1996). Therefore, continuous scores from the SN (information gathering) and TF (judgment) scales were used when examining the percent variation explained by decision-maker characteristics. Continuous scores for both scales range from 33 to 167. Scores from 33 to 99 indicate S and T preferences while scores from 100 to 167 indicate N and F preferences. Previous studies found Form G continuous score coefficient alphas of .85 for the SN scale and .74 for the TF scale (Ruble & Cosier, 1990).

Managers' Actions

Managers' actions are operationalized as scanning actions for the purposes of this study. Scanning focuses on the acquisition of information (Aguilar, 1967) and has been operationalized as "amount of scanning" (Hambrick, 1981). In this study, the amount of scanning action is calculated for each decision for each manager.

Unlike traditional field studies, simulated decision environments allow for the control of information. Managers have no a priori knowledge of the simulated context; thus, information in a manager's possession at the conclusion of the simulation was either provided in their information packet or gathered from other managers within the simulated environment. The afternoon before the simulation begins, participants receive a packet of information based on their position. Thus, each participant begins with a known set of information and the information is consistent between simulation runs for each position. At the conclusion of the simulation, participants are asked to fill out a Problems and Issues Questionnaire (PIQ). There are three versions of the PIQ tied to the three divisions. Each PIQ consists of three sections. The first section asks questions regarding divisional problems and issues. The second section relates to divisional priorities and the final section asks participants to rate the effectiveness of the division, the president, and the other managers within their division.

Only section one of the PIQ pertains to this study. This section presents each issue facing the division on a separate page (See Appendix C for a list of issues by division). Each manager is asked to respond to the following questions relative to each issue:

1. Did you know that . . . (blacken as many as you knew)
   [The options represent all information bits available within the simulation. Given a specific issue, the amount of information available is the same for all participants within the same division]

2. What was done about the XYZ problem? (blacken as many as apply)
   a. don't know*
   b. it was discussed, but no decision was made*
   * NOTE: IF EITHER OF THE ABOVE IS ANSWERED, GO TO NEXT PAGE.
   [The remaining options represent specific actions e.g., "decided to terminate the contract with Mid-Atlantic."]

By comparing the information from question one of the PIQ with the information provided to each participant at the start of the simulation, the proportion of information collected during the simulation, which is equivalent to internal scanning, can be calculated as follows:

% Internal Scanning =

$$\frac{\text{Number of information bits known at end} - \text{Number of information bits at start}}{\text{Number of information bits known at end}} * 100$$

A measure of scanning completeness, that is the percentage of all available information uncovered by an individual manager, can be calculated as follows:

$$\text{Scanning Completeness} = \frac{\text{Number of information bits known at end}}{\text{Number of information bits available for this problem}} * 100$$

SDM Process Characteristics

Rationality in collecting information is used as the indicator of SDM process characteristics in this study. In the context of strategic decisions, rationality is an organizational-level or executive group-level process characteristic (Dean & Sharfman, 1993a; Fredrickson & Mitchell, 1984; Miller, Burke & Glick, 1998).

This study focuses on the extensiveness or completeness of information collection as indicators of process rationality. To capture collection completeness, a measure of decision-level team informity was used. Defined as the amount of information held by the team, team informity is calculated as follows:

$$\text{Team Informity} = \frac{\text{Number of unique information bits known by team members}}{\text{Number of information bits available to the team for this problem}} * 100$$

The number of unique information bits known was obtained from the PIQs of the team members. The PIQ was described previously.

Process Outcome

Decision quality is the process outcome for this study. At least four studies have purported to include measures of decision quality. While Schwenk (1990) hypothesized relationships between conflict and decision quality, the instructions given with the survey instrument requested responses based on the decision-making process rather than the actual decision. Amason (1996), however, did use three survey questions scaled from 1 (poor) to 4 (excellent) relating to decision quality. In contrast, panels of expert judges were used by both Schweiger and Sandberg (1989) and Schweiger, Sandberg, and Rechner (1989) to rate the quality of individual and group recommendations for a decision scenario. Quality was defined as consistency with the external environment and internal resources. Evaluation was based on a scale ranging from 1 (low quality) to 5 (high quality).

Following Schweiger and colleagues, decision quality for this study is based on expert evaluations. Each LGI problem, or issue, consists of a series of possible choices. A stream of choices results in a decision. Thus, decisions may be composed of multiple choices which is consistent with the definition of SDM processes given in Chapter I. LGI designers asked a panel of industry and academic experts to rate the quality of each decision choice as either good, poor, or indifferent. Indifference was assigned a value of zero. For both good and poor decision choices, raters assigned values ranging from one to ten indicating the degree of "good" or "poor". Ten points represents the best or worst possible score depending on whether the choice was evaluated as good or poor.

For example, a CGD management choice to hire a waste management firm was rated by experts as a good choice worth ten points while a decision to haul toxic waste to Mexico was categorized as a poor choice worth two points. These are just two of the nine choices available to deal with the Toxic Waste problem facing CGD. Each LGI decision may be composed of multiple choices. Thus, after summing the number of good points and poor points across decision choices for a given decision, quality is calculated as follows:

$$\text{Quality} = \frac{(\text{Number of good choice points - Number of poor choice points})}{\text{Total possible good choice points}} * 100$$

For the LGI simulation, this measure provides an interval scale ranging from –200 to +100 and provides consistent evaluation between simulation runs. As indicated by the lower bound, some decisions contain more poor choices than good choices. For example, IGD managers must make a decision concerning plant capacity. Combining existing capacity at either the present site or at the alternative site is a poor choice worth 10 points. Choosing to decrease capacity is also a poor choice which is worth 6 points. In contrast, there are three good choices including the purchase of new machinery, focusing on a particular product, and emphasizing a particular market. In this case, each good choice is worth 3 points. Thus, if the decision makers make a poor choice and do not combine that with one of the good choices, the quality of the decision would be ((0 good points – 16 poor points)/9 possible good points) * 100 which equals -178. Only two other decisions have more poor choice points than good choice points. Decisions with decision quality values less than –100 might be considered outliers.

Control Variables

Decision specific factors have been proposed as important antecedents to the decision-making process and ultimately for decision process outcomes (e.g., Hickson et al., 1986; Rajagopalan et al., 1993). However, Papadakis, Lioukas, and Chambers (1998) noted that researchers have not explored *how* these decision-specific factors affect the decision making process as a whole. In an exploratory study, these authors concluded that decision-specific factors, such as type of decision, magnitude of impact and decision uncertainty, may dominate the explanation of decision processes. However, their study did not include decision process outcomes. Therefore, this study again examines the influence of decision-specific factors.

As noted in Appendix C, 12 issues are presented to APD participants, 13 issues are provided to IGD participants, and 14 issues are supplied for CGD participants. This yields the possibility of 39 unique decisions. Since there is a finite set of decision-opportunities replicated between teams, there is no need to control for decision type as suggested in the literature (Hickson et al., 1986; Papadakis et al., 1998). Instead, decision was viewed as a random effect thus allowing inferences to other decisions not represented by the simulation.

Research Design

A 3-stage nested design (Montgomery, 1984: 368), also referred to as a partial hierarchical design (Kirk, 1995: 491), was used to partition the variance of SDM process characteristics and SDM process outcomes. Since SDM process characteristics and SDM process outcomes represent different units of analysis (i.e., the team versus the decision respectively), separate univariate analyses were conducted for the two dependent variables.

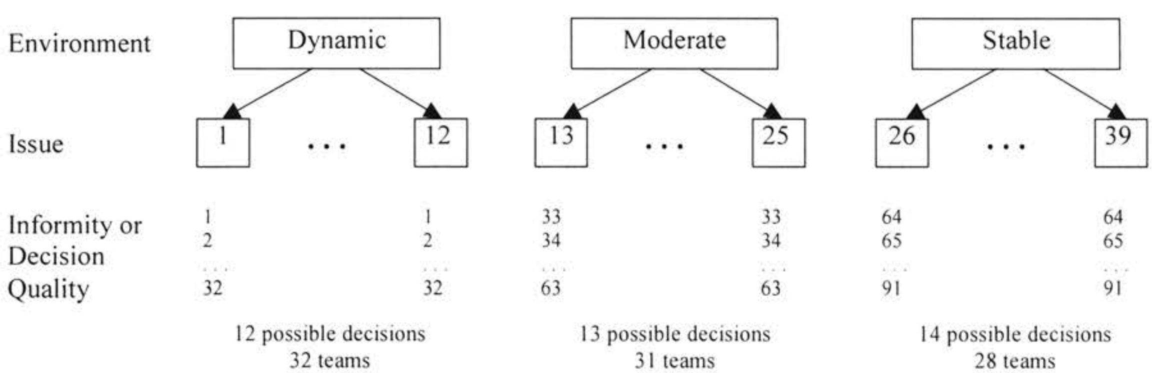
The first of the three design factors is the environment. The environmental factor has three levels representing dynamic, moderate, and stable environments. The environment was assessed as a fixed effect. The second factor, nested with the first, is the decision. Each environment is faced with a different set of decision opportunities, or issues. Thus, the number of levels for decisions is dependent on the environment. Twelve issues are built into the dynamic environment, 13 into the moderate environment, and 14 for the stable environment. Decision was considered a random effect allowing for inference to non-observed decisions. The third and final factor is the team. Like decisions, teams are nested within environments. Due to missing data and or small participant groups, the number of teams per environment varies. Data is available for 32 teams in the dynamic environment, 31 teams in the moderate environment, and 28 teams in the stable environment. Teams were treated as a random effect. Since the number of decisions and the number of teams vary by environment, the design is considered unbalanced.

Decision-maker characteristics and managerial actions were entered into the analysis as covariates. Decision-maker characteristics were represented by the Sensing/Intuiting and Thinking/Feeling scales of the MBTI. Managerial actions were represented by internal scanning and scanning completeness. For each decision and each team, the variation due to these four individual covariates were partialed from the total variation for each member of the team. Teams were defined as the top two levels in each division. That is, teams were composed of the Vice President, Director of Sales and Marketing, Director of Manufacturing, and Director of Product Development. Thus, given a specific decision and a specific team, 16 variables were entered—4 members times 4 covariates per member.

This design allows for examination of variance components associated with the environment, the decision within the environment, decision-maker characteristics, and managerial actions. The variance components provide answers for research questions 1 and 2 which seek to uncover the amount of variation in SDM processes and SDM outcomes explained by the environment and the amount of additional variation explained by decision-maker characteristics and managerial actions. The model is represented graphically in Figure 4 and mathematically by the equation on the next page.

FIGURE 4

Graphic Depiction of Research Design



$$y_{ijkl} = \mu + \alpha_j + \beta_{k(j)} + \gamma_{l(j)} + (\beta\gamma)_{k(j)l(j)} + \tau_{m(lj)}x_1 + \upsilon_{m(lj)}x_2 + \omega_{m(lj)}x_3 + \xi_{m(lj)}x_4 + \varepsilon_{i(jkl)}$$

where
y_{ijkl} represents either SDM processes or SDM outcomes
α_j represents fixed environment effects
(j=1,2,3 where 1=dynamic, 2=moderate, 3=stable)
$\beta_{k(j)}$ represents random decision within environment effects
(k=1…12 for j=1; k=1…13 for j=2; k=1…14 for j=3)
$\gamma_{l(j)}$ represents random teams within environment effects
(l=1…32 for j=1; l=1…31 for j=2; l=1…28 for j=3)
$(\beta\gamma)_{k(j)l(j)}$ represents the random interaction effects of decisions within environments and teams within environments
$\tau_{m(lj)}$ represents the within-groups x1 coefficient for manager m for team l within environment j (m=1…4 where 1 is the Vice President, 2 is the Director of Sales and Marketing, 3 is the Director of Manufacturing, and 4 is the Director of Product Development)
$\upsilon_{m(lj)}$ represents the within-groups x2 coefficient for manager m for team l within environment j
$\omega_{m(lj)}$ represents the within-groups x3 coefficient for manager m for team l within environment j
$\xi_{m(lj)}$ represents the within-groups x4 coefficient for manager m for team l within environment j
x_1 represents the mean adjusted Sensing/Intuiting covariate
x_2 represents the mean adjusted Thinking/Feeling covariate
x_3 represents the mean adjusted Internal Scanning covariate
x_4 represents the mean adjusted Scanning Completeness covariate
$\varepsilon_{i(jkl)}$ represents random error

The total possible sample size of 1179 issues/decisions (32 teams times 12 possible decisions + 31 teams times 13 possible decisions + 28 teams times 14 possible decisions) provides adequate degrees of freedom for partialing the sum of squares and should provide adequate power. Assumptions of normality for the dependent variables, equality of variances across factors, and linear relationships between covariates and the dependent variables were examined. Transformations were used to meet the assumptions of normality. The Brown-Forsythe test was used to test for the equality of variances; this test is appropriate for unequal sample sizes (Kirk, 1995).

Given that the sample consists of managers from three firms representing three different industries, simple random sampling can not be assumed. Demographic characteristics such as age, years of occupational experience, and educational level were used to evaluate potential subject differences across home organization, simulated environment, simulated functional assignment, and simulated position.

Decision making differences are not expected since all of the managers are being asked to assume positions in the glass industry which is different from the managers' home industry. However, the home industry could conceivably produce selective perception and interpretation differences between managers from different industries (Hambrick & Mason, 1984). Perceptual or interpretative differences may in turn lead to process and outcome differences. In addition, occupational or industry choice may be influenced by decision style (Myers & McCaulley, 1985). Thus, Tukey's test for the comparison of means was used to evaluate differences in information gathering, judgment, internal scanning, scanning completeness, team informity, and decision quality. Since significant differences were found for some variables, the hypotheses were evaluated based on separate analyses for each group.

The research design presented above provided answers for the two research questions. Hypothesis testing required separate analyses. Hypothesis 2a, which purported that higher levels of scanning completeness are found in dynamic environments than in moderate or stable environments, was evaluated using analysis of variance (ANOVA) and Tukey's test for the comparison of means. ANOVA and Tukey's test were also used to evaluate hypotheses 3a and 3b, which purported that sensing and feeling preferences would be associated with higher levels of scanning.

The remaining hypotheses suggest simple bivariate relationships. For example, hypothesis 4 states that higher levels of decision quality will be associated with higher levels of rationality in collecting information. (See Table 5 at the end of Chapter II for a summary of the proposed relationships.) The relationships were evaluated based on Spearman correlation coefficients. A given hypothesis was supported by a significant correlation in the hypothesized direction. It should be noted that multiple regression could not be used to test the series of hypotheses due to the upward cross-level nature of the data. That is, individual characteristics are used to predict group-level characteristics, which are used in turn to predict decision-level outcomes. The regression equation would violate the assumption of independence.

Chapter Summary

This chapter defined the sample, described the simulated decision making environment used to address the hypotheses and research questions, and described measures for environmental dynamism, managers' decision style, managers' scanning actions, SDM process rationality in collecting information, and decision quality outcomes. A nested design, also referred to as a partial hierarchical design, along with correlation analysis was proposed to address the hypotheses and questions. The next chapter describes the results of this effort.

CHAPTER IV

RESULTS

This chapter is organized into four sections that describe the results obtained from the research outlined in Chapter III. The first section presents descriptive statistics of the sample. The second section tests statistical assumptions related to the use of a partial hierarchical design with covariates. Sections three and four explore the hypotheses and research questions presented in Chapter II.

Descriptive Statistics

As described in Chapter III, the data for this study was obtained from executives and senior level managers who attended 1 of 32 executive development programs sponsored by an international consulting firm in 1997 and 1998. As part of the development effort, managers participated in the LGI behavioral simulation which is designed as an opportunity to address the strategic issues facing a simulated multi-divisional company. The sample of 364 managers was 72.5% male with over 47% of the sample holding degrees beyond the bachelor's level. On average, participants were 43.1 years of age with 14.1 years of occupational experience. The managers were associated with one of three home organizations--a diversified technology firm, a financial services organization, or an energy producer. Table 7 reports sample demographics for the overall sample and for each organization.

With respect to MBTI preferences, 41% of the managers were sensors and 59% were intuitors; 88% of the managers were thinkers and 12% were feelers. Table 8 presents a standard MBTI type table documenting the distribution of MBTI preferences in the overall sample. A column has been added for average continuous type scores.

TABLE 7

Overall and Organization Sample Demographics

Demographic (% reporting)	Overall Sample	Diversified Technology Sample	Financial Services Sample	Energy Producer Sample
Gender Male	264 (72.5%)	165 (76.4%)	61 (58.7%)	38 (86.4%)
Gender Female	100 (27.5%)	51 (23.6%)	43 (41.3%)	6 (13.6%)
Age in years	43.1 (84.3%)	43.3 (98.1%)	42.7 (91.3%)	(0%)
Occupational Experience in years	14.1 (74.2%)	14.7 (81.9%)	12.8 (89.4%)	(0%)
Education Level < 4 year degree	17 (4.7%)	10 (4.6%)	7 (6.7%)	(0%)
Education Level 4 year degree	121 (33.2%)	81 (37.5%)	40 (38.5%)	(0%)
Education Level > 4 year degree	173 (47.5%)	120 (55.6%)	53 (51.0%)	(0%)
Education Level Not reported	53 (14.6%)	5 (2.3%)	4 (3.8%)	44 (100%)
Number in sample	364	216 (59.3%)	104 (28.6%)	44 (12.1%)

Each manager participated in one of three LGI SBUs (i.e., APD, IGD, CGD) as either a Vice President, Director of Sales and Marketing, Director of Manufacturing, or Director of Product Development. From 32 replications of the simulation, complete data was available for 91 SBU-level top management teams. It was possible for the 91 teams to make a total of 1179 decisions (32 APD teams times 12 issues plus 31 IGD teams times 13 issues plus 28 CGD teams times 14 issues). However, teams could ignore a problem or postpone a decision. Six hundred and seventy five decisions were actually made (57.3% of the number possible).

TABLE 8

Distribution of Personality Type within the Overall Sample

				Type	n	%	Average Score
ISTJ	ISFJ	INFJ	INTJ	E	195	53.6	75.7
n=60	n=2	n=8	n=50	I	169	46.4	125.0
16.5%	0.5%	2.2%	13.7%				
				S	149	40.9	74.0
ISTP	ISFP	INFP	INTP	N	215	59.1	124.6
n=9	n=3	n=7	n=30				
2.5%	0.8%	1.9%	8.2%	T	321	88.2	67.7
				F	43	11.8	115.1
ESTP	ESFP	ENFP	ENTP				
n=12	n=4	n=6	n=45	J	248	68.1	73.9
3.3%	1.1%	1.6%	12.4%	P	116	31.9	122.5
ESTJ	ESFJ	ENFJ	ENTJ	IJ	120	33.0	
n=49	n=10	n=3	n=66	IP	49	13.5	
13.5%	2.7%	0.8%	18.1%	EP	67	18.4	
				EJ	128	35.2	
				ST	130	35.7	
				SF	19	5.2	
				NF	24	6.6	
				NT	191	52.5	
				SJ	121	33.2	
				SP	28	7.7	
				NP	88	24.2	
				NJ	127	34.9	
				TJ	225	61.8	
				TP	96	26.4	
				FP	20	5.5	
				FJ	23	6.3	
				IN	95	26.1	
				EN	120	33.0	
				IS	74	20.3	
				ES	75	20.6	

Examination of residual plots revealed decision quality values of –100 were outliers. The outliers were associated with one of two issues: APD's potential sale of the LCD glass plant and CGD's customer lawsuit. These two issues had standard deviations of 99.8 and 95.8 respectively; the next largest standard deviation was 54.8. For the APD issue 9 teams scored –100 and 14 teams scored +100. With respect to the CGD issue, 12 teams scored –100, 3 teams scored 0, and 11 teams scored +100. A review of the scoring for these two issues revealed that each issue consisted of three mutually exclusive decisions. Given the inherent restriction of variability, both issues were deleted from further consideration. Therefore, the final sample size at the decision-level of analysis was 626. Since teams are comprised of 4 managers, manager-level tests (such as those involving scanning completeness and internal scanning) have a sample size of 4 managers/decision times 626 decisions or 2504 manager actions.

Table 9 presents Pearson correlations, means, and standard deviations for the overall sample. Thirty six of the 153 correlations (24%) are significant at $p=.01$ or less and 54 (36%) are significant at .05 or less. These percentages are greater than those expected by chance.

Assumption Tests

Before proceeding with the tests of hypotheses and examination of the research questions, four sets of tests were conducted to investigate methodological assumptions related to hierarchical designs and analysis of variance techniques. The first set of tests explored threats to validity. Random selection and assignment of participants was not feasible in the context of the executive development program. This represented a threat to statistical conclusion validity. Therefore, homogeneity of a priori participant

TABLE 9

Pearson Correlations, Means, and Standard Deviations for the Overall Sample

	Mean	St Dev	1	2	3	4	5	6	7	8
1 Decision Quality	32.86	30.28								
2 Team Informity	89.27	14.29	-0.01							
3 Transformed Team Inf	2.68	0.52	-0.00	**-0.97**						
4 Scanning Comp VP	49.42	25.35	-0.03	**0.35**	**-0.37**					
5 Scanning Comp SM	48.70	30.48	**-0.13**	**0.34**	**-0.32**	**0.11**				
6 Scanning Comp MG	57.91	25.05	0.08	**0.25**	**-0.21**	**0.10**	**-0.11**			
7 Scanning Comp PD	46.45	30.85	0.09	**0.38**	**-0.38**	**0.20**	-0.06	-0.05		
8 Internal Scan VP	56.04	39.11	**0.18**	0.05	-0.07	-0.01	-0.09	**0.13**	**0.19**	
9 Internal Scan SM	46.26	41.44	**0.11**	0.01	-0.02	0.03	**-0.15**	**0.17**	**0.21**	**0.25**
10 Internal Scan MG	49.12	34.72	0.07	0.04	-0.04	**-0.14**	0.04	0.07	**0.24**	**0.34**
11 Internal Scan PD	50.16	40.55	-0.09	-0.06	0.08	**0.16**	0.04	**0.27**	-0.08	-0.04
12 Sensing/Intuit VP	100.01	28.64	-0.00	-0.01	0.01	0.00	-0.06	0.07	0.03	0.06
13 Sensing/Intuit SM	103.86	28.03	0.01	0.02	-0.01	0.07	0.05	0.03	0.08	-0.05
14 Sensing/Intuit MG	98.56	29.50	0.02	0.01	-0.01	0.02	0.01	0.07	0.09	0.00
15 Sensing/Intuit PD	110.24	27.43	0.08	0.08	-0.08	**0.14**	-0.10	**0.12**	0.05	-0.04
16 Thinking/Feel VP	70.51	20.86	0.01	-0.03	0.02	0.01	0.02	-0.06	-0.01	0.07
17 Thinking/Feel SM	75.35	23.05	0.04	0.03	-0.04	0.02	-0.08	-0.01	0.01	-0.01
18 Thinking/Feel MG	73.01	23.52	0.04	0.01	-0.02	-0.01	-0.05	0.09	-0.00	-0.06
19 Thinking/Feel PD	71.99	19.08	-0.01	0.04	-0.04	0.03	-0.04	0.02	-0.00	-0.07

p<=.01 p<=.05

VP=Vice President SM=Director of Sales & Marketing MG=Director of Manufacturing PD=Director of Product Development

TABLE 9 (continued)

Pearson Correlations, Means, and Standard Deviations for the Overall Sample

	9	10	11	12	13	14	15	16	17	18
10 Internal Scan MG	0.10									
11 Internal Scan PD	0.09	-0.08								
12 Sensing/Intuit VP	-0.04	0.04	-0.04							
13 Sensing/Intuit SM	0.04	0.02	0.01	0.06						
14 Sensing/Intuit MG	**0.15**	0.06	0.03	0.05	**0.18**					
15 Sensing/Intuit PD	0.02	0.04	0.02	0.06	0.08	0.10				
16 Thinking/Feel VP	-0.01	-0.01	-0.06	**0.23**	**0.17**	0.08	0.06			
17 Thinking/Feel SM	0.02	0.05	-0.07	**0.15**	**0.16**	**0.14**	-0.07	0.06		
18 Thinking/Feel MG	0.05	0.04	0.07	0.04	-0.08	**0.23**	0.07	0.05	0.06	
19 Thinking/Feel PD	0.06	0.04	-0.01	**0.14**	-0.05	**0.17**	**0.22**	-0.05	**0.21**	0.10

p<=.01 p<=.05

VP=Vice President SM=Director of Sales & Marketing MG=Director of Manufacturing PD=Director of Product Development characteristics and a posteriori measures obtained from the simulation were examined. The potential for history effects by home organization was also explored. The second set of tests examined the normality of the two dependent variables (i.e., team informity and decision quality). The third set of tests examined linearity between the covariates (i.e., scanning completeness, internal scanning, sensing/intuiting preferences, and thinking/feeling preferences) and the dependent variables. The fourth set of tests explored the equality of variance across environments, decisions within environments, and teams within environments.

Threats to Validity

Random assignment can not be assumed for this study since participants self-selected their positions within LGI. However, a lack of a priori participant differences across home organization, simulated environment, simulated functional assignment, and simulated position would lend support for a lack of systematic bias in selecting positions. Mean differences in age, years of occupational experience, and level of education were examined for each of these four categories. Managers associated with the energy producer did not report demographic information therefore limiting comparisons to participants from the diversified technology firm and the financial services organization.

Analysis of variance (ANOVA) was used to test for mean differences in age and years of occupational experience across home organization, simulated environment (i.e., dynamic, moderate, stable), simulated functional assignment (i.e., Vice President, Director of Sales and Marketing, Director of Manufacturing, or Director of Product Development), and simulated position. The results for participant age are given in Table 10 while Table 11 provides information on the years of occupational experience. No significant differences in mean participant age were detected across home organization (p=.453), environment (p=.402), functional assignment (p=.210), or position (p=.165). With respect to years of occupational experience, no significant differences were indicated across home organization (p=.051), environment (p=.831), functional assignment (p=.686), or LGI position (p=.294).

TABLE 10

Mean Differences in Participant Age by Home Organization, Environment, LGI Functional Assignment, and LGI Position

Group	Mean	Standard Deviation	Sample size	F value; df	Pr > F
Home Organization				0.56; 1, 305	.453
Diversified Technol	43.3	6.1	212		
Financial Services	42.7	6.0	95		
Environment				0.91; 2, 304	.402
Dynamic	42.9	6.4	103		
Moderate	43.8	6.2	100		
Stable	42.7	5.5	104		
Functional Assign				1.52; 3, 303	.210
VP	43.1	6.1	75		
Dir S&M	44.2	6.3	76		
Dir Mfg	43.1	6.1	78		
Dir Prod Dev	42.1	5.6	78		
LGI Position				1.42; 11, 295	.165
APD, VP	43.4	6.6	25		
APD, Dir S&M	45.8	6.6	24		
APD, Dir Mfg	41.0	5.4	27		
APD, Dir Pr Dev	41.9	6.5	27		
IGD, VP	43.2	5.9	25		
IGD, Dir S&M	43.4	6.1	25		
IGD, Dir Mfg	45.4	7.0	25		
IGD, Dir Pr Dev	43.1	5.8	25		
CGD, VP	42.7	6.0	25		
CGD, Dir S&M	43.5	6.1	27		
CGD, Dir Mfg	43.1	5.2	26		
CGD, Dir Pr Dev	41.5	4.6	26		

TABLE 11

Mean Differences in Participant Years of Occupational Experience by Home Organization, Environment, LGI Functional Assignment, and LGI Position

Group	Mean	Standard Deviation	Sample size	F value; df	Pr > F
Home Organization				3.85; 1, 268	.051
Diversified Technol	14.7	7.6	177		
Financial Services	12.8	7.1	93		
Environment				0.19; 2, 267	.831
Dynamic	13.8	7.7	94		
Moderate	14.5	7.7	87		
Stable	13.9	7.1	89		
Functional Assign				0.50; 3, 266	.686
VP	14.7	7.8	64		
Dir S&M	13.2	7.7	66		
Dir Mfg	13.9	7.7	69		
Dir Prod Dev	14.4	6.8	71		
LGI Position				1.19; 11, 258	.294
APD, VP	15.4	8.2	23		
APD, Dir S&M	12.7	8.1	21		
APD, Dir Mfg	13.9	7.5	24		
APD, Dir Prod Dev	13.3	7.2	26		
IGD, VP	17.3	7.0	22		
IGD, Dir S&M	11.7	6.9	22		
IGD, Dir Mfg	13.4	8.9	21		
IGD, Dir Prod Dev	15.4	7.2	22		
CGD, VP	10.9	7.0	19		
CGD, Dir S&M	15.1	7.9	23		
CGD, Dir Mfg	14.5	7.0	24		
CGD, Dir Prod Dev	14.7	6.1	23		

The educational level of participants was classified as: a) less than a four year college degree, b) four year college degree, or c) work beyond a four year college degree. Table 12 provides frequencies of participants in each category by home organization, environment, LGI functional assignment, and LGI position. Chi square tests indicated independence between educational level and a) home organization (χ^2=1.43, df=2;

p=.49), b) environment (χ^2=.77, df=4; p=.94), c) functional assignment (χ^2=3.72, df=6; p=.72), and d) position (χ^2=14.02, df=22; p=.90).

TABLE 12

Frequency Table of Participant Education Level by Home Organization, Environment, LGI Functional Assignment, and LGI Position

Group Frequency Percent	Less than 4 year college degree	4 year college degree	More than 4 year college degree	Total
Home Organization				
Diversified Tech	15 4.69	81 25.31	120 37.50	216 67.50
Financial Service	11 3.44	40 12.50	53 16.56	104 32.50
Total	26 8.13	121 37.81	173 54.06	320 100.00
Environment				
Dynamic	7 2.19	40 12.50	61 19.06	108 33.75
Moderate	9 2.81	40 12.50	55 17.19	104 32.50
Stable	10 3.13	41 12.81	57 17.81	108 33.75
Total	26 8.13	121 37.81	173 54.06	320 100.00
Functional Assign				
Vice President	9 2.81	28 8.75	43 13.44	80 25.00
Dir Sales & Mkt	5 1.56	32 10.00	43 13.44	80 25.00
Dir Manufact.	7 2.19	34 10.63	39 12.19	80 25.00
Dir Prod Devel	5 1.56	27 8.44	48 15.00	80 25.00
Total	26 8.13	121 37.81	173 54.06	320 100.00

TABLE 12 (continued)

Frequency Table of Participant Education Level by Home Organization, Environment, LGI Functional Assignment, and LGI Position

Group Frequency Percent	Less than 4 year college degree	4 year college degree	More than 4 year college degree	Total
LGI Position				
APD, VP	3 0.94	9 2.81	15 4.69	27 8.44
APD, Dir S&M	2 0.63	10 3.13	15 4.69	27 8.44
APD, Dir Mfg	2 0.63	11 3.44	14 4.38	27 8.44
APD, Dir Pr Dev	0 0.00	10 3.13	17 5.31	27 8.44
IGD, VP	2 0.63	11 3.44	13 4.06	26 8.13
IGD, Dir S&M	2 0.63	10 3.13	14 4.38	26 8.13
IGD, Dir Mfg	4 1.25	9 2.81	13 4.06	26 8.13
IGD, Dir Pr Dev	1 0.31	10 3.13	15 4.69	26 8.13
CGD, VP	4 1.25	8 2.50	15 4.69	27 8.44
CGD, Dir S&M	1 0.31	12 3.75	14 4.38	27 8.44
CGD, Dir Mfg	1 0.31	14 4.38	12 3.75	27 8.44
CGD, Dir Pr Dev	4 1.25	7 2.19	16 5.00	27 8.44
Total	26 8.13	121 37.81	173 54.06	320 100.00

No significant differences were detected for participant age, occupational experience, or educational level by home organization, simulated environment, simulated functional position, or simulated position. Thus, there is no evidence of systematic bias in the position selected by participants.

Tests for mean differences were also used to test for potential differences between participants from each company on a posteriori measures obtained from the simulations (i.e., decision-maker characteristics, managerial actions, SDM process, and process outcomes). Taken together, these tests provide insight into whether home industry affected decision making in the simulated industry.

Company differences were not detected for the average level of internal scanning (F=1.64; df=2, 2501; p=.19) or team informity (F=0.60; df=2, 623; p=.55). Differences were noted for scanning completeness (F=3.12; df=2, 2501; p=.045) and decision quality (F=3.47; df=2, 623; p=.03). Although the F test indicated significant differences for scanning completeness, Tukey's follow-up test for mean differences, which controls for type I experimentwise error, did not uncover any differences. Thus, it is not clear that scanning completeness truly differs between companies.

With respect to decision quality, Tukey's indicated that the financial services organization was different from the energy company. Means were not different between the technology and energy companies or between the technology and financial firms. This implies that either the energy firm or the financial services organization should be treated as a separate sample while the other organization is combined with the technology firm. Since the sample size for the energy company was the smallest (n=74 decisions), the financial services company was treated as a separate sample (n=152 decisions) and the technology and energy firms were combined into another sample (n=474 decisions).

An F test for equal means of decision quality between the technology/energy sample and the financial services sample could not be rejected ($F=3.25$; $df=1, 624$; $p=.07$).

Tests for independence between sensors/intuitors (two categories) and home organization (three categories) could not be accepted ($\chi^2=6.59$; $df=2$; $p=.037$). That is, the number of sensors/intuitors differs by home organization. However, there was support for independence between thinkers/feelers and the home organization ($\chi^2=1.87$; $df=2$; $p=.39$).

As a result of the tests for decision-maker characteristics, managerial actions, process characteristics, and process outcomes, the following guidelines were used in testing the hypotheses. Hypotheses concerning scanning completeness (H2a, H2b, and H3a) were tested for the overall sample and for each company separately. Hypotheses involving decision quality (H1a, H1b, and H4) were tested using three different samples: a) an overall, all-company sample, b) a sample containing decisions made by participants from the diversified technology firm and the energy producer, and c) a sample representing decisions made by participants from the financial services firm. Hypothesis 3b proposes a relationship between internal scanning and thinking/feeling preferences. Since no evidence supported mean differences between companies on internal scanning or thinking/feeling preferences, hypothesis 3b was tested using only the overall sample.

Besides the tests for homogeneity already mentioned, the possibility of history effects was examined for each organization. That is, simple regressions were used to test for the possibility that earlier teams passed along knowledge of the simulation to later teams thereby causing decision quality to increase over time. Tests were performed for each issue addressed by each company. Of the 111 tests (3 organizations times 37 issues) only 1 was significant which is well within the number which would be expected by chance alone.

Tests for Normality

Analysis of variance (ANOVA) techniques are used to examine the results of research design such as the partial hierarchical design used for this study. Statistical conclusions from ANOVA depend on the F distribution and therefore require that observations be normally distributed (Kirk, 1995). For the purposes of this study, ANOVA techniques were used to examine the two research questions which explore the predictors of team informity and decision quality.

Normality of these two dependent variables was examined based on skewness and kurtosis values as well as box and normal probability plots. Theoretically, the normal distribution has a skewness of 0 and a kurtosis of 0. From a practical point of view, skewness values between –1 and +1 are not considered to be substantially skewed (Hair, Anderson, Tatham & Black, 1995). Kurtosis refers to the peakedness (positive kurtosis) or flatness (negative kurtosis) of the sample. Skewness, rather than kurtosis, is used most frequently in the assessment of normality (Hair et al.). Box plots should depict the majority of values in the center of the distribution with tails on either side. Normal probability plots should depict a straight diagonal line.

Decision Quality had a skewness value of -.07, a kurtosis of .02 and box and normal probability plots that exhibited patterns consistent with a sample from a normal distribution.

Team informity exhibited non-normal patterns in the box and normal probability plots, a skewness value of –1.6, and a kurtosis of 2.8. Reflexing the variable by subtracting the scores from the largest value + 1 provides a sample with a positive skew of 1.6. A potential correction for positive skewness is the square root function (Tabachnick & Fidell, 1983). Making this transformation provided a skewness of .6 and a kurtosis of .8. The box plot still indicates that the sample distribution is missing one tail. This is a result of the large number of observations at the upper bound of team informity (i.e., 100). Likewise, the normal probability plot shows a large number of observations at the boundary but is otherwise relatively straight. Thus, the transformed value of team informity was used when the assumption of normality was required.

Tests for Linearity

The two research questions require partitioning the variance of SDM process and process outcomes into an environmental component and a component consisting of decision-maker characteristics and managerial actions. As noted in Chapter III, decision-maker characteristics and managerial actions were entered into the analysis as continuous variable covariates. Decision-maker characteristics were represented by thinking/intuiting and sensing/intuiting preference covariates. Managerial actions were represented by covariates for internal scanning and scanning completeness. For a given decision, these four covariates are unique to an individual team member. That is, the sensing/intuiting preference of the Vice President is independent of the sensing/intuiting preferences of the Directors of Sales & Marketing, Manufacturing, and Product Development. Therefore, a total of 16 covariates (4 team members times 4 covariates) were entered into the analysis for each dependent variable (i.e., decision quality and team informity).

When covariates are included in ANOVA models, linearity between the covariate and the dependent variable is required. Observation of random patterns in simple regression residual plots was used as an indicator of linearity. Thirty two residual plots were examined (i.e., 2 dependent variables times 16 covariates).

The residual plots for decision quality and the 16 proposed covariates appeared random. With respect to team informity, the plots appeared random for positive residuals but exhibited either a horizontal or diagonal boundary line for negative residuals. For the sensing/intuiting, thinking/feeling, and internal scanning covariates, horizontal lines were observed. Plots of scanning completeness residuals created diagonal lines for negative residuals. These residual patterns were created when team informity was at the upper bound of 100. Although these patterns do not represent the most desirable conditions, team informity values of 100 are realistic and important to the analysis.

Tests for Equality of Variance

The use of ANOVA models with categorical groups requires homogeneity of variance across the groups. The nested design in this study depends upon three different approaches to grouping. The first group consists of three environments. The second group contains various numbers of issues for each environment (i.e., 11 issues for the dynamic environment, 13 issues for the moderate, and 13 issues in the stable environment). The third group consists of teams within each environment (i.e., 32 teams in the dynamic environment, 31 teams in the moderate environment, and 28 teams in the stable environment). Unequal sample sizes suggested the use of the Brown-Forsythe test for equality of variance (Kirk, 1995). The null hypothesis for this test is that variances are equal across groups. The results are shown in Table 13.

For both decision quality and team informity, homogeneity of variance can not be rejected for environments or teams within environments. Similarly, the homogeneity of decision quality variance for issues within the moderate environment and team informity within stable environments can not be rejected. However, the four remaining tests for issues within environments do not support homogeneity. Due to the wide variety of issues included in each environment, it is not unreasonable to expect that the variances would not be equal.

TABLE 13

Results of Brown-Forsythe Tests for Equality of Variance

Group	F value; df	Pr > F
Dependent=Decision Quality		
Environments	1.22; 2, 623	.296
Issues in Dynamic Environment	2.25; 10, 209	.016*
Issues in Moderate Environment	1.69; 12, 241	.071
Issues in Stable Environment	1.98; 11, 138	.035*
Teams in Dynamic Environment	0.68; 31, 188	.902
Teams in Moderate Environment	0.84; 30, 223	.713
Teams in Stable Environment	0.80; 23, 120	.726
Dependent=Team Informity		
Environments	0.24; 2, 623	.785
Issues in Dynamic Environment	3.19; 10, 209	.001*
Issues in Moderate Environment	4.39; 12, 241	.0001*
Issues in Stable Environment	1.59; 11, 138	.105
Teams in Dynamic Environment	0.61; 31, 188	.946
Teams in Moderate Environment	0.83; 30, 223	.723
Teams in Stable Environment	0.40; 23, 120	.993

*$p<.05$

Summary of Assumptions

Four sets of assumptions were examined. The first examined threats to validity. Since random assignment of individuals to LGI positions was not possible, homogeneity of a priori characteristics was examined. No evidence of systematic bias in participant-selected LGI position was found. However, differences in a posteriori measures (i.e., scanning completeness, decision quality, and the number of sensors versus intuitors) suggest that participant's home industry does affect performance in the simulated industry. History effects for LGI decision quality were not indicated.

Normality of the dependent variables was the second assumption explored. Decision quality exhibited characteristics of normality. The original team informity variable exhibited a substantial negative skew. Following a transformation that took the square root of reflexed team informity, the sample began to take on characteristics of a normal distribution.

Linearity was the third assumption examined. Random patterns in the residual plots provided evidence of linearity for all decision quality-covariate relationships. However, random patterns were not observed in the team informity-covariate plots. A large number of team informity values were at the upper bound of 100. Furthermore, these values were associated with a broad range of values for sensing/intuiting, thinking/feeling, scanning completeness, internal scanning, and decision quality. This resulted in distinct patterns on the residual plots. The observed deviations from linearity were deemed more desirable than eliminating all observations with a team informity value of 100.

The final assumption examined was homogeneity of variance. Equality was observed for environments and teams within environments for both dependent variables (i.e., decision quality and team informity). Homogeneity of decisions within environments was observed for two out of six groups: decision quality in the moderate environment and team informity in the stable environment. The lack of homogeneity in the remaining cases is consistent with the use of a wide range of issues.

Hypothesis Tests

Four sets of hypotheses were proposed in Chapter II. The first set of hypotheses proposed relationships between the SDM process characteristic and the process outcome in different environments (H1a and H1b). Hypotheses 2a and 2b were related to the level of managerial actions observed in different environments (H2a) and the relationship between these actions and the SDM process characteristic (H2b). The third set of hypotheses examined the relationship between managerial actions and decision-maker characteristics (H3a and H3b). Finally, hypothesis 4 proposed that an overall relationship would exist between the SDM characteristic and the process outcome irrespective of environment (H4). This section provides the results for each set of hypotheses.

H1a, H1b: SDM Process Characteristics and Process Outcomes by Environment

Hypothesis 1a posited that rationality in collecting information would be positively related to SDM quality in dynamic environments. Hypothesis 1b theorized that the relationship would not exist in moderate and stable environments. These relationships were tested using Spearman correlation coefficients between team informity (the measure for rationality in collecting information) and decision quality (the measure of SDM process outcome). The Spearman coefficient was preferred over the Pearson coefficient for the following reasons: a) the potential non-normality of team informity b) the non-parametric nature of Spearman coefficients, and c) the lack of linear relationship assumptions. Since decision quality differences were found between the different home organizations, Spearman coefficients were calculated for three samples. The first sample consisted of the entire data set (i.e., all home organizations; n=626). The second sample consisted of decisions made by teams from the diversified technology firm and the energy producer (n=474). And the final sample contained decisions made by teams from the financial services organization (n=152). Hypotheses were evaluated based on the combined technology/energy sample and the financial services sample. Information on the overall sample is provided for informational purposes.

Table 14 shows Spearman coefficients for each of the three environments (i.e., dynamic, moderate, stable). Based on the composite model originally presented in Chapter II (reproduced on the next page as Figure 5), decision-maker characteristics and managerial actions should be partialed from the relationship between SDM process and process outcomes. Thus, table 14 also includes correlation coefficients that partial managerial actions (i.e., scanning completeness) and decision-maker characteristics (i.e., sensing/intuiting and thinking/feeling) from the team informity—decision quality relationship.

As shown in table 14, partialing decision-maker characteristics and managerial actions from the team informity-decision quality relationship can impact the magnitude and significance of the correlations. For example, in the all company, stable environment sample the non-partialed correlation is positive and significant (.169; p=.04). After partialing, however, the coefficient becomes non-significant (.019; p=.82). Due to these differences, the hypotheses were evaluated based on the partialed correlations.

TABLE 14

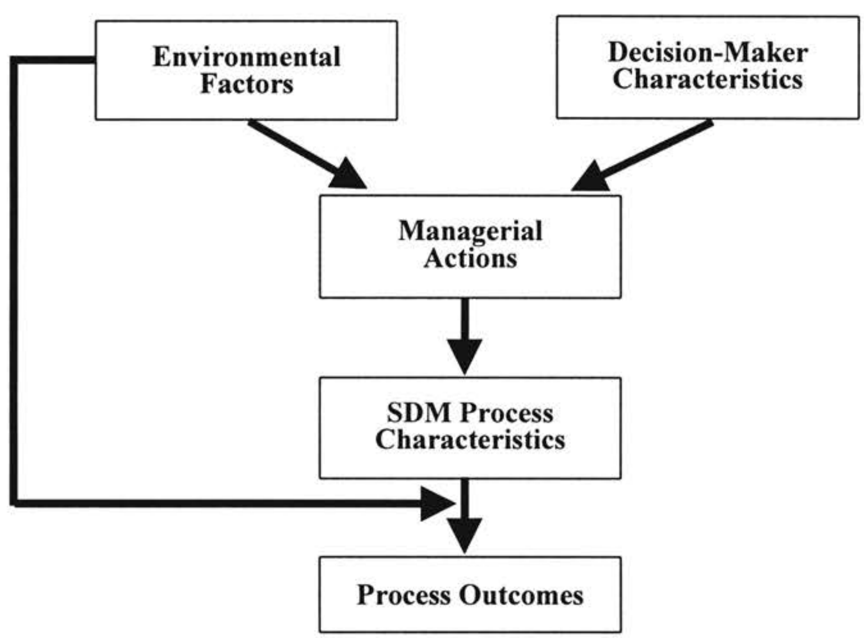
Spearman Correlation Coefficients and P Values for the Relationship between Team Informity and Decision Quality by Environment

	All Companies		Tech & Energy		Financial	
No partials						
Dynamic environment	-.015	(.82)	.008	(.92)	-.094	(.50)
Moderate environment	-.087	(.17)	-.034	(.64)	**-.248**	(.06)
Stable environment	**.169**	(.04)	**.189**	(.04)	.038	(.82)
Partialing SC, SN, TF						
Dynamic environment	.078	(.26)	**.137**	(.09)	.032	(.84)
Moderate environment	**-.123**	(.06)	**-.160**	(.03)	.099	(.50)
Stable environment	.019	(.82)	.053	(.60)	-.087	(.67)

Notes: SC=scanning completeness; SN=sensing/intuiting; TF=thinking/feeling; Bold values significant at p=.10 or less.

FIGURE 5

Research Model for Determinants of SDM Process Outcomes



Based on the partialed information for the technology and energy sample, we find support for H1a. That is, there is a significant and positive relationship between team informity and decision quality in the dynamic environment (.137; p=.09). However, the financial sample does not support H1a. The contradictory findings between samples will be discussed in the next chapter.

Hypothesis 1b suggests non-significant relationships will be found in moderate and stable environments. The technology/energy sample provides only partial support for this hypothesis. As seen in Table 14, a non-significant relationship is found in the stable environment (.053; p=.60) but a significant relationship is found in the moderate environment (-.16; p=.03). Hypothesis 1b is fully supported in the financial sample. Partial correlations in both the moderate (.099; p=.50) and stable (-.087; p=.67) environments are not significant. In general, team informity is not significantly related to decision quality in moderate and stable environments as hypothesized. Potential explanations for the significant relationship found in the technology/energy sample will be discussed in Chapter V.

H2a: Mean Differences of Managerial Actions between Environments

Hypothesis 2a posited that scanning completeness would be greatest in dynamic environments. Analysis of variance was used to test the null hypothesis that mean scanning completeness was equal across environments. As noted in the assumptions' section, scanning completeness differs across home organizations (F=3.12, 2, 2501; p=.045). Yet, the differences or similarities between organizations is equivocal (Tukey's test suggested no differences between organizations). Thus, four samples were tested: the total sample including all three home organizations and separate samples for each of the three different home organizations. Based on hypothesis 3a, which posited that sensing preferences lead to higher levels of scanning completeness, sensing/intuiting was used as a covariate in the analysis of variance model. (Note: Hypothesis 3a is tested in a later section.)

As shown in Table 15, none of the samples produced significant differences in mean scanning completeness across environments. However, post-hoc tests looking at mean differences across environments by decision-maker position (i.e., Vice President, Director of Sales & Marketing, Director of Manufacturing, and Director of Product Development) suggested that differences were unique to position. Table 15 indicates differences for all positions in the all-company sample and the technology sample. For the financial services and energy samples, mean differences are indicated only for the VP.

Specific differences were explored using Tukey's test for mean differences. Table 16 reports the results of this analysis and the following paragraphs describe those results. Explanations for the findings will be explored in the next chapter. Based on environmental differences for Vice Presidents in the different samples, there is no support for H2a for Vice Presidents. Rather than having the highest levels of scanning completeness in dynamic environments, dynamic environments were associated with the lowest level of scanning completeness for the Vice Presidents.

TABLE 15

Type III F Statistics for Scanning Completeness across Environments

	F value; df	Pr > F
All Companies		
All decision makers	1.06; 2, 2500	.35
Vice Presidents	**24.48**; 2, 622	.0001
Sales & Marketing	**8.55**; 2, 622	.0002
Manufacturing	**4.39**; 2, 622	.01
Product Development	**6.41**; 2, 622	.002
Technology		
All decision makers	0.43; 2, 1596	.65
Vice Presidents	**13.93**; 2, 396	.0001
Sales & Marketing	**5.37**; 2, 396	.005
Manufacturing	**6.00**; 2, 396	.003
Product Development	**5.71**; 2, 396	.004
Financial Services		
All decision makers	0.19; 2, 604	.83
Vice Presidents	**8.92**, 2, 148	.0002
Sales & Marketing	0.99. 2, 148	.37
Manufacturing	0.68, 2, 148	.51
Product Development	0.24; 2, 148	.79
Energy		
All decision makers	1.42; 2, 292	.24
Vice Presidents	**6.17**; 2, 70	.003
Sales & Marketing	2.04; 2, 70	.14
Manufacturing	0.06; 2, 70	.94
Product Development	1.72; 2, 70	.19

Notes: Bold values are significant at p=.05 or less.
Sensing/Intuiting was included as a covariate.

TABLE 16

Scanning Completeness Mean Differences between Environments by Position

	Group A High	Group B Middle	Group C Low	Dynamic Mean	Moderate Mean	Stable Mean
All Companies						
Vice President	mod	stb	dyn	41.2	57.2	48.3
Sales/Marketing	dyn/stb	mod		54.5	43.1	49.6
Manufacturing	dyn/mod	mod/stb		61.0	58.1	53.0
Product Devel.	stb	mod/dyn		41.5	46.8	53.1
Technology						
Vice President	mod	stb	dyn	42.9	58.2	49.7
Sales/Marketing	dyn/stb	stb/mod		56.0	44.3	49.7
Manufacturing	dyn/mod	stb		62.9	59.3	51.5
Product Devel.	stb/mod	mod/dyn		41.9	48.1	54.9
Financial						
Vice President	mod	stb/dyn		40.5	60.1	43.4
Energy						
Vice President	stb/mod	dyn		32.4	51.0	60.2

Notes: dyn=dynamic environment; mod=moderate environment; stb=stable environment

With respect to the Director of Sales and Marketing, partial support was found for H2a. In the all-company sample, scanning completeness was greater in the dynamic environment than in the moderate environment, but completeness was not different between the dynamic and stable environments. In the technology sample, scanning completeness was higher in the dynamic environment than in the moderate environment. However, support was found for the equality of means between the dynamic and stable environments.

Directors of Manufacturing provide partial support for H2a in both the all-company and technology samples. In both instances, scanning completeness is higher in dynamic environments than in moderate environments but is equal to the scanning completeness observed in stable environments.

There is no support for H2a for the Directors of Product Development. In both the all-company and technology samples, scanning completeness was lowest, rather than highest, in dynamic environments.

H2b: Relationship between Managerial Actions and SDM Process Characteristics

Hypothesis 2b proposed that higher levels of scanning completeness would be associated with higher levels of team informity. This hypothesis was tested using Spearman correlation coefficients. Since hypothesis 3a posits that scanning completeness is related to sensing/intuiting preferences, these preferences were partialed from the scanning/informity relationship. As discussed in the previous section, scanning completeness differs across home organizations. Thus, hypothesis 2b was explored in four different samples: the total sample and separate samples for participants from each of the three different home organizations. The results presented in Table 17 provide full support for H2b in all samples. Thus, as expected, individual scanning uncovers unique information that was not necessarily previously available to the team.

TABLE 17

Spearman Correlation Coefficients and P values for the Relationship between Scanning Completeness and Team Informity Partialing Sensing/Intuiting

Sample	n	Spearman	p value
All Companies	2504	.304	.0001
Technology	1600	.314	.0001
Financial	608	.271	.0001
Energy	296	.305	.0001

H3a and H3b: Relationships between Managerial Actions and Decision-Maker Characteristics

Hypothesis 3a stated that scanning completeness would be greater for managers with sensing preferences. Analysis of variance was used to test the hypothesis that scanning completeness was equal between managers with sensing preferences and managers with intuiting preferences. In addition to scanning completeness differences between companies (see H2a), sensing/intuiting categories also differed across companies (χ^2=6.59; df=2; p=.037). Therefore, potential differences were examined for the overall sample as well as for each of the three different companies. Neither scanning completeness (F=1.07; df=2, 2501; p=.34) nor sensing/intuiting categories (χ^2=2.21; df=2; p=.33) differ across environments. However, sensing/intuiting did differ across companies within the dynamic environment (χ^2=6.39; df=2; p=.041). Thus, each different sample was tested within the dynamic environment.

Table 18 suggests that scanning completeness does not differ between sensors and intuitors, in any of the four different samples, when environments are not differentiated. This does not support hypothesis 3a. When differences are examined within the dynamic environment only, the energy sample exhibits scanning completeness differences between sensors and intuitors. With a mean scanning level of 51.5 for sensors and 40.3 for intuitors, H3a is partially supported.

TABLE 18

Type III F Statistics, Degrees of Freedom, P Values, and Mean Differences for Scanning Completeness by Sensing/Intuiting Categories

Environment	All Companies	Technology	Financial	Energy
All	0.59;1,2502 .44	1.02;1,1598 .31	0.13;1,606 .72	1.44;1,294 .23
Dynamic	2.33;1,878 .13	0.01;1,562 .92	0.97;1,210 .33	3.78;1,102 .05

<u>Significant Differences</u>
Dynamic Environment, Energy Sample
Sensor Mean Scanning Completeness = 51.5
Intuitor Mean Scanning Completeness = 40.3

Hypothesis 3b posited that managers with feeling preferences would have higher levels of internal scanning than those with thinking preferences. Differences between mean levels of internal scanning between thinking and feeling managers were examined using analysis of variance. Internal scanning does not differ between companies (F=1.64; df=2, 2501; p=.19) but does differ between environments (F=32.83; df=2, 2501; .0001). No differences across environments (χ^2=4.34; df=2; p=.11) or across companies (χ^2=1.87; df=2; p=.39) were detected for thinkers versus feelers. This led to tests that included an overall test for all environments and tests for each environment separately. Since no company differences were detected, only the total sample was tested.

Table 19 shows that no significant differences between mean levels of internal scanning were detected for thinkers versus feelers. This provides no support for hypothesis 3b. This will be discussed in the next chapter.

TABLE 19

Type III F Statistics, Degrees of Freedom, and P Values
for Internal Scanning by Thinking/Feeling Categories in the Overall Sample

Environment	F value	Pr > F
All	0.16;1, 2502	.69
Dynamic	0.44;1, 878	.51
Moderate	0.24;1,1014	.41
Stable	0.51;1, 606	.48

H4: SDM Process Characteristics and Process Outcomes

Hypothesis 4 proposed the existence of an overall relationship between rationality and quality regardless of the environment. Spearman correlation coefficients were used to test the hypothesis. Like hypotheses 1a and 1b scanning completeness, sensing/intuiting, and thinking/feeling were partialed from relationship. Given the differences in decision quality between home organizations, the hypothesis was evaluated based on the technology/energy sample and the financial services organization.

The partial correlation between decision quality and team informity was non-significant in both samples (technology/energy: -.006 p=.89; financial: .012 p=.89). This provides no support for H4.

Based on the inequality of decision quality variances between decisions (see earlier discussion on assumptions of homogeneity of variance), post hoc tests were conducted to see if the relationship was decision specific. Mean differences in decision quality across decisions was confirmed for both the technology/energy sample (F=5.74; df=36, 437; p=.0001) and the financial sample (F=2.19; df=35, 116; p=.001).

Therefore, Spearman correlations were examined for each decision. As shown in Table 20, 27% (7 out of 26) of the correlations from the technology/energy sample were significant. Six of the seven significant correlations were positive. For the financial services sample, 2 out of 16 correlations were significant and positive. This is just above the chance expectation of 1.6 significant correlations. Based on the number of significant correlations between decision quality and team informity for specific decisions, hypothesis 4 receives partial support. Explanations for decision specific results will be explored in the next chapter.

TABLE 20

Cell Sizes, Spearman Correlation Coefficients, and P Values
for Team Informity and Decision Quality by Decision within Environment

Environment/ Decision	Tech/Energy Sample n	r	p	Financial Sample n	r	p
Dynamic 01	18	**-.489**	(.04)	7		
02	22	**.492**	(.02)	9	.144	(.71)
03	13	NM		6		
04	11	-.239	(.48)	2		
05	7	-.242	(.60)	1		
07	8	-.065	(.88)	0		
08	21	**.519**	(.02)	6	**.746**	(.09)
09	13	.025	(.94)	3		
10	16	.330	(.21)	6	-.414	(.41)
11	18	.039	(.88)	5	.028	(.96)
12	20	.189	(.43)	8	.267	(.52)
Moderate 01	12	.186	(.56)	5	.760	(.16)
02	9	.266	(.49)	3		
03	7	NM		2		
04	14	**.460**	(.10)	5	-.287	(.64)
05	21	-.188	(.41)	8	.099	(.82)
06	20	NM		5		
07	20	.010	(.97)	7		
08	11	NM		2		
09	15	**.510**	(.05)	4	-.707	(.29)
10	11	.122	(.72)	2		
11	17	**.415**	(.10)	5	.304	(.62)
12	22	**.400**	(.07)	8	-.276	(.51)
13	15	NM		4		

TABLE 20 (continued)

Cell Sizes, Spearman Correlation Coefficients, and P Values for Team Informity and Decision Quality by Decision within Environment

Environment/ Decision	Tech/Energy Sample			Financial Sample		
	n	r	p	n	r	p
Stable 01	4	NM		1		
02	13	.312	(.30)	4	.775	(.23)
03	5	.412	(.49)	2		
04	9	.277	(.47)	6	-.283	(.59)
05	15	.080	(.78)	2		
06	12	.159	(.62)	8	.105	(.80)
07	1	NM		1		
08	7	NM		2		
10	13	.141	(.65)	5	**.825**	(.09)
11	9	NM		1		
12	12	NM		2		
13	4	NM		1		
14	9	-.243	(.53)	4	0	(1)

Notes: Correlations in bold are significant at p=.10. Decisions are unique (i.e., decision 1 environment 1 is not equivalent to decision 1 environment 2 etc.). NM: Not meaningful due to small sample size and/or 75% or more of the cell observations taking on team informity values of 100.

Examination of Research Questions

Research question one concerns the amount of variation in SDM process characteristics and SDM outcomes explained by the environment. Question two is a follow-on question that asks about the additional variation in process characteristics and outcomes explained by decision-maker characteristics and actions. Since environment is a fixed effect, question one was examined by fitting separate general linear models for team informity and decision quality and then determining the proportion of total variance explained (i.e., omega squared) by environment. The results are shown in Table 21. Omega squared was calculated as follows (Kirk, 1995: 178):

$$\omega^2 = \frac{\text{Sum of squares between groups} - (\text{Groups} - 1)\text{Mean squares within groups}}{\text{Sum of squares total} + \text{Mean squares within groups}}$$

F values can also be used to calculate the proportion of total variance explained as follows (Kirk, 1995: 178):

$$\omega^2 = \frac{(\text{Groups} - 1)(\text{F value} - 1)}{(\text{Groups} - 1)(\text{F value} - 1) + \text{number of observations}}$$

TABLE 21

General Linear Models for Environment Effects on
Team Informity and Decision Quality

Dependent Variable	SS Between	MS Within	SS Total	Model F	Pr > F	Omega squared
Team Informity	22.69	4.04	2541.85	2.81; 2, 623	.06	.006
Decision Quality	15046.79	895.47	572922.90	8.40; 2, 623	.0003	.023

The three levels of environment (i.e., dynamic, moderate, and stable) account for 2.3% of the variance in decision quality (p=.0003). However, environment does not account for a significant amount of variance in team informity (p=.06).

Additional models were estimated that considered the experimental design structure of the data. In addition to fixed environment effects, random effects for decision within environment and team within environment were considered. A partial hierarchical design model, given by the following equation (Kirk, 1995: 491), was used to model the data.

$$y_{ijkl} = \mu + \alpha_j + \beta_{k(j)} + \gamma_{l(j)} + (\beta\gamma)_{k(j)l(j)} + \varepsilon_{i(jkl)}$$

where
y_{ijkl} represents either team informity or decision quality
α_j represents fixed environment effects
(j=1,2,3 where 1=dynamic, 2=moderate, 3=stable)
$\beta_{k(j)}$ represents random decision within environment effects
(k=1…11 for j=1; k=1…13 for j=2; k=1…13 for j=3)
$\gamma_{l(j)}$ represents random teams within environment effects
(l=1…32 for j=1; l=1…31 for j=2; l=1…28 for j=3)
$(\beta\gamma)_{k(j)l(j)}$ represents the random interaction effects of decisions within environments and teams within environments

$\varepsilon_{i(jkl)}$ represents random error

The interaction effect was assumed to be non-significant and was treated as random error in the model. The models were estimated using SAS Proc Mixed and Satterthwaite's formula for calculating denominator degrees of freedom. Table 22 compares the fit of the model containing only the fixed effect environment factor to the partial hierarchical model. The partial hierarchical model is also referred to as a mixed model since it contains both fixed (the environment) as well as random effects (decision within environment and team within environment).

TABLE 22

Fit Comparison Between Fixed Effect Models and Mixed Effects Models

Model	Akaike's Info Criterion	-2 Res Log Likelihood	χ^2, df	p value
Team Informity				
Fixed Effect	-1328.18	2654.368		
Mixed Effects	-1221.49	2436.979	217.389, 2	0.00
Decision Quality				
Fixed Effect	-3010.35	6018.699		
Mixed Effects	-2964.05	5922.097	96.602, 2	0.00

Fit was compared based on AIC values, where larger values represent better fit, and –2 residual log likelihood (-2 RLL) statistics. When the fixed effects portion of a model is constant between models (i.e., environment is entered as the only fixed effect in both the fixed model and the mixed model), the difference in –2 RLL values is distributed as chi-square with degrees of freedom equal to the difference in the number of parameters estimated (Littell, Milliken, Stroup, & Wolfinger, 1996). Since variance components are restricted to non-negative numbers, a one-tailed test should be used. As seen in the table, both the AIC and the Chi square difference statistics indicate that the mixed effects model is superior to the fixed effect model for both team informity (p=0.00) and decision quality (p=0.00). Therefore, the research questions were evaluated based on the mixed effects model.

Table 23 reports the results of the two mixed effects models. As seen by the F value for the fixed environment effects, environment is not significant for team informity (p=.62) and failed to reach significance for decision quality (p=.08). The significance of the random effects was tested using Wald's Z. The conservative nature of the test (McNew & Mauromoustakos, 1996), provides additional confidence when p values are less than the desired alpha level. Therefore, the random effect for decision within environment appears to be significant for both dependent variables (p=.0002 for team informity and p=.001 for decision quality). The proportion of total variance explained by random effects is referred to intraclass correlation, or ρ_I. Since estimates for the variance components have been estimated, ρ_I is calculated as the follows:

$$\rho_I = \frac{\text{variance estimate of the random effect}}{\text{total variance}}$$

TABLE 23

Summary of the Mixed Effects Models

	Variance Estimate	Test Statistic	p value	Omega Squared	Intraclass Correlation
Team Informity					
Environment		F=0.48;2,35.1	.62	ns	
Decision (environment)	1.640	Z=3.72	.0002		.395
Team (environment)	0.071	Z=1.02	.31		ns
Random error	2.441	Z=15.87	.0001		
Decision Quality					
Environment		F=2.70;2,35.9	.08	ns	
Decision (environment)	217.77	Z=3.33	.001		.237
Team (environment)	37.24	Z=1.78	.08		.040
Random error	665.52	Z=15.89	.0001		

ns = not significant

Thus, decision within environment explains 39.5% of the variance in team informity and 23.7% of the variance in decision quality.

The Z values indicate that the random effect of team within environment is not significant. However, the conservative nature of the Wald test suggests the need for a follow-on test using –2RLL values. A model with fixed environment and random decision within environment effects was compared to a model that added the team within environment random effect. For team informity the two effect model yielded a –2RLL statistic of 2438.16 compared to the full model (see table 22) –2RLL of 2436.979. This results in a non-significant Chi square difference of 1.181 with 1 degree of freedom (p=.28). Thus, team within environment does not explain a significant portion of the variance in team informity.

With respect to decision quality, the Chi square difference of 4.62 with 1 degree of freedom is significant (p=.03). The intraclass correlation indicates that the team within the decision explains 4% of the variance in decision quality.

In response to research question one, environment does not explain a significant portion of variance in either team informity or decision quality when the random effects of decision within environment and team within environment are included in the model. The amount of variance explained is dominated by decision within environment, which explains 39.5% of the variation in team informity and 23.7% of the variance in decision quality. Team within environment explains another 4% of the variance in decision quality.

To answer research question two, covariates for manager actions and decision-maker characteristics were added to the mixed model. Since actions and characteristics are individual level variables, while team informity and decision quality are team level variables, covariates were added for each member of the team. For example, given a particular decision made by a specific team, covariates were added for each team member (i.e., Vice President, Director of Sales and Marketing, Director of Manufacturing, and Director of Product Development) for each of two managerial actions (i.e., scanning completeness and internal scanning) and each of two decision-maker characteristics (i.e., sensing/intuiting and thinking/feeling preferences). This results in a total of 16 covariates added to the model as fixed effects. Model results are shown in table 24.

The results for team informity show that fixed environment effects are not significant. However, fixed effects for scanning completeness are significant for each team member (p=.0001 for all 4 members). In addition, internal scanning fixed effects are significant for the Director of Product Development (p=.0003). The percent of variance in team informity explained by scanning completeness ranges from 5.7% for the Vice President to 9.2% for the Director of Product Development. Internal scanning for the Director of Product Development explains an additional 2% in the total variance for team informity. Taken together, managerial actions and decision-maker characteristics explain 31.1% of the variance in team informity.

Random decision within environment explains 23.1% of the variance in team informity (p=.002). Using –2RLL statistics to check the significance of team within environment yields a non-significant Chi square difference of 2.901 with 1 degree of freedom (p=.09).

TABLE 24

Summary of the Mixed Effects Models with Covariates

	Team Informity*					Decision Quality				
	Variance Estimate	Test Statistic	p Value	Omega Squared	Intraclass Correlation	Variance Estimate	Test Statistic	p Value	Omega Squared	Intraclass Correlation
Environment		F=0.41;2,36.3	.67	ns			F=3.77;2,39.9	.03	.009	
Scanning Completeness										
Vice President		F=38.64;1,466	.0001	.057			F=0.18;1,480	.67	ns	
Dir. Sales/Marketing		F=49.80;1,259	.0001	.072			F=0.30;1,251	.59	ns	
Dir. Manufacturing		F=64.43;1,507	.0001	.092			F=3.35;1,499	.07	ns	
Dir. Product Devel.		F=48.21;1,208	.0001	.070			F=6.15;1,202	.01	.008	
Internal Scanning										
Vice President		F=0.05;1,392	.82	ns			F=6.09;1,377	.01	.008	
Dir. Sales/Marketing		F=1.79;1,311	.18	ns			F=0.14;1,308	.71	ns	
Dir. Manufacturing		F=1.53;1,273	.22	ns			F=0.22;1,263	.64	ns	
Dir. Product Devel.		F=13.70;1,334	.0003	.020			F=6.35;1,330	.01	.008	
Sensing/Intuiting										
Vice President		F=1.51;1,68.1	.22	ns			F=0.01;1,76.8	.93	ns	
Dir. Sales/Marketing		F=1.90;1,65.7	.17	ns			F=0.12;1,73.9	.73	ns	
Dir. Manufacturing		F=1.23;1,71.7	.27	ns			F=0.19;1,80.5	.66	ns	
Dir. Product Devel.		F=1.08;1,74.5	.30	ns			F=1.69;1,83.6	.20	ns	
Thinking/Feeling										
Vice President		F=0.10;1,69.6	.75	ns			F=0.21;1,78.1	.65	ns	
Dir. Sales/Marketing		F=2.68;1,73	.11	ns			F=0.89;1,81.7	.35	ns	
Dir. Manufacturing		F=0.62;1,73.4	.43	ns			F=0.02;1,82.4	.89	ns	
Dir. Product Devel.		F=0.97;1,71.7	.33	ns			F=0.30;1,80.3	.58	ns	
Decision (environment)	0.563	Z=3.11	.002		.231	179.56	Z=3.15	.002		.205
Team (environment)	0.090	Z=1.45	.15			40.25	Z=1.78	.08		.046
Random error	1.786	Z=15.73	.0001			654.45	Z=15.81	.0001		

*Team Informity was transformed using the square root of the reflexed values; ns = not significant

With respect to decision quality, fixed environment effects are significant and explain 0.9% of the total variance (p=.03). Three fixed covariates also explain significant amounts of total variance in decision quality. Scanning completeness for the Director of Product Development explains 0.8% of total variance. Internal scanning of the Vice President and the Director of Product Development each explain another 0.8% of the variance. Managerial actions and decision-maker characteristics explain 2.4% of the variance in decision quality.

Decision within environment is also significant (p=.002) and explains 20.5% of the total variance in decision quality. Using –2RLL indicates that team within environment is also significant (χ^2=4.758; df=1; p for significance of variance component=.03). The team explains 4.6% of the variance in decision quality.

Chapter Summary

This chapter described the sample used for this study, presented test results for assumptions used in the analysis, documented the hypothesis tests, and supplied information to answer the two research questions. Descriptive statistics were presented for sample demographics, distribution of MBTI personality types in the sample, and correlations, means, and standard deviations for all variables.

Assumptions were tested in the following areas: a) threats to validity, b) normality, c) linearity, and d) equality of variance. Comparisons based on demographic information did not indicate any systematic bias in the position selected by participants. Potential differences between home organization were noted for scanning completeness, decision quality, and the number of sensors versus intuitors. Decision quality exhibited characteristics of a sample from a normal population and a transformation to team informity also resulted in characteristics consist with a normal distribution. Linearity appeared to be a reasonable assumption for relationships concerning decision quality. Relationships involving team informity did exhibit patterns inconsistent with linearity at team informity values of 100. Equality of variances was supported for environments and teams within environments. However, equality could not be accepted for decisions within environments.

Hypotheses were evaluated using Spearman correlation coefficients and mean differences. Due to the potential differences between home organizations for scanning completeness, decision quality, and the number of sensors versus intuitors, hypothesis testing was conducted for the overall sample and/or for samples containing decisions made by participants from each specific home organization. In the case of potential differences in decision quality, the technology and energy firms were equivalent and therefore combined into a single sample. Table 25 presents the results of the hypothesis tests for each sample tested.

Exploration of the variance explained by the environment versus that explained by the decision makers, indicated that environment does not explain significant amounts of the variation in team informity while decision-maker characteristics and actions explained 31.1% of the variation. Decisions within environments explained another 23.1%. With respect to decision quality, environment explained 0.9% of the total variance, decision-maker effects explained 2.4%, decisions within environments explained 20.5%, and teams within environments contributed 4.6%.

The next chapter will provide a discussion of these results and draw conclusions regarding the confluence of the rational and learning lens models of SDM.

TABLE 25

Summary of Support for Hypotheses by Sample

	All Firms	Technology Sample	Energy Sample	Financial Sample	Technology & Energy Sample
H1a DQ-TI positively related in dynamic env					
Across all decisions				None	Full
H1b DQ-TI not related in mod & stable env					
Stable environment; all decisions				Full	Full
Moderate environment; all decisions				Full	Neg related
H2a SC greatest in dynamic environment					
All decision makers	No env diffs	No env diffs	No env diffs	No env diffs	
Vice President	Greatest in Mod	Greatest in Mod	Greatest in Mod	Greatest in Stb/Mod	
Director of Sales & Marketing	Greatest in Dyn/Stb	Greatest in Dyn/Stb	No env diffs	No env diffs	
Director of Manufacturing	Greatest in Dyn/Mod	Greatest in Dyn/Mod	No env diffs	No env diffs	
Director of Product Development.	Greatest in Stb	Greatest in Stb/Mod	No env diffs	No env diffs	
H2b SC positively related to TI					
All decision makers	Full	Full	Full	Full	
H3a Sensing leads to higher SC					
All environments	None	None	None	None	
Dynamic environment	None	None	None	Full	
H3b Feeling leads to higher IS					
All environments	None				
Dynamic environment	None				
Moderate environment	None				
Stable environment	None				
H4 DQ-TI positively related across all env					
All decisions				None	None
Different decisions				Partial	Partial

Notes: DQ=decision quality; TI=team informity; SC=scanning completeness; IS=internal scanning; Stb=Stable environment; Mod=Moderate environment; Neg=negatively; None=non-significant finding

CHAPTER V

DISCUSSION AND CONCLUSIONS

Over forty years have passed since March and Simon's (1958) seminal work on rational decision making. Despite a wealth of studies, the research remains fragmented (Rajagopalan, Rasheed, Datta & Spreitzer, 1998) and non-cumulative (Dean, Sharfman & Ford, 1991). In response, authors have begun to propose more overarching or integrative models of SDM (e.g., Bell, Bromiley & Bryson, 1998; Dean, Sharfman & Ford, 1991; Rajagopalan, Rasheed & Datta, 1993; Rajagopalan et al., 1998). Thus, the general purpose of this work was to move toward a more integrative approach to SDM research by proposing and testing a model that examined the confluence of the rational and learning lens views of SDM. The rational lens suggests that the context defines the relationship between process and outcome while the learning lens view recognizes the importance of how decision makers choose to deal with the context. Specifically, this research was designed to examine the relationships between environmental factors, decision-maker characteristics, managerial actions, SDM process, and process outcomes. The relationships were empirically evaluated using a sample of senior-level managers in a simulated strategic decision-making environment.

This chapter summarizes the empirical findings, compares these results to previous research, and provides possible explanations for non-hypothesized results. Contributions and implications of the findings, limitations of the research, and avenues for future research are also discussed.

Review of Empirical Results

The relationships explored in this study are grounded in three streams of research. The first stream has examined how the environment affects rational decision processes. The second area of research has emphasized the relationship between decision-maker characteristics and SDM processes. The third stream of research has focused on the relationship between SDM processes and process outcomes. This section will compare the results from this study with these three streams of research. The section closes with a summary of how these conclusions support the confluence of the rational and learning lens view of SDM.

Effects of the Environment

The findings of this study support and extend previous research that suggests rationality leads to greater performance in dynamic environments but has little or no performance value in moderate and stable environments (Eisenhardt, 1989; Judge & Miller, 1991; Priem, Rasheed & Kotulic, 1995). Higher levels of information collection and analysis are required to understand and effectively deal with the complexities of dynamic environments. However, the relative certainty of moderate and stable environments requires less investigation. In support of these ideas, this study generally found that rationality in collecting information led to higher levels of decision quality in dynamic environments and had no affect on decision quality in moderate and stable environments. This extends the previous research by demonstrating the relationship holds not only for firm performance but also for decision-level outcomes such as decision quality.

In two special cases, non-hypothesized results were obtained. First, rationality was not related to higher decision quality in the dynamic environment for managers with a background in financial services. Second, rationality was negatively related to decision quality in the moderate environment for managers from the diversified technology and energy production industries. Possible explanations for differences based on industry background will be explored in the next section.

Previous research also suggests that the environment affects the scanning actions of individual managers (Daft & Lengel, 1984). When faced with an equivocal environment, managers seek more information than when operating in more certain settings. The additional information assists in the identification of strategic issues (Dutton & Jackson, 1987) and development of cognitive schema representing cause and effect relationships (Walsh, 1995). The results of this study provide only partial support for this point of view. In particular, scanning was greatest in the dynamic environment when the manager had technology experience and assumed the role of Director of Sales & Marketing or Director of Manufacturing. Possible explanations for this result are explored in the next section.

Non-hypothesized results suggest that the relationship is more complex than previously thought. Similar to the relationship between process rationality and decision outcomes, this study suggests that industry background is an important factor in understanding individual scanning actions. In particular, managers with experience in either energy production or financial services did not exhibit scanning differences between environments unless they acted in the capacity of Vice President when making decisions. Regardless of industry background, Vice Presidents (whose functional role is that of General Manager for the SBU) scanned more completely in moderate environments. Thus, functional assignment also appears to interact with environment in predicting scanning.

Decision-Maker Characteristics

Several SDM studies have moved from the artificial, demographic method of measuring cognitive bases toward measurement of personality preferences and traits (Hunt, Krzystofiak, Meindl & Yousry, 1989; Nutt, 1986, 1990; Papadakis, Lioukas & Chambers, 1998; Wally & Baum, 1994). While personality traits such as cognitive complexity, risk propensity, and need for achievement have yet to be successfully connected to decision processes (Hitt & Tyler, 1991; Papadakis, Lioukas & Chambers, 1998), Jungian (1921/1971) decision styles have been consistently related to both decision processes and decision outcomes (Brockmann & Simmonds, 1997; Hunt et al., 1989; Nutt, 1986, 1990; Stumpf & Dunbar, 1991). This study, however, was unable to support a relationship between either sensing/intuiting or thinking/feeling preferences and the scanning actions of managers.

Process Outcomes

There is a growing literature relating environmental effects to process rationality and firm performance. However, relating process variables to firm performance is problematic due to the potential for confounding factors. Yet, examination at the decision-level has been severely limited by the difficulty in obtaining adequate sample sizes. Two small-sample studies suggest that environment affects process outcomes (Dean & Sharfman, 1996; Judge & Miller, 1991) as well as firm outcomes. As noted above, the results of this study suggest that the value of rationality in collecting information differs based on environment. Whereas previous studies demonstrated differences for effectiveness compared to goals and decision speed, this research extended these findings to decision quality. Unlike the two studies mentioned, this study did not find an overall significant relationship between rationality and process outcomes. However, post hoc tests revealed that the relationship did exist for certain decisions. Although not specifically hypothesized, this is consistent with work suggesting that the decision is an important contextual factor (Hickson et al., 1986; Papadakis, Lioukas & Chambers, 1998).

The Confluence of Rational and Learning Lens Views

Research in SDM is grounded in three traditions that have been labeled by Rajagopalan and Spreitzer (1997) as the rational, learning, and cognitive lenses. Although the traditions are proposed to operate in tandem, the field has been dominated by single lens views. Thus, this research sought to examine the confluence of two of these views—the rational and learning lens views.

The rational view of SDM holds that contextual factors such as the environment and/or the decision directly affect SDM processes and SDM outcomes. Support for this view was provided by the finding that the relationship between team informity and decision quality is non-significant in stable environments while the relationship is significant in dynamic or moderate environments for certain types of decisions. In addition, the decision context explained approximately 20% of the variance in both team informity and decision quality.

From the perspective of the learning lens, the focus shifts from a deterministic view of context affecting process and outcome to a view that emphasizes the importance of managerial actions in dealing with the context. Support for this view was garnered from the significant relationship between a manager's scanning actions and the team's rationality in collecting information. These managerial actions are a function of the context. Specifically, the level of scanning completeness is dependent upon the interaction of environment, industry background, and functional assignment. The manager's sensing/intuiting preferences may also interact with environment and industry background to predict scanning completeness. Finally, scanning actions explain about 30% of the variation in team informity and 2.4% of the variation in decision quality.

Contextual as well as managerial effects were found to be important in the explanation of SDM process and process outcomes. Thus, this study supports the confluence of the rational and learning lens views of strategic decision making.

Explanation of Non-hypothesized Results

Several results were not as hypothesized thus requiring further examination. This section explores three possible explanations for the unexpected results: a) the effects of decision-makers' functional assignment and industry experience, b) underspecification of MBTI preferences, and c) the importance of the decision itself.

Functional Assignment and Industry Experience

The environment was hypothesized to have a direct effect on the scanning actions of decision-makers. However, this hypothesis was supported only when functional assignment and industry background were included as interactive effects. Industry background was also important in the explanation of how the environment moderates the relationship between process characteristics and process outcomes. While these moderating effects were not specifically hypothesized, their importance has been supported by research.

Studies have used upper echelon theory (Hambrick & Mason, 1984) to support the importance of various individual decision-maker demographics (e.g., Brockmann & Simmonds, 1997; Hitt & Tyler, 1991) in SDM research. Upper echelon theory suggests that the cognitive bases and values of decision makers are used to screen complex stimuli received from the environment thereby affecting perceptional processes and ultimately strategic choices. Functional background is one variable assumed to influence the cognitive base. This view has been supported with findings suggesting that problem definition (Dearborn & Simon, 1958) and evaluation (Hitt & Tyler, 1991) are dependent on functional background. Research has also demonstrated that current functional position is positively related to the beliefs that managers hold regarding strategic issues (Frankwick, Ward, Hutt & Reingen, 1994). Industry background also has been proposed as a perceptual filter (Hambrick & Mason, 1984; Hitt & Tyler, 1991). Based on industrial organization economics, industry structure is presumed to affect the dominant logic of managers (Hitt & Tyler, 1991; Spender, 1989).

Although not specifically hypothesized, the results of this study provide additional support for the idea that functional position and industry background affect SDM. In particular, managers experienced in diversified technology demonstrated different levels of scanning by environment. Specifically, managers taking on the simulated role of Directors of Product Development scanned more completely in stable environments; managers assuming the position of Director of Sales and Marketing exhibited the greatest scanning completeness in the dynamic and stable environments;

and managers asked to assume to role of Director of Manufacturing scanned more completely in dynamic and moderate environments. However, between-environment scanning differences were not observed for managers who took on functional decision making roles and were experienced in financial services or energy production.

The fact that environmental scanning differed across environments for managers from diversified technology but not those from financial services and energy production may be related to the diversified versus non-diversified nature of the two groups. Managers with experience in non-diversified industries may develop a set of core assumptions which they apply to all environments. Thus, varying the level of scanning based on environment would not be viewed as beneficial. In addition the two non-diversified organizations operate in more stable environments than the diversified technology firm. Thus, managers from non-diversified firms may not recognize the value of collecting additional information in dynamic environments instead believing that scanning is equally important irrespective of environmental uncertainty. In contrast, it is unlikely that managers with experience in diversified organizations operating in dynamic environments would develop common beliefs thereby leading to scanning differences based on environment.

Differences between functional directors with experience in the technology industry may be a result of the throughput versus output orientation of the managers. Manufacturing managers have an output orientation focused on improving efficiency. Product development and marketing managers, on the other hand, have a throughput orientation focused on growth and new opportunities (Hambrick & Mason, 1984). The manufacturing manager has a good understanding of efficiency improvement in the stable environment but requires additional information from the dynamic and moderate environments to help develop and update his/her cognitive schema with respect to improving efficiency. In contrast, product development managers are familiar with making decisions in uncertain environments and therefore actually experience more uncertainty when making decisions for stable environments. Therefore, these managers scan more completely in stable environments than in moderate or dynamic environments. Sales and marketing managers desire more information when operating in stable and dynamic environments than in moderate environments. Although this seems doubtful, it may be related to product life cycles. For example, maturing products are most likely found in stable environments. Under these circumstances, marketers look for ways to ensure that their products are not viewed as obsolete while at the same time scanning for the next opportunity. This effort requires increased scanning efforts. With respect to dynamic environments, marketers are keenly aware of the need to monitor changing circumstances for new market potential.

Regardless of industry background, Vice Presidents scanned moderate environments more completely than either dynamic or stable environments. Vice Presidents served as the heads of the SBUs, therefore taking on the role of General Managers. Managers leading divisions that operate in moderate environments may increase scanning with the belief that these environmental conditions offer the most potential for future growth with the least amount of risk. In contrast, the dynamic environment offers greater growth potential but higher risk and the stable environment provides low growth potential. Thus, the General Manager seeks more information and greater understanding of the moderate environment.

Additional support for the idea that managers from different industry backgrounds respond differently in strategic situations was garnered from examination of the rationality-performance relationship across environments. More specifically, the decision quality of teams experienced in technology or energy related industries with current operations in a dynamic environment benefited from higher levels of rationality in collecting information. This did not hold for teams with experience in financial services. Managers from the technology and energy related industries are accustomed to uncertainty thus they use information to update their cognitive schemas and increase decision quality (Eisenhardt, 1989). In contrast, managers from the relatively stable financial services sector make decisions based on existing conceptions of cause-effect relationships rather than using information to update cognitive schemas.

Decision quality may actually suffer as more information becomes available to teams experienced in technology or energy related industries currently operating in moderate environments. Managers from a dynamic environment may not perceive significant process differences between dynamic and moderate environments. Therefore, they may respond to the moderate environment in the same way as the dynamic environment, that is, by collecting more information. This additional information adds complexity to the cognitive map resulting in lower quality decisions.

MBTI Preferences

The decision-maker characteristics of sensing/intuiting and thinking/feeling were not adequate predictors of manager scanning actions. One possible explanation for non-significant results with respect to the thinking/feeling scale is the fact that only 12% of the participants were feelers. In addition, scores for these managers indicated only "moderate" feeling preferences whereas their peers demonstrated "clear" preferences for thinking. While the low number of feelers in comparison to thinkers is not inconsistent with previous studies that have found managerial samples containing between 13% and 43% feelers (see review by Gardner & Martinko, 1996), it does have a negative effect on the power of statistical tests.

Another possible explanation for the lack of findings related to the sensing/intuiting and thinking/feeling scales is that the influence of decision style was "obfuscated" by the "strong" situation (Gardner & Martinko, 1996). That is, the motivation to "do well" in the simulated decision-making environment, may have overshadowed the perceiving and interpreting preferences of the managers.

It is also plausible that the model was misspecified. In particular, this study hypothesized relationships based on the two separate components of decision style rather than exploring their interaction. Based on evidence suggesting that the four different decision styles produce unique biases for action (Haley & Stumpf, 1989; Stumpf & Dunbar, 1991), managers with the four different styles may use different perceptual filters for scanning.

Decision Context

Post hoc examination revealed that the hypothesized relationship between rationality in collecting information and decision quality was moderated by the decision. Although not specifically hypothesized, this result was not unexpected. Chapters II and III briefly mentioned work suggesting that decision-specific factors may have a significant effect on SDM (e.g., Hickson, Butler, Cray, Mallory & Wilson, 1986; Papadakis, Lioukas & Chambers, 1998; Rajagopalan, Rasheed & Datta, 1993). However, the lack of theory development in this area led to the inclusion of the decision as a control rather than a hypothesized antecedent or moderating variable. Results from this study indicate that the decision may explain up to 20% of the variation in decision quality. This finding adds further support to the importance of the decision and the view that decision makers adjust their rationality in complex ways (Eisenhardt & Zbaracki, 1992).

In addition, the results from this study are consistent with previous case study research suggesting that low risk decisions require decision processes of shorter duration than high risk decisions (Schilit & Paine, 1986). Combining these results with results suggesting that rational processes lead to speedier decisions and that speedier decisions lead to higher performance (Eisenhardt, 1989), it is possible that rational decision processes used on low risk decisions will lead to higher quality decisions. With respect to this research, the decisions for which more information led to higher quality decisions (i.e., dealing with raw materials shortages, implementing control systems, establishing hiring policies, possible restructuring of the product development organization, and instituting safety and security guidelines) might be classified as low risk. That is, it was unlikely, or impossible, for these decisions to jeopardize organization resources or negatively impact performance. For example, several pieces of information existed concerning raw materials waste, lost orders, theft, etc. Any controls implemented by the team were considered good decisions. Thus, the more information (i.e., problems) uncovered by the team, the more likely they were to implement an effective control system.

Contributions and Implications

Several potential contributions of this work were discussed in the opening chapter. In closing this discussion, these potential contributions are reviewed and implications of the work are highlighted.

Potential Contributions

First, this study adopted multiple theoretical perspectives to simultaneously examine multiple contextual factors, managerial actions, process characteristics, and process outcomes. This extends the existing research, as identified in reviews of the SDM literature (i.e., Dean & Sharfman, 1991; Eisenhardt & Zbaracki, 1992; Rajagopalan, Rasheed & Datta, 1993), in three ways. First, whereas the majority of existing research used a macro, organizational view of SDM thereby ignoring the role of the decision maker, this study combined the more macro rational view of SDM with the more micro learning lens view into a single study. Second, much of the existing research failed to consider the multi-dimensional nature of the SDM context and the potential interrelationships between contextual elements. In response, this study included elements of the environmental context, the decision, and characteristics of the decision-maker as well as controlling for several elements of the organizational context. Finally, much of the existing SDM research has been descriptive in nature thereby ignoring the practical implications for organizations. To provide a normative focus for this research, decision quality was examined as the outcome variable. In general, this study demonstrated that a) decision makers are important, b) the context is multi-dimensional and has a significant affect on results, and c) relationships often found at the organizational level also exist at the decision-level.

The second contribution of this study was exploration of the environment's moderating effect on the relationship between rationality and process outcomes at the decision level of analysis. While several studies explored the relationship between rationality and firm performance (see Table 1 in Chapter II, page 19), a very limited number of studies addressed the decision-level of analysis (e.g., Dean & Sharfman, 1996; Eisenhardt, 1989; Judge & Miller, 1991). In general, the results of this study suggest that rationality improves decision quality in dynamic environments but has no effect in stable environments. However, industry background may be an important moderator of this relationship.

Third, this study examined the relationship between the decision style of each team member and the quality of the team's decision. Given that several previous studies had connected decision style to individual decision processes (see Table 2 in Chapter II, page 27), the overall lack of significance found in this study has important practical implications. These implications will be discussed later.

Finally, this study examined the relative contribution of the environment, decision-maker characteristics, managerial actions, decisions, and teams to SDM process and SDM outcomes. This is the first known attempt to examine the relative importance of multiple process and outcome predictors. The results indicate that a) the environment explains a small but significant amount of variation in decision quality, b) decision maker characteristics do not explain variation in rationality or decision quality, c) managerial actions explain a rather large amount of variation in decision process but much less for decision quality, d) decision is an important contextual factor explaining approximately 20% of the variation in SDM processes and process outcomes, and e) team differences are not significant in the explanation of team rationality but do explain a small amount of variation in decision quality.

Implications for Managers

From a manager's perspective, the relative importance of the various predictors of decision quality assist in defining those elements which should be emphasized, or de-emphasized, in strategic decision-making processes. In particular, environmental dynamism, the sensing/intuiting and thinking/feeling preferences of individual decision-makers, and the scanning actions of individual decision-makers have little to no direct effect on decision quality. Thus, overall increases in scanning efforts and/or development of decision styles preferring concrete information will not necessarily contribute to increased levels of decision quality.

However, the interaction between environment and the previous industry experience of decision makers is an important consideration. More specifically, the decision quality of teams experienced in dynamic industries with current operations in a dynamic environment benefit from higher levels of rationality in collecting information. However, decisions made by teams with experience in stable environments do not benefit from the availability of addition information. Teams experienced in dynamic industries and currently operating in moderate environments should not be encouraged to actively seek new information as this may actually have a negative impact on decision quality. The reasons for these differences were discussed in the previous section.

Implications for Research

Three important implications for research can be drawn from the results of this study. First, research models should include both macro and micro views of SDM. As noted in reviews of the literature, most of the existing research has focused on the macro, organizational view of SDM (Eisenhardt & Zbaracki, 1992; Rajagopalan, Rasheed & Datta, 1993) with the remaining studies generally taking a micro perspective focusing on individual decision biases and heuristics. This research demonstrates that macro and micro views operate in tandem. Results supported the macro, rational lens view of SDM as well as the micro, learning lens view. If considered separately, each view would provide an incomplete picture of process outcomes.

The second research implication is the importance of modeling contextual interactions. The importance of including multiple contextual factors has been addressed by many (e.g., Dean, Sharfman & Ford, 1991; Rajagopalan, Rasheed & Datta, 1993) but has not previously been implemented in studies that simultaneously include context, process, and outcome (see Appendix A). Inclusion of multiple contextual factors allows researchers to examine how the various factors may interact to produce more effective decisions. For example, the ability of organizational slack to predict decision quality may depend upon the risk propensity of the decision-makers. This relationship may be further influenced by the munificence of the environment. Although not initially hypothesized, this study demonstrated the existence of interactions between environment (dynamism), managerial cognitions (industry background), and decision-maker characteristics (functional assignment and sensing preferences).

The third research implication is the importance of the decision-level of analysis. Several studies have demonstrated a significant connection between decision processes and decision-specific factors such as decision criticality, complexity, decision motive, urgency, frequency, information source, and problem classification (see review by

Rajagopalan, Rasheed & Datta, 1993; Nutt, 1998; Papadakis, Lioukas & Chambers, 1998). However, only one previous study addressed the performance implications of a decision-specific factor (Nutt, 1998). Through the use of a simulated decision-making environment, this study demonstrated that the decision might explain up to 20% of the variation in decision quality. Therefore, decision-specific factors and their interaction with other contextual variables should be included in SDM models.

Limitations

The analysis and findings of this research are subject to several limitations. First, the simulated setting raises questions of generalizability. In most cases the decision-making teams did not represent intact management teams. While the same firm employed the managers, they were often from different locations and/or different divisions. Although employment with the same organization provided similar contextual experience for the participants, they were not experienced in the context of the simulated environment. In addition, the managers made decisions within a one-day time frame which is much shorter than is typically observed for strategic decisions. Therefore, while the external validity of simulated decision-making settings has been supported (Van Velsor, Ruderman & Phillips, 1989), generalizability is still limited.

The second limitation of the study was the relatively small number of antecedents included in the study and the restrictive manner in which SDM processes and process outcomes were operationalized. For example, dynamism was the only environmental factor explored as an antecedent of SDM outcomes. While this is consistent with most previous SDM research (see Priem, Rasheed & Kotulic, 1995), it ignored the potential effects of environmental munificence and environmental complexity. A narrow view of the organizational context as a predictor of decision process and decision outcomes was also adopted. This was primarily a result of using a simulated decision-making environment that naturally controlled factors such as organizational size, structure, and past performance. However, decision-maker characteristics could not be controlled and were therefore considered for inclusion in the model. Based on research that consistently identified significant relationships between decision style and various measures of decision-making process, only the MBTI styles of sensing/intuiting and thinking/feeling were explored in this study. However, decision-maker demographics and personality traits have produced significant results in other studies (see Table 2 in Chapter II, page 27).

In addition to limiting the number of antecedents included in the study, managerial actions, decision making processes, and process outcomes were narrowly conceptualized. Previous research characterizes SDM as rational, political, random, (Eisenhardt & Zbaracki, 1992) and conflict-driven (Amason, 1996) with rational perspectives dominating the field. In an attempt to clarify conflicting results from the literature and add depth to our understanding through the exploration of an integrative model, this study again focused on the rational perspective. However, integrative models are not theoretically limited to rational perspectives. Furthermore, scanning actions represent a narrow view of the actions undertaken by managers in rational decision making. This study also depended on decision quality as the sole measure of process outcome. However, one could argue that decision quality is meaningless if the decision is not adopted or is not effectively implemented. Suggestions for expanding the conceptualizations of environment, decision-maker characteristics, managerial actions, and SDM processes will be provided in the next section.

The third major limitation of this study was the exclusive focus on the rational and learning lens views of SDM. In particular, the research model and design did not explicitly consider the cognitive view of SDM which depends on how managers interpret and enact their environment to explain SDM process and outcomes. Furthermore, the cross-sectional nature of the study prohibited insight into the learning loops associated with both the learning and cognitive views. From a theoretical perspective, the rational, learning, and cognitive lens views of SDM should operate temporally and in tandem (Rajagopalan, Rasheed, Datta & Spreitzer, 1998; Rajagopalan & Spreitzer, 1997).

Future Research

While this research studied many aspects of SDM, several interesting issues remain unexamined. Three specific suggestions for future research will be explored.

First, the research model presented in this study should be expanded to include the cognitive view of SDM. Managerial cognitions act as the transfer mechanism between the context and managerial actions (Rajagopalan & Spreitzer, 1997). In other words, cognitions are the interpretive processes through which managers perceive and enact their environments. Thus, cognitions should explain why different teams operating under similar environmental and organizational contexts respond differently when presented with the same decision. Studies of strategic issue diagnosis (e.g., Denison, Dutton, Kahn & Hart, 1996) and framing (e.g., Nutt, 1998) connect cognitive research to the field of SDM; however, cognitive views have not yet played a role in integrative models of SDM that consider context, process, and outcomes.

Second, future research efforts should include a more complete conceptualization of the environment, decision-maker characteristics, managerial actions, and SDM process. For example, by supporting the moderating effect of environmental munificence, Goll and Rasheed (1997) demonstrated the importance of including environmental factors beyond just dynamism. Furthermore, the potential importance of environmental complexity can be extrapolated from Schwenk's (1988) work on the use of heuristics, biases, assumptions, cognitive maps, and analogy in the comprehension of complex problems. With respect to decision-maker characteristics, the lack of significance for manager sensing/intuiting and thinking/feeling preferences should be explored. Previous studies have consistently found significant results when these two preferences are crossed (see Table 2 in Chapter II, page 27). As noted earlier, research should explore whether it is the interaction of these preferences that is important or whether individual decision style is not critical in predicting group process. Researchers should also continue to explore the importance of demographic and personality variables. While previous research has provided mixed results for the importance of these variables (e.g., Glick, Miller & Huber, 1993; Hitt & Tyler, 1991; Wally & Baum, 1994), examination from a cognitive lens view may bring clarity. For example, age may not have a direct effect on SDM process but may have an indirect effect through managerial cognitions and actions.

In addition to broader conceptualizations of the environment and decision-maker characteristics, there is a tremendous need to examine various managerial actions and how they affect SDM processes. Due to the conceptual consistency with rational views of SDM process, this study narrowly focused on the scanning actions of managers.

However, other information gathering actions such as meeting with stakeholders and social networking would also be consistent with a rational view. As researchers expand the integrative model to include other views of SDM process (i.e., political, flexible, etc.), actions consistent with each view should be considered. For example, lobbying actions would be appropriate for political views and acquiring additional resources may be appropriate for flexible views.

Finally, there is a need for decision-specific theory building. The cognitive lens view of SDM may provide the missing link. That is, process and outcomes may depend on how an issue is perceived and defined. On the other hand, outcomes may be more dependent on the actions of competitors or the organization's interpretation of competitor actions. Explaining how different decisions affect the SDM process and its outcomes will assist organizations in defining decision-specific processes and/or in assembling management teams with the most effective set of cognitive characteristics.

Conclusions

Rational and learning lens views of strategic decision making operate in tandem suggesting that decision process outcomes are partially deterministic and partially adaptive. Further, the cognitions or interpretive frames of decision makers may operate as the transfer mechanism between contextual factors and managerial actions. Although research has provided insight into several antecedents of SDM process outcomes, it is only through systematic examination of the complex interactions between rational, learning, and cognitive views that effective strategic decision processes can be understood. With this understanding, firms should be able to design unique decision-making processes that can be used as a competitive advantage.

BIBLIOGRAPHY

Aldrich, H. E. 1979. Organizations and environments. Englewood Cliffs, NJ: Prentice-Hall.

Aguilar, F. J. 1967. Scanning the business environment. New York: Macmillan.

Allison, G. T. 1971. Essence of decision: Explaining the cuban missile crisis. Boston: Little Brown.

Amason, A. C. 1996. Distinguishing the effects of functional and dysfunctional conflict on strategic decision making: Resolving a paradox for top management teams. Academy of Management Journal, 39:123-148.

Andrews, K. R. 1980. The concept of corporate strategy. Homewood, IL: Irwin.

Ansoff, I. H. 1980. Strategic issue management. Strategic Management Journal, 1:131-148.

Ashmos, D. P., Duchon, D., & McDaniel, R. R. J. 1998. Participation in strategic decision making: The role of organizational predisposition and issue interpretation. Decision Sciences, 29:25-51.

Barr, L., & Barr, N. 1989. The leadership equation: Leadership, management, and the Myers-Briggs. Austin, TX: Eakin Press.

Bateman, T. S., & Zeithaml, C. P. 1989. The psychological context of strategic decisions: A model and convergent experimental findings. Strategic Management Journal, 10:59-74.

Bell, G. G., Bromiley, P., & Bryson, J. 1998. Spinning a complex web: Links between strategic decision making context, content, process and outcome. In V. Papadakis & P. Barwise (Eds.), Strategic Decisions (pp. 163-178). Norwell, MA: Kluwer Academic.

Bourgeois, L. J., III, & Eisenhardt, K. M. 1988. Strategy decision processes in high velocity environments: Four cases in the microcomputer industry. Management Science, 34:816-835.

Bower, J. L. 1998. Strategic decision making: A contingency framework and beyond. In V. Papadakis & P. Barwise (Eds.), Strategic Decisions (pp. 35-50). Norwell, MA: Kluwer Academic.

Brockmann, E. N., & Simmonds, P. G. 1997. Strategic decision making: The influence of CEO experience and use of tacit knowledge. Journal of Managerial Issues, 9:454-467.

Carey, J. C., Fleming, S. D., & Roberts, D. Y. 1989. The Myers-Briggs type indicator as a measure of aspects of cognitive style. Measurement and Evaluation in Counseling and Development, 22:94-99.

Chaffee, E. 1985. Three models of strategy. Academy of Management Review, 10:89-98.

Chatman, J. A., & Barsade, S. G. 1995. Personality, organizational culture, and cooperation: Evidence from a business simulation. Administrative Science Quarterly, 40:423-443.

Chatman, J. A., Polzer, J. T., Barsade, S. G., & Neale, M. A. 1998. Being different yet feeling similar: The influence of demographic composition and organizational cutures on work processes and outcomes. Administrative Science Quarterly, 43:749-780.

Cohen, M. D., March, J. G., & Olsen, J. P. 1972. A garbage can model of organizational choice. Administrative Science Quarterly, 17:1-25.

Corman, L. S., & Platt, R. G. 1988. Correlations among the group embedded figures test, the Myers-Briggs type indicator and demographic characteristics: A business school study. Perceptual and Motor Skills, 66:507-511.

Cyert, R. M., & March, J. G. 1963. A behavioral theory of the firm. Englewood Cliffs, NJ: Prentice-Hall.

Daft, R. L., Bettenhausen, K. R., & Tyler, B. B. 1993. Implications of top managers' communication choices for strategic decisions. In G. P. Huber & W. H. Glick (Eds.), Organizational change and redesign: Ideas and insights for improving performance (pp. 112-146). New York: Oxford University Press.

Daft, R. L., & Lengel, R. H. 1984. Information richness: A new approach to managerial behavior and organizational design. Research in Organizational Behavior, 6:191-233.

Daft, R. L., Sormunen, J., & Parks, D. 1988. Chief executive scanning, environmental characteristics, and company performance: An empirical study. Strategic Management Journal, 9:123-139.

Daft, R. L., & Weick, K. E. 1984. Toward a model of organizations as interpretation systems. Academy of Management Review, 9:284-295.

Dean, J. W., Jr., & Sharfman, M. P. 1993a. Procedural rationality in the strategic decision-making process. Journal of Management Studies, 30:587-610.

Dean, J. W., Jr., & Sharfman, M. P. 1993b. The relationship between procedural rationality and political behavior in strategic decision making. Decision Sciences, 24:1069-1083.

Dean, J. W., Jr., & Sharfman, M. P. 1996. Does decision process matter? A study of strategic decision-making effectiveness. Academy of Management Journal, 39: 368-396.

Dean, J. W., Jr., Sharfman, M. P., & Ford, C. M. 1991. Strategic decision-making: A multiple-context framework. Advances in Information Processing in Organizations, 4:77-110.

Dearborn, D. C., & Simon, H. A. 1958. Selective perception: A note on the department identifications of executives. Sociometry, 21:140-144.

Dennison, D. R., Dutton, J. E., Kahn, J. A., & Hart, S. L. 1996. Organizational context and the interpretation of strategic issues: A note on CEOs' interpretations of foreign investment. The Journal of Management Studies, 33: 453-474.

Dess, G. G., & Beard, D. W. 1984. Dimensions of organizational task environments. Administrative Science Quarterly, 29: 52-73.

Duncan, R. B. 1972. Characteristics of organizational environments and perceived environmental uncertainty. Administrative Science Quarterly, 17:313-327.

Dutton, J. E., Fahey, L., & Narayanan, V. K. 1983. Toward understanding strategic issue diagnosis. Strategic Management Journal, 4:307-323.

Dutton, J. E., & Jackson, S. E. 1987. Categorizing strategic issues: Links to organizational action. Academy of Management Review, 12:76-90.

Dutton, J. E., & Stumpf, S. A. 1991. Using behavioral simulations to study strategic processes. Simulation & Games, 18:207-224.

Eisenhardt, K. M. 1989. Making fast strategic decisions in high velocity environments. Academy of Management Journal, 32:543-576.

Eisenhardt, K. M., & Zbaracki, M. J. 1992. Strategic decision making. Strategic Management Journal, 13:17-37.

Etzioni, A. 1964. Modern organizations. Englewood Cliffs, NJ: Prentice-Hall.

Fahey, L. 1981. On strategic management decision processes. Strategic Management Journal, 2:43-60.

Frankwick, G. L., Ward, J. C., Hutt, M. D., & Reingen, P. H. 1994. Evolving patterns of organizational beliefs in the formation of strategy. Journal of Marketing, 58:96-110.

Fredrickson, J. W. 1984. The comprehensiveness of strategic decision processes: Extensions, observations, future directions. Academy of Management Journal, 27:445-466.

Fredrickson, J. W. 1985. Effects of decision motive and organizational performance level on strategic decision processes. Academy of Management Journal, 28:821-843.

Fredrickson, J. W., & Iaquinto, A. L. 1989. Inertia and creeping rationality in strategic decision processes. Academy of Management Journal, 32:543-576.

Fredrickson, J. W., & Mitchell, T. R. 1984. Strategic decision processes: Comprehensiveness and performance in an industry with an unstable environment. Academy of Management Journal, 27:399-423.

Gardner, W. L., & Martinko, M. J. 1996. Using the myers-briggs type indicator to study managers: A literature review and research agenda. Journal of Management, 22:45-83.

Gibson, C. B. 1999. Do they do what they believe they can? Group efficacy and group effectiveness across tasks and cultures. Academy of Management Journal, 42:138-152.

Gist, M. E., Hopper, H., & Daniels, D. 1998. Behavioral simulation: Application and potential in management research. Organizational Research Methods, 1:251-295.

Gladstein, D. L., & Reilly, N. P. 1985. Group decision making under threat: The tycoon game. Academy of Management Journal, 28:613-627.

Glick, W. H., Miller, C. C., & Huber, G. P. 1993. The impact of upper-echelon diversity on organizational performance. In G. P. Huber & W. H. Glick (Eds.), Organizational change and redesign: Ideas and insights for improving performance (pp. 176-214). New York: Oxford University Press.

Gnyawali, D. R. 1997. Creation and utilization of organizational knowledge: An empirical study of the effects of organizational learning on strategic decision making. Doctoral dissertation, University of Pittsburgh.

Goll, I., & Rasheed, A. M. A. 1997. Rational decision-making and firm performance: The moderating role of environment. Strategic Management Journal, 18: 583-591.

Hair, Jr, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. 1995. Multivariate data analysis with readings (4th ed.). Englewood Cliffs, NJ: Prentice Hall.

Haley, U. C. V., & Stumpf, S. A. 1989. Cognitive trails in strategic decision-making: Linking theories of personalities and cognitions. Journal of Management Studies, 26: 477-497.

Hambrick, D. C. 1981. Specialization of environmental scanning activities among upper level executives. Journal of Management Studies, 18: 299-320.

Hambrick, D. C., & Finkelstein, S. 1987. Managerial discretion: A bridge between polar views of organizational outcomes. Research in Organizational Behavior, 9:369-406.

Hambrick, D. C., & Mason, P. 1984. Upper echelons: The organization as a reflection of its top managers. Academy of Management Journal, 9:193-206.

Hart, S., & Branbury, C. 1994. How strategy-making processes can make a difference. Strategic Management Journal, 15:251-270.

Henderson, J. C., & Nutt, P. C. 1980. The influence of decision style on decision making behavior. Management Science, 26:371-386.

Hickson, D. J., Butler, R. J., Cray, D., Mallory, G. R., & Wilson, D. C. 1986. Top decisions: Strategic decision-making in organizations. San Francisco: Jossey-Bass.

Hitt, M. A., & Tyler, B. B. 1991. Strategic decision models: Integrating different perspectives. Strategic Management Journal, 12:327-352.

Hunt, R. G., Krzystofiak, F. J., Meindl, J. R., & Yousry, A. M. 1989. Cognitive style and decision making. Organizational Behavior and Human Decision Processes, 44:436-453.

Iaquinto, A. L., & Fredrickson, J. W. 1997. Top management team agreement about the strategic decision process: A test of some of its determinants and consequences. Strategic Management Journal, 18:63-75.

Judge, W. Q., & Miller, A. 1991. Antecedents and outcomes of decision speed in different environmental contexts. Academy of Management Journal, 34:449-463.

Jung, C. G. 1971. The collected works of C. G. Jung: Vol. 6 Psychological types (trans. H. G. Baynes, revised by R. F. Hull). Princeton, NJ: Princeton University Press (originally published 1921).

Kirk, R. E. 1995. Experimental design: Procedures for the behavioral sciences. Pacific Grove, CA: Brooks/Cole.

Lant, T. K., Milliken, F. J., & Batra, B. 1992. The role of managerial learning and interpretation in strategic persistence and reorientation: An empirical exploration. Strategic Management Journal, 13:585-608.

Lessard, D. R., & Zaheer, S. 1996. Breaking the silos: Distributed knowledge and strategic responses to volatile exchange rates. Strategic Management Journal, 17:513-533.

Littell, R. C., Milliken, G. A., Stroup, W. W., & Wolfinger, R. D. 1996. SAS system for mixed models. Cary, NC: SAS Institute.

Locke, E. A. 1986. Generalizing from laboratory to field: Ecological validity or abstraction of essential elements? In E. A. Locke (Ed.), Generalizing from laboratory to field settings. (pp. 3-9). Lexington, MA: Lexington Books.

March, J. G. 1962. The business firm as a political coalition. The Journal of Politics, 24:662-678.

March, J. G., & Simon, H. A. 1958. Organizations. New York: John Wiley & Sons.

Mason, R. O., & Mitroff, I. I. 1981. Challenging strategic planning assumptions. New York: Wiley.

McCall, M. W., & Lombardo, M. M. 1979. Looking glass,inc.: The first three years (Technical Report Number 13). Greensboro, NC: Center for Creative Leadership.

McCall, M. W., & Lombardo, M. M. 1982. Using simulation for leadership and management research: Through the looking glass. Management Science, 28:533-549.

McNew, R. W., & Mauromoustakos, A. 1996, March. Testing variance components in the GLM and MIXED procedures of SAS software. Paper presented at the meeting of the SAS Users Group International, Chicago, IL.

Miller, C. C., Burke, L. M., & Glick, W. H. 1998. Cognitive diversity among upper-echelon executives: Implications for strategic decision processes. Strategic Management Journal, 19:39-58.

Miller, D. 1987. Strategy making and structure: Analysis and implications for performance. Academy of Management Journal, 30:7-32.

Miller, D., & Friesen, P. H. 1983. Strategy-making and environment: The third link. Strategic Management Journal, 4:221-235.

Miller, D., & Toulouse, J. M. 1986. Chief executive personality and corporate strategy and corporate structure in small firms. Management Science, 32:1389-1409.

Miller, S. 1997. Implementing strategic decisions: Four key success factors. Organization Studies, 18:577-602.

Mintzberg, H., Raisinghani, D., & Theoret, A. 1976. The structure of "unstructured" decision processes. Administrative Science Quarterly, 21:246-275.

Montgomery, D. C. 1984. Design and analysis of experiments. New York: John Wiley & Sons.

Myers, I. B. 1993. Introduction to type (5th ed.). Palo Alto, CA: Consulting Psychologists.

Myers, I. B. & McCaulley, M. H. 1985. Manual: A guide to the development and use of the Myers-Briggs type indicator. Palo Alta, CA: Consulting Psychologists.

Nutt, P. C. 1984. Types of organizational decision processes. Administrative Science Quarterly, 29:414-450.

Nutt, P. C. 1986. Decision style and its influence on the strategic decision of top executives. Technological Forecasting and Social Change, 30:39-62.

Nutt, P. C. 1990. Strategic decisions made by top executives and middle managers with data and process dominant styles. Journal of Management Studies, 27:173-194.

Nutt, P. C. 1993. The formulation processes and tactics used in organizational decision making. Organization Science, 4:226-251.

Nutt, P. C. 1998. Framing strategic decisions. Organization Science, 9:195-216.

Olsen, J. P. 1976. Choice in an organized anarchy. In J. G. March and J. P. Olsen (Eds.), Ambiguity and Choice in Organizations (pp. 82-139). Universitetsforlaget, Bergen.

Papadakis, V., & Barwise, P. 1998. Research on strategic decisions: Where do we go from here? In V. Papadakis & P. Barwise (Eds.), Strategic Decisions (pp. 289-302). Norwell, MA: Kluwer Academic.

Papadakis, V. M., Lioukas, S., & Chambers, D. 1998. Strategic decision-making processes: The role of management and context. Strategic Management Journal, 19:115-147.

Pettigrew, A. M. 1973. Politics of organizational decision-making. London: Tavistock.

Priem, R. L., Rasheed, A. M. A., & Kotulic, A. G. 1995. Rationality in strategic decision processes, environmental dynamism and firm performance. Journal of Management, 21:913-929.

Quinn, J. B. 1980. Strategies for change: Logical incrementalism. Homewood, IL: Richard D. Irwin.

Rajagopalan, N., Rasheed, A. M. A., & Datta, D. K. 1993. Strategic decision processes: Critical review and future directions. Journal of Management, 19:349-384.

Rajagopalan, N., Rasheed, A., Datta, D. K., & Spreitzer, G. M. 1998. A multi-theoretic model of strategic decision making processes. In V. Papadakis & P. Barwise (Eds.), Strategic Decisions (pp. 229-249). Norwell, MA: Kluwer Academic.

Rajagopalan, N., & Spreitzer, G. M. 1997. Toward a theory of strategic change: A multi-lens perspective and integrative framework. Academy of Management Review, 22:48-79.

Rodrigues, S. B., & Hickson, D. J. 1995. Success in decision making: Different organizations, differing reasons for success. Journal of Management Studies, 32:655-678.

Romanelli, E., & Tushman, M. L. 1986. Inertia, environments, and strategic choice: A quasi-experimental design for comparative-longitudinal research. Management Science, 32:608-621.

Ruble, T. L., & Cosier, R. A. 1990. Effects of cognitive styles and decision setting on performance. Organizational Behavior and Human Decision Processes, 46:283-295.

Schilit, W. K., & Paine, F. T. 1987. An examination of the underlying dynamics of strategic decisions subject to upward influence activity. Journal of Management Studies, 24: 161-187.

Schweiger, D. M., & Sandberg, W. R. 1989. The utilization of individual capabilities in group approaches to strategic decision-making. Strategic Management Journal, 10:31-43.

Schweiger, D. M., Sandberg, W. R., & Ragan, J. W. 1986. Group approaches for improving strategic decision making: A comparative analysis of dialectical inquiry, devil's advocacy and consensus. Academy of Management Journal, 29:51-71.

Schweiger, D. M., Sandberg, W. R., & Rechner, P. L. 1989. Experiential effects of dialectical inquiry, devil's advocacy and consensus approaches to strategic decision making. Academy of Management Journal, 32:745-772.

Schwenk, C. R. 1984. Effects of planning aids and representation media on performance and affective responses in strategic decision making. Management Science, 30:263-271.

Schwenk, C. R. 1988. The cognitive perspective on strategic decision making. Journal of Management Studies, 25:41-55.

Schwenk, C. R. 1990. Conflict in organizational decision making: An exploratory study of its effects in for-profit and not-for-profit organizations. Management Science, 36:436-447.

Schwenk, C. R. 1995. Strategic decision making. Journal of Management, 21:471-493.

Shackleton, V. J., & Fletcher, C. 1984. Individual differences: Theories and applications. London: Methuen.

Sharfman, M. P., & Dean, J. W., Jr. 1991. Conceptualizing and measuring the organizational environment: A multidimensional approach. Journal of Management, 17:681-700.

Sharfman, M. P., & Dean, J. W., Jr. 1997. Flexibility in strategic decision making: Informational and ideological perspectives. Journal of Management Studies, 34:191-217.

Shrivastava, P., & Grant, J. H. 1985. Empirically derived models of strategic decision-making processes. Strategic Management Journal, 6:97-113.

Smith, K. G., Smith, K. A., Olian, J. D., Sims, H. P. J., O'Bannon, D. P., & Scully, J. A. 1994. Top management team demography and process: The role of social integration and communication. Administrative Science Quarterly, 1994:412-438.

Spender, J. C. 1989. Industry recipes: An enquiry into the nature and sources of managerial judgement. Cambridge, MA: Basil Blackwell.

Stumpf, S., & Dunbar, R. 1991. The effects of personality type on choices made in strategic decision situations. Decision Sciences, 22:1047-1069.

Tabachnick, B. G., & Fidell, L. S. 1983. Using multivariate statistics. New York: Harper & Row.

Thomas, J. B., Clark, S. M., & Gioia, D. A. 1993. Strategic sensemaking and organizational performance: Linkages among scanning, interpretation, action, and outcomes. Academy of Management Journal, 36:239-270.

Thomas, A. S., Litschert, R. J., & Ramaswamy, K. 1991. The performance impact of strategy-manager coalignment: An empirical examination. Strategic Management Journal, 12:509-522.

Thompson, B., & Borello, G. M. 1986. Second-order factor structure of the MBTI: A construct validity assessment. Measurement and Evaluation in Counseling and Development, 18:148-153.

Van Velsor, E., Ruderman, M., & Phillips, A. D. 1989. The lessons of looking glass: Management simulations and the real world of action. Leadership & Organization Development Journal, 10 (6):27-31.

Wally, S., & Baum, J. R. 1994. Personal and structural determinants of the pace of strategic decision making. Academy of Management Journal, 37:932-956.

Walsh, J. P. 1995. Managerial and organizational cognition: Notes from a trip down memory lane. Organization Science, 6:280-321.

Wiersema, M. F., & Bantel, K. A. 1992. Top management team demography and corporate strategic change. Academy of Management Journal, 35:91-121.

Yasai-Ardekani, M., & Nystrom, P. C. 1996. Designs for environmental scanning systems: Tests of a contingency theory. Management Science, 42:187-204.

APPENDIX A

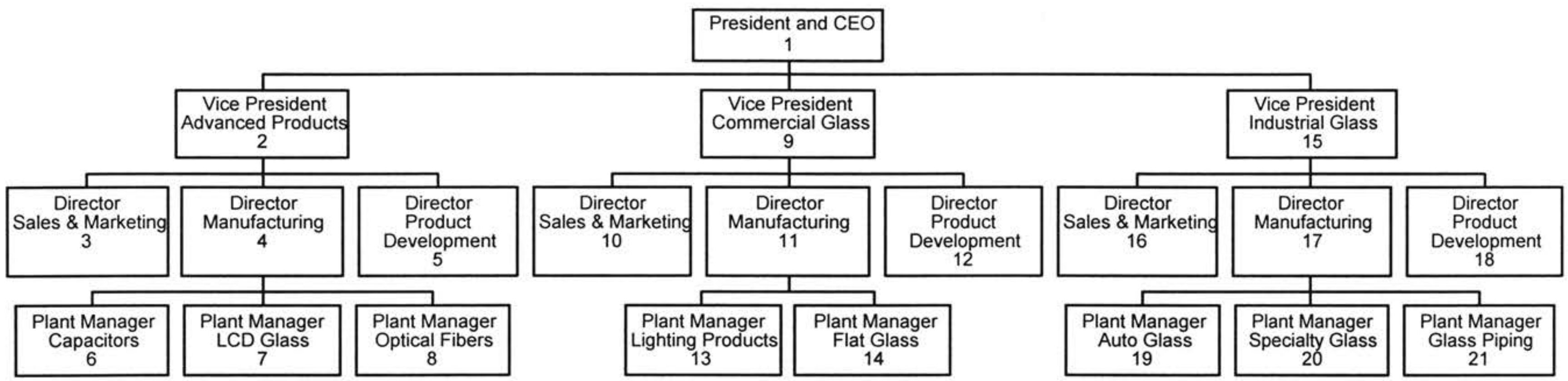
List of Empirical Studies Concerning the Strategic Decision-Making Process, its Antecedents, and Outcomes

Cite	Context			Process	Outcomes	
	Environ-ment	Organi-zation	Decision		Process	Firm
Henderson & Nutt, 1980	•	•	•		•	
Fredrickson & Mitchell, 1984	•			•		•
Fredrickson, 1984	•			•		•
Nutt, 1984				•		
Schwenk, 1984				•		
Fredrickson, 1985		•	•	•		
Gladstein & Reilly, 1985			•	•		
Shrivastava & Grant, 1985		•		•		
Hickson et al, 1986			•	•		
Nutt, 1986	•	•	•		•	
Schweiger, Sandberg & Ragan, 1986				•		
Miller, 1987		•		•		
Bourgeois & Eisenhardt, 1988		•		•	•	•
Bateman & Zeithaml, 1989		•			•	
Eisenhardt, 1989				•	•	
Fredrickson & Iaquinto, 1989		•		•		
Haley & Stumpf, 1989				•		
Hickson, Butler, Cray, Mallory & Wilson, 1989				•		
Hunt et al, 1989		•		•		
Schweiger & Sandberg, 1989				•	•	
Schweiger, Sandberg & Rechner, 1989				•	•	
Nutt, 1990	•	•	•		•	
Schwenk, 1990				•		
Hitt & Tyler, 1991	•	•	•	•		
Judge & Miller, 1991	•	•		•	•	•

Cite	Context			Process	Outcome	
	Environment	Organization	Decision		Process	Firm
Stumpf & Dunbar, 1991		•		•	•	
Daft, Bettenhausen & Tyler, 1993	•				•	
Dean & Sharfman, 1993a	•	•	•	•		
Dean & Sharfman, 1993b				•		
Glick, Miller & Huber, 1993		•		•		•
Nutt, 1993				•	•	
Thomas, Clark & Gioia, 1993				•		•
Wally & Baum, 1994		•			•	
Priem, Rasheed & Kotulic, 1995	•			•		•
Rodrigues & Hickson, 1995			•	•	•	
Amason, 1996				•	•	
Dean & Sharfman, 1996	•			•	•	
Lessard & Zaheer, 1996		•		•	•	
Brockmann & Simmonds, 1997		•		•		
Goll & Rasheed, 1997	•			•		•
Iaquinto & Fredrickson, 1997	•	•		•		•
Sharfman & Dean, 1997	•	•	•	•		
Ashmos, Duchon & McDaniel, 1998		•		•		
Miller, Burke & Glick, 1998				•		
Nutt, 1998			•	•	•	
Papadakis, Lioukas & Chambers, 1998	•	•	•	•		

APPENDIX B

Looking Glass, Inc. Organization Chart


President and CEO 1
Vice President Advanced Products 2
Vice President Commercial Glass 9
Vice President Industrial Glass 15
Director Sales & Marketing 3
Director Manufacturing 4
Director Product Development 5
Director Sales & Marketing 10
Director Manufacturing 11
Director Product Development 12
Director Sales & Marketing 16
Director Manufacturing 17
Director Product Development 18
Plant Manager Capacitors 6
Plant Manager LCD Glass 7
Plant Manager Optical Fibers 8
Plant Manager Lighting Products 13
Plant Manager Flat Glass 14
Plant Manager Auto Glass 19
Plant Manager Specialty Glass 20
Plant Manager Glass Piping 21

APPENDIX C

Embedded Issues for the Advanced Products Division, Industrial Glass Division, and Commercial Glass Division

Advanced Product Division Issues
Marketing Strategies
Soda Ash Supply Crisis
Toxic Waste Disposal
Issues Concerning Major Customer
External versus Internal Supply of Capacitor Blanks
Potential Sale of LCD Glass Plant
Potential for New Capacitors Plant
Control Systems for Raw Materials, Orders, and Invoices
Sales Morale
Shipping Issues
Product Development
EEOC Lawsuit

Industrial Glass Division Issues
Energy Alternatives
Raw Materials Handling
Production Capacity Problems/Auto Glass
Product Development
Personnel Policies/Potential for Union
Sales Practices
Marketing Research Studies
Future of Project Deepsea
Hiring Policies and EEOC
Capacity Problems Specialty Glass & Glass Piping
Safety and Security of Confidential Information
Soda Ash Supply Crisis/Auto Glass
Toxic Waste Citation by EPA and Diversification Potential

Commercial Glass Division Issues
Flat Glass Capacity
Problems with Lighting Products Plant
Supplying Blanks to APD
Customer Considering Vertical Integration
Product Development
Soda Ash Supply Crisis
Price Increase for Lighting Products
New Products
Customer Lawsuit
Diversion of Orders
Personnel Loss
Energy Alternatives
Unionization
Disposal of Toxic Waste

APPENDIX D

Internal Review Board (IRB) Form

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD

Date:	September 27, 1999	IRB #:	BU-99-008
Proposal Title:	"A TEST OF THE MULTI-THEORETIC MODEL OF STRATEGIC DECISION MAKING: LINEAR AND ADAPTIVE VIEWS OF THE AFFECT OF CONTEXT, MANAGERIAL COGNITION, AND PROCESS CHARACTERISTICS ON PROCESS OUTCOMES"		
Principal Investigator(s):	Margaret White Jill Hough		
Reviewed and Processed as:	Continuation and Modification		

Approval Status Recommended by Reviewer(s): Approved

Signature:

Carol Olson

Carol Olson, Director of University Research Compliance

September 27, 1999
Date

Approvals are valid for one calendar year, after which time a request for continuation must be submitted. Any modification to the research project approved by the IRB must be submitted for approval. Approved projects are subject to monitoring by the IRB. Expedited and exempt projects may be reviewed by the full Institutional Review Board.

VITA

Jill Renee Hough

Candidate for the Degree of

Doctor of Philosophy

Thesis: THE CONFLUENCE OF RATIONAL AND LEARNING LENS VIEWS OF STRATEGIC DECISION MAKING

Major Field: Business Administration

Biographical:

Personal Data: Born in Oklahoma City, Oklahoma on February 4, 1962, the daughter of Thomas J. and Betty J. Smith.

Education: Graduated from Northeast High School, Oklahoma City, Oklahoma in May, 1979; received Bachelor of Science degree in Math with a Statistics option from Oklahoma State University, Stillwater, Oklahoma in July, 1982; received Master of Science degree in Industrial Engineering and Management from Oklahoma State University, Stillwater, Oklahoma in July, 1984. Completed the requirements for the Doctor of Philosophy degree with a major in Business Administration at Oklahoma State University in December, 1999.

Experience: Manufacturing Engineer at General Motors in Oklahoma City, Oklahoma from 1984 to 1988; Manager of Computer Operations at the Oklahoma State University Foundation in Stillwater, Oklahoma from 1988 to 1989; Total Quality Coordinator and Software Quality Assurance Manager at Frontier Engineering in Stillwater, Oklahoma from 1989 to 1992; Independent Management Consultant from 1992 to 1999; Graduate Teaching Assistant at Oklahoma State University in Stillwater, Oklahoma from 1996 to 1999; Assistant Professor of Management at the University of Tulsa in Tulsa, Oklahoma from 1999 to present.

Professional Memberships: Academy of Management, Strategic Management Society, Institute for Operations Research and the Management Sciences.