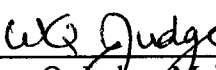


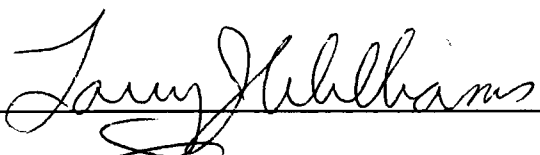
To the Graduate Council:

I am submitting herewith a dissertation written by Johnnie Williams entitled "A Casual Model of the Linkages Between Innovative Ecological Responsiveness and Performance." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Business Administration.

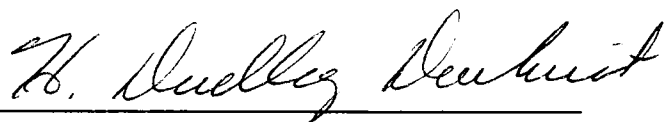


William Q. Judge, Major Professor

We have read this dissertation and
recommend its acceptance:







Accepted for the Council:



Associate Vice Chancellor and
Dean of The Graduate School

**A CAUSAL MODEL OF THE LINKAGES BETWEEN INNOVATIVE
ECOLOGICAL RESPONSIVENESS AND PERFORMANCE**

A Dissertation
Presented for the
Degree of
Doctor of Philosophy
The University of Tennessee, Knoxville

Johnnie Williams
August 1997

DEDICATION

Only those who risk going too far can possibly find out how far one can go

by T.S. Eliot

With love, I dedicate this dissertation to my “inner circle,” especially my grandmother, Ida Sawyer, and the memory of my mother, Ruthie Williams who encouraged and helped me to know that I could go as far as I chose.

ACKNOWLEDGEMENTS

I owe a tremendous debt of gratitude to a large number of individuals who contributed in so many ways to the successful completion of my doctoral studies.

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program needed to pursue a life-long dream. The debt of gratitude I owe for his kind mentorship is immeasurable.

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And as a final note, it would have been impossible for me to undertake and successfully conclude my doctoral studies without the grace of **God**, who answered all my prayers through the involvement and support of all the people mentioned above.

ABSTRACT

The purpose of this study was to examine the question "What are the organizational "antecedents" and "downstream" effects of innovative ecological responsiveness in the electric service industry?" Data were collected primarily from the chief operating, financial, and environmental/regulatory officers from 101 investor owned electric power producers across the United States.

Theory from the organizational innovation literature was integrated with the organizational adaptation literature to identify the relationship between the organizational determinants of innovative adaptive responses, as well as to project the financial implications of these responses. Since innovations are a means of introducing change into organizations in order to facilitate the adaptation process, these two theoretical frameworks were found to be quite complementary.

Statistical results suggest that "culture and context" matter. Managerial ideology was found to be significantly related to innovative ecological responsiveness. Regulatory uncertainty was significantly and positively related to the range of innovative responses implemented by a company. The range of innovative activities implemented by a company had a significant positive effect on financial performance. This finding suggests that firms that adopt a broad range of activities tend to perform better, indicating a possible synergistic effect in this adaptive pattern.

TABLE OF CONTENTS

CHAPTER	PAGE
1. INTRODUCTION	1
Purpose	6
Significance of the study	7
Summary	9
2. LITERATURE REVIEW	10
Open System Theory	10
Business and Society	13
The Concept of Corporate Social Responsibility	14
Ecological Responsiveness	19
Economic Theory	20
Gaps in the Literature	21
Summary	22
3. THEORETICAL BACKGROUND	23
Organizational Adaptation Research	24
Innovation and Organizational Adaptation	31
Innovative Ecological Responsiveness	34
Organizational Centralization and Innovativeness	35
Regulatory Uncertainty and Innovativeness	38
Managerial Ideology and Innovativeness	41
Organizational Slack and Innovativeness	44
Financial Performance	45
Summary	46
4. METHODS	49
The Setting	49
Measuring Innovative Ecological Responsiveness	60
Pilot Testing	61
Survey Administration Procedures	62
Dependent Variables	65
Independent Variables	69
Data Analysis	75
Summary	77
5. RESULTS	78
Factor Analysis	78
Descriptive Statistics	80
Analytic Assessment of the Model	84
Hypothesis Testing	88

	Regression Results	92
	Summary	92
6.	DISCUSSION	96
	Discussion of Findings	97
	Implications of the Findings	105
	Limitations of the Study	108
	Suggestions for Future Research	108
	REFERENCES	110
	APPENDICES	125
	VITA	143

LIST OF TABLES

TABLE	PAGE
2-1 Social Responsiveness Continuum	18
3-1 Summary of Hypotheses.	47
4-1 Distribution of Positions of Survey Respondents.	64
5-1 Rotated Factor Matrix	81
5-2 Descriptive Statistics, Correlations, and Reliabilities of Latent Variables.	82
5-3 Completely Standardized Solution of the Individual Parameter Estimates	85
5-4 Goodness of Fit Statistics.	86
5-5 Standardized Path Estimates.	87
5-6 Results of Regression Analyses.	93
5-7 Summary of Empirical Results	94
6-1 Measure of Dispersion for Centralization Variable	98

LIST OF FIGURES

FIGURE	PAGE
1-1 Emissions by Sector in the U.S., 1990.	5
3-1 Theoretical Model	48
4-1 Theoretical Structural Model	76
5-1 Factor Scree Plot.	79
5-2 A Path Model of Innovative Ecological Responsiveness.	88

CHAPTER 1

INTRODUCTION

While public support for stringent environmental regulations is near an all-time high, there has long been concern about the natural environment. The first great wave of ecological concerns emerged in the late 1960s and early 1970s. The primary focus during this era was on local issues, such as the products of individual pipes and smokestacks. The solutions manifested themselves in numerous "command-and-control" style environmental regulations, including the Clean Air, Clean Water, and Safe Drinking Water Acts, and a host of other federal statutes (Greve & Smith, 1992). The reemergence of ecological concerns has taken on an international dimension. The parochial concerns of the 1960s and 1970s have given way to ubiquitous issues such as acid rain, depletion of the stratospheric ozone layer, and global warming (Comtois, 1992; Schmidheiny, 1992). Moreover, in recent years the core body of statutes has been heavily amended to explicitly address global and regional issues. Today, eight major legislative Acts govern users/producers of toxic and hazardous substances:

- **Clean Air Act (CAA)** -- to prevent degradation of outdoor air quality in the United States (U.S.)
- **Clean Water Act (CWA)** -- to restore and maintain the chemical, physical and biological integrity of the nation's waters
- **Safe Drinking Water Act** -- to ensure that public drinking water systems, including surface water and groundwater, meet minimum standards for protection of public health
- **Resource Conservation and Recovery Act (RCRA)** -- to protect public health and the environment from risks posed by improperly disposed hazardous waste

- **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** -- the "Superfund" Law designed to clean up releases of hazardous substances, regardless of when the release occurred
- **Emergency Planning and Community Right-to-know Act** -- Title III of the Superfund Amendment and Reauthorization Act of 1986, which is a free-standing statute that guards against and responds to chemical accidents
- **Toxic Substances Control Act (TSCA)** -- to address concerns that certain chemical or chemical mixtures may present an unreasonable risk to human health and the environment, no matter how carefully they are managed
- **Occupational Safety and Health Act (OSHA)** -- to protect the health of workers who are often exposed to high concentrations of dangerous chemicals in the workplace

These laws regulate nearly every phase in the life-cycle of commonly used industrial products. Taken together, these laws and regulations converge to control four basic types of ecological liabilities, namely (1) soil contamination, (2) groundwater contamination, (3) surface water contamination and (4) air emissions.

The overall known economic impact of these regulations is currently estimated to be 2% - 5% of the Gross National Product (GNP) (Chadwick, Rouse, & Surma, 1993). And though compliance costs constitute an estimated 1% - 2% of total costs in most industries, they are believed to be much higher in some pollution - intensive industries (Henry, 1993; Stevens, 1993). In fact, studies claim that because these costs are localized in particular industrial sectors, they are, in part, responsible for the exodus of basic industries from the developed to the developing world. The Arthur Anderson Company estimated that the incremental cost of complying with 6 federal agencies' environmental programs for 48 large companies was \$2.6 billion in 1992 (Trevino, 1993). In the same year, DuPont spent more than \$10 million in remediation settlements as a potentially

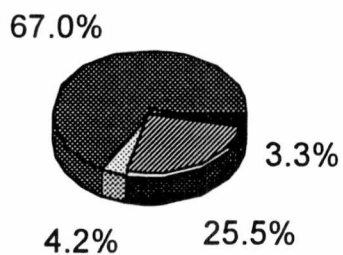
responsible party in more than 100 Superfund sites and is expected to pay Superfund taxes totaling some \$35 million annually (Baker, 1993).

The financial imposition and long - term effects of these ecological costs were beginning to prompt more and more companies to disclose their ecological costs and liabilities to their shareholders. Recognizing this trend, in 1989 the Securities and Exchange Commission (SEC) released a rule stipulating the obligations of companies to reveal their enviro - liabilities known as the Management Discussion and Analysis rule. This rule requires a company's annual report to include estimates of all current, as well as future costs associated with ecological compliance. Recently, the SEC clamped down further on enviro - liabilities by entering into an information exchange with the Environmental Protection Agency (EPA). The collaboration between these two agencies means that companies may now be subject to civil, judicial, and administrative fines for environmental infractions (Pitre, 1993). These changes in regulatory costs and consequences have motivated an increasing number of firms to manage the natural environment as an integral part of their core business operations (Haines, 1993).

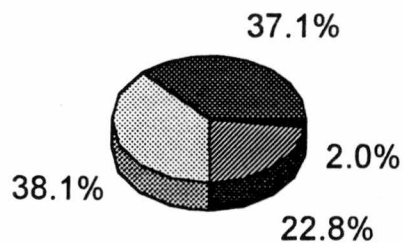
This heightened ecological pressure has focused more attention on the electric service industry (Fenn, 1992; Hanser, Sioshansi, & Bosch, 1992). In particular, this industry has been targeted by a number of environmental groups, especially in the area of air emissions. The focus of the concerns has emanated from the fact that electric power producers are a major source of the heat-trapping gases believed to be responsible for global warming. Studies indicate that power producers account for about 36% of the

man-made CO₂ emissions in the United States. Globally, this proportion of CO₂ is estimated to be equal to approximately 7.5% of the total man - made emissions. Electric power producers have not only been on the front lines of government actions to mitigate CO₂, they have come under fire for a host of other air emissions. Electric power producers are a principal source of at least three other gases associated with either acid rain or climate change, namely methane (CH₄), nitrous oxide (NO_x), and sulfur dioxide (SO₂). While some experts argue that the industry's emissions are too small for any realistic set of actions, taken in isolation by the industry, to have much ecological impact, they have been, however, too large to escape U.S. or international regulatory responses (Fenn, 1992). Fenn cited three reasons for why electric power producers have experienced more concentrated regulatory attention. First, he stated that the industry is the largest source of man-made CO₂ emissions, and these emissions are from large stationary sources that are easily monitored. Second, many of the industry's air emissions are already regulated, making additional emissions easier to regulate than those from other industries. Finally, as a "public service" industry, he concluded, power producers continue to make an attractive regulatory target (see Figure 1-1).

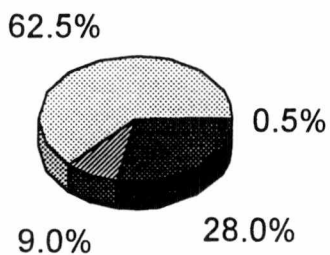
Regulatory pressures on the electric service industry are not singularly focused on air emissions. Additional pressure is placed on the industry to comply with standards for groundwater, surface water, high- and low-level nuclear waste disposal, as well as electromagnetic fields (EMFs). Until recently, nearly all environmental regulations could be characterized as "command and control."



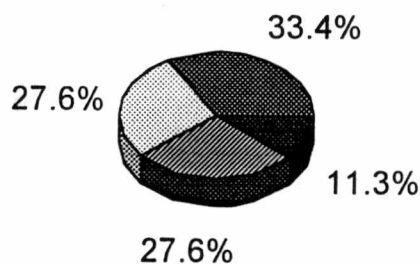
Sulfur Oxides



Nitrogen Oxides



Carbon Monoxide



Carbon Dioxide

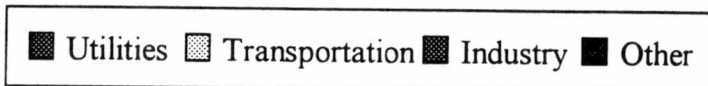


FIGURE 1-1
Emissions by Sector in the U.S., 1990

Source: Consumer Energy Council of America Research
Foundation Environmental Externalities Project, Incorporating
Environmental Externalities into Utility Planning, 1993

Command and control regulations essentially operate by setting standards, and businesses are expected to comply. If they do not comply, they face stiff penalties. These standards (and, in theory, solutions) force power producers to internalize ecological costs which have a significant impact on electricity rates, new electric capacity, technology costs, capital stock turnover, and generation dispatching (Freeman, Burtaw, Harrington, & Krupnick, 1992; Wood & Naill, 1992; National Association of Regulatory Utility Commissioners (NARUC), 1993). Several states have adopted a policy for adjusting the cost of new generation capacity by imposing externality "adders" for various ecological insults. Additionally, a market-based allowance trading program for decreasing SO₂ has been created by Title IV of the 1990 Clean Air Act Amendments (CAAA). As EPA progresses in its trek of rulemaking pursuant to electric power producers' ecological impacts, market-based programs such as allowance trading may be used for other pollutants. All in all, existing regulatory policies, as well as future ones, are expected to have a profound impact on the way electric power producers do business (Hobbs, 1992; NARUC, 1993; Consumer Energy Council of America Research Foundation (CECA/RF); Albanese, 1994).

Purpose

Given the dynamic regulatory climate of the electric service industry, it appears to be worthy of academic inquiry. The purpose of this dissertation research was to examine the strategic and economic implications of electric power producers' ecological responsiveness. As a first step, this study identified the non-technology responses available to these companies. Next, it examined the organizational antecedents that affect

the intensity and breadth of these responses. And finally, this study assessed whether the intensity or the breadth of a company's responsiveness had financial implications. The core research question of this research was: What are the "antecedents" and "downstream" effects of ecological responsiveness in the electric service industry?

This research integrated the structural adaptation literature with the organizational innovation literature to propose that electric power producers' responses to ecological pressures are, in fact, innovations to the adopting utility. It further combined the two sets of literature to probe the antecedents of these innovative responses, and the subsequent impact of these innovative responses on financial performance. The structural adaptation literature provided insights about the patterns and processes that organizations employ to respond to social pressures. The innovation literature, on the other hand, provided a framework to specify the organizational antecedents, or determinants that condition an organization's responsiveness. However, the performance implications of an organization's responses is notably absent in both sets of literature. This study extends the extant innovation and adaptation literature to examine the performance implications of electric power producers' ecological responses.

Significance of the Study

Conventional wisdom suggests that tail - end investments to address environmental liabilities are almost unavoidably a burden on the bottom line. According to this perspective, preventing such pollution from happening in the first place is almost always the most cost - effective alternative (Rowe, 1993; Strong, 1993). In fact, It has been said that electric, as well as other companies, can look to their product lines, manufacturing

processes, customer service and marketing strategies to recover costs associated with preemptive changes. They cannot, however, recover investments to clean up pollution after it has occurred since this practice generally increases costs without any apparent value accruing to customers. As such, there would appear to be some ecological responses that would be more apt than others to reconcile positively ecological costs with the bottom line. Insights about these responses and their strategic implications would be valuable competitive tools. This study seeks empirically to investigate this perspective by exploring the following questions: do certain organizational characteristics have a greater potential for shaping ecological responses? do power producers who implement more ecological activities fare better? or is financial success a result of synergistic responses?

In today's electric service industry, costs are being driven up by environmental regulations, while companies in the industry are simultaneously being challenged as retail open access becomes a reality to remain competitive. Consequently, it is increasingly more important for power producers to understand their organizational characteristics, how these characteristics influence environmental responsiveness, and the financial implications of these two elements interacting. It was hoped that this study would provide some insights about determinants and outcomes of ecological responsiveness. It was further hoped that these insights would be valuable to firms in both regulated and non-regulated industries. By understanding the relationship between the organization's characteristics, ecological responsiveness and financial performance, it was hoped that firms might better integrate their ecological and economic objectives.

This dissertation research also had implications for academicians. It represented an empirical extension of the conceptual research in both the organizational innovation and structural adaptation literature. It is believed that the findings of this study shed light on the organizational value of high versus low innovation intensity, and broad versus narrow breadth of innovations. In addition to this objective, it is further believed that this study extends both the innovation and adaptation literature to provide further insights about the relationship between innovative adaptive processes and performance.

Summary

The electric service industry is facing increasing public scrutiny for its contribution to the degradation of the natural environment. Consequently, new and more comprehensive laws and regulations have been promulgated to curtail the amount of ecological degradation caused by power production. The impact of these changes on the electric service industry will require innovative strategies in order to secure a competitive advantage. Additional research in strategic management will be needed to understand the impact and implications of this new, more potent "green" movement. This research examined several of the organizational antecedents that influence the intensity and breadth of electric power producers' ecological responses. Also, this study examined the financial impact of these companies' responsiveness.

This research provided valuable insights for both organizational theorists and practitioners about effective competition in an ecologically challenging context. It was hoped that this research would help extend and integrate the organization innovation and structural adaptation literature.

CHAPTER 2

LITERATURE REVIEW

This chapter examines the evolution of open system theory to demonstrate how it is inextricably linked to the Business and Society literature. Following this examination, corporate social responsibility (CSR) and corporate social performance (CSP) are discussed and contrasted. The comparison/contrast of CSR and CSP provide some insights a how and why the Business and Society literature has failed to provide academicians and practitioners with an acceptable means for balancing social responsibility with financial performance. Economic theory of public goods and externalities were examined briefly to demonstrate the theoretical gaps in using this theoretical framework to guide socially responsible actions.

Open System Theory

The theoretical basis for the Business and Society literature is found in open systems theory. Open system theory asserts that organizations must carry out transactions with their task environment in order to survive and grow. Open systems theory, often referred to as the systems approach, has dominated organization theory since the late 1960's. Robert Katz and Daniel Kahn first articulated the concept of organizations as "open systems" in their book entitled, The Social Psychology of Organizations. Katz and Kahn's concept of open systems has influenced the thinking of many organizational theorists. Classical organization theorists saw organizations as rational but "closed systems," which sought only the goal of economic efficiency. Since the system was viewed as closed and not subject to influence from the external task environment, major

attention is typically focused on such functions as planning and/or controlling (Shafritz & Ott, 1987). Katz and Kahn posited that the traditional closed system view of organizations led to a failure to fully appreciate the interdependencies and interactions between organizations and their task environments. The systems school views an organization as:

a complex set of dynamically intertwined and interconnected elements, including its inputs, processes, outputs, feedback loops, and the environment in which it operates. A change in any element of the system inevitably causes changes in its other elements. The interconnections tend to be complex, dynamic, and often unknown. Thus when management makes decisions involving one organizational element, unanticipated impacts usually occur throughout the organizational system (Katz & Kahn, 1966:132).

In this context, the organization is viewed as an adaptive system which must adapt to changes in its task environment in order to survive (Scott, 1971; Miles & Snow, 1984; Lawrence & Lorsch, 1969; Thompson, 1967).

Open systems theory holds that effective organizations carve out and maintain a healthy alignment with their task environments. Ineffective organizations fail at this alignment. Organizations must constantly modify and refine the mechanism by which they achieve this alignment -- rearranging their structure of roles and relationships and their decision making and control processes (Lawrence & Lorsch, 1969; Miles & Snow, 1978).

The conceptual foundation of this view is built upon empirical research dating back to the early sixties. Tom Burns and G.M. Stalker (1961) found that organizations successfully pursuing innovation strategies used flexible, more open structures and management processes to appropriately fit elements of such a strategy. Their research was followed by Joan Woodward's (1965) work in which she asserted that manufacturing technology was a prime determinant of organizational form. During the same period, Alfred Chandler (1962) in his landmark book, Strategy and Structure: Chapters in the History of the American Industrial Enterprise, found that innovative growth strategies

resulted in new organizational structures to fit the new strategies. This organization/task environment interface was further confirmed by Jay Lorsch (Lawrence and Lorsch, 1967, 1969; Lorsch & Allen, 1973; Lorsch & Morse 1974) in a series of works. He not only examined structure, task, people and administrative practices, but also the congruence between these dimensions and the degree to which congruence was related to organizational performance. These early research efforts, coupled with more recent efforts by Child (1977), Armour and Teece (1978) and Teece (1981) have helped to affirm the transactional relationship between organizations and their task environment.

According to this volume of research, there are certain contingencies which affect the organization's interaction with its task environment. These contingencies encompassed a diversity of variables, including organization (structure); rate of environmental change (strategy); technology; contextual variables (size, ownership, location, and technology); bureaucratic dimensions of structure (formalization, centralization, specialization, and standardization); as well as economic performance (Pugh, Hickson, Hinings, MacDonald, Turner, & Lupton, 1963, 1968, 1969; Child, 1974 1975).

In contrast to the contingency view of the organization, Talcott Parsons (1960) advanced another view. He conceptualized the organization as an open, yet social system, that is, as a complex whole with a tendency toward self-regulation or equilibrium. He held that organizations operate at or exhibit three levels of responsibility and control. A technical level focuses on the effective performance of the technical functions of the organization. The managerial level mediates between the technical subsystem and the larger environment for the procurement of resources and dispersement of outputs. Further, he maintained that the technical system is controlled by a managerial subsystem, and the managerial organization is concomitantly controlled by a third level of the system,

the institutional or societal structure. Although the third level may be relatively independent of formal controls, the organization is never wholly independent of this third level.

At the technical level the goal is likely to be to remove as much uncertainty as possible. While uncertainty is likely to be greatest at the institutional level where the organization deals largely with elements of the task environment such as generalized norms, public authority or public interest groups. It is the managerial subsystem which mediates between the two levels. Thompson (1967) extended Parson's (1960) work in systems theory to integrate the work of Simon (1957), March and Simon (1958), and Cyert and March (1963) who viewed the organization as a problem-facing and problem-solving phenomenon subject to varying degrees of rational choice and decision making criteria.

Business and Society

Corporate Social Responsibility. It was both the contingency and the social system views of the organization which provided the basis for the still developing body of literature called "Business and Society." Contingency theory established relevance for the various factors that influence the tasks to be performed by the firm. Parson's social system, on the other hand, established the relevance for an environment characterized by varying degrees of uncertainty due to social as well as market forces. The social movements of the sixties and seventies in civil rights, anti-war, consumerism, natural environmentalism, and women's rights served as a catalyst for merging these two streams of thought into this new body of literature. In the School of Management at Berkeley, a number of scholars addressed a broad range of issues. Votaw (1966) studied corporate power in Europe, and concluded that (1) power is a resource of society which can be used to solve some of society's problems, (2) power is essentially a relationship -- reciprocal in nature -- based, in large measure, on interpersonal expectations and attitudes, and (3)

power is not static in quantity but is constantly being produced and destroyed. Epstein (1969) conducted a classic study of business and the political arena in the U.S. in which he concluded that although the political power of business firms is very real, it does not constitute a danger to the American pluralistic democracy. Finally, Sethi (1970) analyzed the role of minorities in the firm by studying the Kodak-FIGHT confrontation. The distinguishing feature of this stream of research was that it represented the development of a pragmatic role for corporations in society. For the first time, academics and practitioners, alike, were coming to the realization that the corporation's goals and society's goals must be brought into harmony. Corporations were compelled to set social goals just as they set business goals. Implicit in this perspective were two concepts. First was the concept of social responsibility which contended that the businessman's decisions and actions must be taken for reasons at least partially beyond the firm's economic or technical interest (Davis, 1960). The second concept was that of "stakeholders," different publics or constituencies relevant to the organization to the extent that they are affected by or in a position to affect the achievement of an organization's objectives (Freeman and Reed, 1983; Preston & Post, 1975). This second concept advanced the view that managers of firms must make decisions which maintain an equilibrium among their relevant constituents or stakeholders.

The Concept of Corporate Social Responsibility

Organizational responses to social demands have generally been studied in the research subfield of the Business and Society literature focused on corporate social responsibility (CSR). Though volumes of literature have been devoted to defining and developing the concept of corporate social responsibility (Steiner, 1975; Carroll, 1979; Sethi, 1979; Aupperle, Carroll, and Hatfield, 1985; Wartick & Cochran, 1985; Hoesvar & Bhambri, 1989; Wood, 1990, 1991), there is still a lack of agreement on relevant terms and unifying paradigms. Since Howard Bowen's (1953) development of the contemporary

usage of the term, the term "social responsibility" and the discussions which accompany it have become strongly associated with the notions of intent, good will, sacrifice and voluntary initiative (Ackerman & Bauer, 1976). Moreover, the connotation of "responsibility" is someone assumes an obligation. It places emphasis on motivation rather than on performance (Ackerman & Bauer, 1976). As such, CSR could be defined as ethics and enforced by social control. Generally speaking, to be socially responsible meant bringing corporate behavior up to a level where it was congruent with prevailing social norms, values and expectations of society. The notion of the corporation, however, responding as an ethical entity was very troublesome for many theorists.

The most noted of the dissenters was economist Milton Friedman (1962), who asserted that the only social responsibility of business is to use its resources and engage in activities designed to increase its profits so long as the company stays within the rules of the game. He believed, along with others (Levitt, 1958, Hayek, 1960; Hacker, 1963) that capitalism separates moral concerns from economic ones. Social benefits such as employment, a higher standard of living, and individual self-esteem he believed derived from the health of the economy. Peter Drucker (1981) concurred to some extent with this perspective. He argued that only persons -- not organizations -- can be ethical actors. Drucker also argued that society must expect managers, executives, and professionals to practice behavior appropriate to the sort of person the would want to see in the mirror in the morning. The burden for right behavior rests squarely on individuals, not on their organizations. Karen Paul (1981) further corroborated this view. She insisted that value is a social concept, and is therefore subject to group definition and sanctions. While ethics is essentially a matter of personal courage and conviction. Gerald Kiem (1978) suggested that social responsibility was good business practice because failure to deal with social concerns in a timely manner often results in social criticism and heavy-handed governmental regulation which interfered with corporate operations.

According to Ackerman and Bauer (1976), the concept of corporate social responsibility offered little guidance as to the content of what corporations need to do. The Committee for Economic Development (CED) in 1971 also listed a broad range of social activities. Steiner (1975) categorized a range of activities on a continuum from the economic, to the legal, to the legal and finally the voluntary area. Extending his classification, he assigned responsibility for these social demand areas as either internal or external. Internal social responsibilities were concerned with assuring due process, equality and justice within the workplace. External responsibilities referred to a range of social and community activities. Rich Strand (1983) stated that dissatisfaction and the expectations of constituent groups form the social demands placed on organization in the form of legal, economic and social pressures. Additionally, he stated that the formation of organizational social responsibilities is the filtering of the legal, economic and social pressures through the environmental texture of the organization.

Corporate Social Performance. To replace the language of corporate social responsibility with more useful terminology, new models and frameworks of the CSR concept have been developed. Theorists are increasingly more concerned with the task of putting the firm's social concerns into practice. This emphasis, which has been referred to as "corporate social performance (CSP)," and suggests that the focus is no longer on social obligations, but on the adaptation of corporate behavior (Wood, 1991).

The CSP framework does not attempt to replace the CSR framework. Instead, it complements it. Donna Wood (1990: 110) define CSP as the exercise of the principles of social responsibility, the process of social responsiveness, and the policies developed to address social issues. In essence, CSP add an action dimension to the CSR concept. The CSP concept provides the much needed guidance about what and how corporations need to behave. With this conceptualization of the CSR framework, firms could now develop structures for managing social responses to their task environment; for example, an

environmental compliance department charged with managing governmental issues. The CSP framework provided companies with a means to focus on their long-term survival and health by optimizing relationships with their environment and society, as opposed to the traditional business emphasis on maximizing profits (Strand, 1983). Consistent with the principle of legitimacy and the principle of public responsibility, this externally focused component of the company's social obligations provided a guide for managerial action and discretion.

Many social issues arise, become controversial, and disappear. Responsibility is rooted in the company's relationship to others in society. Responsibilities, however, do not disappear as fast as social issues (Wood, 1990). Corporate social responsibility only offers a philosophical framework for justifying social action. Corporate social performance goes beyond this to offer an action framework for implementing action.

The development of the CSP literature provided a firms with a systematic way for responding to challenges, opportunities, claims, and task environmental changes such as the natural environment, literacy, crime, and so on. In fact, the concept of CSP even provided a means for characterizing a company's level of responsiveness (see Table 2-1).

Some CSP proponents argued that business created many of the problems, and that is business must solve them. Davis and Blomstrom (1975) expressed this perspective as the "Iron Law of Responsibility." Other more moderate theorists acknowledged that profit is indeed the bedrock of corporate survival, that no firm should drive itself out of business to solve social problems, but that firms need to identify ways to be profitable and socially responsible at the same time. Therein, lies the weakness in the Business and Society literature.

Proponents of CSP argue that social responsibility and profitability are not polar opposites. They say that companies can make a profit without engaging in deceptive advertising, using unsafe labor practices, or polluting the environment. Unfortunately,

TABLE 2-1
Social Responsiveness Continuum

Author	Characterization			
Post	Adaptive	Proactive		Interactive
Votaw & Sethi	Legalistic	Public relations		Bargaining
Carroll	Reactive	Defensive	Accommodative	Proactive
McAdam	Fight all the way	Do only what is required	Be progressive	Lead the industry
Davis & Blomstrom	Withdrawal	Public relations approach	Legal approach	Bargaining
	Reactive	← → Strategic		

little or no empirical CSP studies have been conducted to better understand the interaction between corporate social responsibility and profits.

Ecological Responsiveness

“Green theory” represents a special case of the Business and Society literature. This theory has moved to the forefront in the past decade. In fact, the 1990’s are said to be the decade of the natural environment (Shrivastava, 1994). And in its simplest form, green theory focuses on ecologically sustainable organizations. According to this stream of research, organizations in the past have determined that ecological responsibility is too costly – the marginal costs of environmental protection outweigh the benefits. Consequently, these costs have traditionally been externalized to governments (Jennings & Zandbergen, 1995; Shrivastava, 1994).

Theorists, and society-at-large agree that organizations cannot continue to ignore the ecological impacts of economic decisions. And while few would disagree that economic considerations are important, operating in the current paradigm of the organizational environment has been said to be too narrow in scope and has led to some ecologically catastrophic decisions. According to Jennings and Zandbergen (1995: 1015), organizations operate in an economic system that is inextricably intertwined with and dependent on the ecological system with all actions having deeper, ecological consequences. Daly and Cobb (1994) reinforced this position when they asserted that ecosystems support economies, not vice versa.

Economic activities threaten to alter the global climate, air and water quality, as well as destroy biodiversity as we know it today. Theory development toward ecologically sustainable corporation is virtually in its infancy. Hart (1995) has set forth what he terms “a natural resource-based view of the firm,” in which there are three interconnected strategies. According to Hart (1995) these strategies should address pollution prevention, product stewardship, and sustainable development. He advanced

propositions for each of these strategies. Shrivasta, 1991 outlined a similar blueprint for what he termed “green” organizations.

Conceptually, these two researchers have moved to the forefront in providing directions for firms in transcending the parochial view of the organization’s “environment.” Unfortunately, much research is still needed to help firms in altering their behavior in such a way as to align the “green” systems with the organization’s strategic aim. Both Hart (1995) and Shrivastava (1991) stress that this transformation can only occur by examining organizational inputs, throughputs, and output, along with the organizational culture.

Economic Theory

Theory of Public Goods. The theory of public goods predates much of the social responsibility discussion. This theory states that “public goods are resources or commodities from which potential users cannot be excluded (Dorfman & Dorfman, 1972).” And since access to public goods can not be controlled, then the question becomes how much of the goods to provide and at what price. According to the theory of public goods, the appropriate level at which to provide a “public good” is the interception between the sum of the beneficiaries’ willingness-to-pay curves and the marginal cost curve. In other words, access to public goods, such as clean air, flood protection, or a lighthouse should be provided to the extent that potential beneficiaries willingness to pay for the good meets or covers the marginal cost of providing the good.

This theory attempts to address the issue of balancing social responsibility with financial performance. Unfortunately, its applicability has been limited. Many of the assumptions underlying this theory make it difficult, at best, for managers to gainfully employ it as a decision making tool.

Theory of Externalities. The basic notion underlying externality theory is that since each user imposes a cost (in terms of inconvenience or reduced productivity of

shared resources), use should be limited to the point where the utility or benefit to an additional user just counterbalances the total cost that he imposes on all the others (Dorfman & Dorfman, 1972: xviii). Imposing externality costs, therefore, means finding the level of inconvenience created by other user and setting a realistic cost in order to discourage excessive use or abuse of a particular resource. In fact, several states have implemented an externality cost for certain activities that cause ecological degradation. A number of opponents claim that the information needed to equitably distribute the cost can not be known, consequently use of externality charges have been criticized as being inequitable.

Externality theory, like the theory of public goods, acknowledges that we must continue to use these public goods, as well as use them in common. Externality theory departs, however, in that it attempts to assign a cost and discourage use of the resources. Controlling the use of these resources means finding the proper balance between the utility of these products and its disutility. Externality theory has done little to engender socially responsible behavior. For the most part, it only serves to discourage the use of a certain resource up to the point that the company can continue to pay for it.

Gaps in the Literature

Both the business and society and economic theory literature have failed to close the gap between socially responsible behavior and financially motivated performance. Consequently, companies have had limited success in reconciling stakeholders concerns such as the natural environment with financial performance objectives. A number of theorists continue to argue that the business of business is business, while social theorists argue the necessity of stakeholders' satisfaction. The reality in organizations is far from resolving this debate, and there is a dearth of empirical work to guide managers' decisions.

Because this debate continues, the current study was undertaken to better understand ways for balancing social responsibility, particularly in the ecological area with financial performance.

Summary

This chapter examined the evolution of open systems theory to better understand its theoretical linkage to the Business and Society literature. This examination was followed by a discussion of the Business and Society literature and two areas of economic theory, public goods and externalities, to identify deficiencies in the current paradigms that attempt to balance social concerns with financial concerns. It was found that both the Business and Society literature and economic theory are inadequate in guiding social behavior in organizations due to (1) problems with the adequacy of information and research, (2) equity issues, as well as (3) problems of valuation.

CHAPTER 3

THEORETICAL BACKGROUND

The organizational adaptation literature emphasizes the responses taken by the firm to adapt to its task environment. According to Thompson (1967) this task environment represents those external actors or conditions relevant or potentially relevant to goal attainment. These adaptive responses to the task environment are generally characterized as long-term and incremental rather than radical and revolutionary (Tushman & Romanelli, 1985). Studies of this adaptive process have provided significant insights about how organizations might effectively balance task environmental pressures with internal capabilities. Adaptation research has found that factors such as industry, economics, social characteristics, financial resources, strategic choices, regulations, and organizational interests motivate organizations to respond in similar and predictable patterns to task environmental pressures (Aldrich, 1979; Aldrich & Pfeffer, 1976; Child, 1972; Covaleski & Dirsmith, 1988; DiMaggio & Powell, 1983; Hannan & Freeman, 1977; Meyer & Rowan, 1977; Meyer & Scott, 1983). Often the adaptation process compels firms to adjust such activities as their scale of operations or organizational structure in order to conform to the dictates of their task environment (Jenning and Seaman, 1994). Depending on the task environment, adaptational changes can differ greatly in breadth and cost, and can affect an organization's control systems, structure, resources, strategy, and core value and beliefs (Koberg, 1987; Tushman & Romanelli, 1985). A failure to engineer these internal adjustments is predicted to result invariably in inferior organizational performance (Chakravarthy, 1982; Jennings & Seaman, 1994). Damanpour (1987: 676), a leading

researcher in the innovation field, stated that innovations are a means of introducing changes into the outputs, structure, or processes of an organization in order to facilitate the adaptation process. He further stated that innovations are organizational changes that facilitate the adaptive process with the intention of either maintaining or enhancing performance. Given the integral role of organizational innovation in the adaptive process, this chapter examines the theoretical underpinnings of both the adaptation and organizational innovation literature to better understand the adaptive processes that electric power producers might adopt in response to ecological pressures. This chapter also examines the proposed relationship between organizational adaptation and financial performance. Using this theoretical framework, this chapter concludes by setting forth a number of hypotheses about the relationship between the organizational determinants of certain adaptive patterns and the economic outcome of these adaptive patterns.

Organizational Adaptation Research

A central question in the adaptation literature is whether or not the organization's responses are managerially or environmentally derived (Astley and Van de Ven, 1984). In other words, is adaptation a process reflecting strategic choice, or is it deterministic -- a necessary reaction to peremptory environmental forces (Aldrich, 1979; Astley and Van de Ven, 1983; Campbell, 1969; Child, 1972; Hannan & Freeman, 1977; Hrebiniak & Joyce, 1985; Lawless & Finch, 1979; Marlin, Lamont, & Hoffman, 1994; Tushman & Romanelli, 1985; Wholey & Brittain, 1986)? One perspective on adaptation argues that organizations that effectively adapt to their task environments do so by a process of "natural selection." A process that emphasizes external control of the organization, and presupposes a

selection mechanism which is indifferent to managerial and organizational decision-making. Because of management's limited span of control, this perspective of the adaptive process is often referred to as the minimum choice view or environmental determinism.

Aldrich (1979) stated that an organization's task environment varies along six dimensions: (1) capacity, (2) homogeneity, (3) stability, (4) concentration, (5) domain consensus, and (6) turbulence. Beard and Dess (1984), using factor analysis, later collapsed these dimensions into a more parsimonious set of three variables, namely (1) munificence, (2) dynamism, and (3) complexity. Nonetheless, these researchers agreed that to the extent that these variables are externally controlled, management's ability to adapt is constrained. Aldrich believed that resource variation in the task environment is a critical factor in the adaptive process. He observed that environments affect organizations through the process of making available or withholding resources (1979: 61). In those organizational species where there is a lack of resources, power vis-à-vis the task environment is low. Thus, he believed that only limited choices are possible since this type of situation increased overall organizational species' risk (Keats & Hitt, 1988; Hrebiniak & Joyce, 1985). Although Aldrich and certain other theorists (Boeker, 1989; Hannan and Freeman, 1984; Kelly and Amburgey, 1991; Pfeffer and Salancik, 1978; Quinn, 1980) suggest that elements in the task environment constrain the organization's ability to adapt, other theorists have argued a distinctively different perspective on organizational adaptation.

This distinctively different perspective argues that adaptation occurs through a managerially determined process within a tractable task environment (Child, 1972; Weiner & Mahoney, 1981). Child (1972) raised three arguments to counter the claim that environmental influence is the primary constraint on organizations. First, he noted that organizational decision makers can choose appropriate strategies from a range of viable alternatives and they can choose the environment in which they prefer to operate. The second point that he asserted was that organizations, through their transactions, are simultaneously affected by and affecting their task environments. His third point argued that the minimum choice view fails to distinguish between the characteristics of the task environment and the perception of these characteristics by persons within the organization. As a parallel to this third argument, James March (1981) developed what he termed, the "created environment." He explained that the "created environment" represents the intersection of the individual, the organization, and the task environment.

The reasoning inherent in Child's arguments form the basis for the adaptive process perspective that has become known as the strategic choice perspective or maximum choice view (Andrews, 1971; Bower, 1970; Chaffee, 1985; Child, 1972; Gupta and Govindarajan, 1984; Hambrick & Mason, 1984; March, 1981; Miles, 1982; Miller, Kets de Vries & Toulouse, 1982; Schendel & Hofer, 1979). The strategic choice perspective argues that organizational decision makers are the primary link between the organization and its task environment, and that these decision makers manipulate the task environment or organization itself in order to bring the two into alignment. In contrast to the deterministic view of the organization, the strategic choice perspective emphasizes the

ability of organizations to interpret and select their task environments (Goodstein, 1994; Hitt and Tyler, 1991). A considerable body of research supports the position that managers are important determinants of organizational change and outcomes. They are the boundary between an organization and its task environment. Managers are said to mediate between external demands and internal organizational dynamics (Barnard, 1938; Keck & Tushman, 1993; Miles, 1987; Pfeffer & Salancik, 1977; Pfeffer, 1981; Post, 1978; Selznick, 1957; Thompson, 1967).

Implicit in the debate about strategic choice and determinism is the belief that the two perspectives represent mutually exclusive endpoints along a single continuum (Astley & Van de Ven, 1983). Hrebiniak and Joyce (1985), however, asserted that this view is misleading and diverts research inquiry away from the critical interactive nature of the relationship between the organization and its task environment. These researchers demonstrated that strategic choice and determinism are orthogonal in that the two are independent variables that can be positioned on two separate continua. They postulated that the interaction of these variables result in four main types of adaptation: (1) natural selection with minimum choice, (2) differentiation with high choice and high environmental determinism and adaptation within constraints, (3) strategic choice with maximum choice and adaptation by design, and (4) undifferentiated choice with incremental choice and adaptation by chance. They further contended that the orthogonality of the two variables follows logically from the open systems theory of organizations (Miller, 1965; von Bertalanffy, 1968) which states that systems tend toward

a state of dynamic equilibrium with their task environments through the continuous exchange of internal and external resources.

Lawless and Finch (1989) later challenged Hrebiniak and Joyce's theory. Focusing on several industry characteristics, they first classified firms in one of the four Hrebiniak and Joyce's choice situations. Contrary to expectations, 74 percent of the firms were found to operate in incremental choice situations, situations which Hrebiniak and Joyce (1985: 341) described as being a relatively unstable context for decision making, action, and the exercise of power. They then classified firms in each cluster into one of five strategy categories: low cost, three types of differentiation, and muddling. Differentiation strategies proved to be the most prevalent in each of the four choice situations. Further, Lawless and Finch found that the performance difference between strategies in each of the four choice situations were not consistent with Hrebiniak and Joyce's theory. The Lawless and Finch (1989) study seemed to negate the orthogonality of determinism and choice in organizational adaptation.

It was not until 1994 when Marlin, Lamont, and Hoffman questioned the methodological integrity of the Lawless and Finch study (1989). Marlin et al. showed that industry characteristics alone do not represent the appropriate operationalization of choice situations. Since choice situations include both organizational and task environmental factors, they argued that it should stand to reason that both dimensions need to be included in such a measure. Further, these researchers asserted that Lawless and Finch's

use of industry - level data to identify choice situations assumed that all firms in an industry possess the same level of choice and determinism, which would seem to run counter to the evidence of strategic groups.

In addition to problems with the Lawless and Finch (1989) study, Marlin et al. (1994) found that there were statistical differences found in the strategy types. Using a sample of 147 hospitals, Marlin et al. , using principal component analysis, classified each hospital into one of four choice situations and three strategy types. They then examined the relationships between choice situation, strategy and performance suggested by Hrebiniak and Joyce (1985). They found unqualified support for two of their six hypotheses. And stated that based on the evidence of their study and the methodological flaws of the Lawless and Finch (1989) study, it would be difficult to refute the findings of Hrebiniak and Joyce's contribution to adaptation theory.

Resource dependency theorists, perhaps, more than other organizational theorists, have continued to affirm Hrebiniak and Joyce's idea that managers make strategic choices within constraints. Resource dependence theory maintains that (1) organizations are constrained by their dependency on other organizations and (2) managers do exercise some discretion over how to control the uncertainties created by their dependency (Oliver, 1991; Pfeffer & Salancik, 1978). Consistent with the idea that firms can adapt within constraints, several other researchers have explored how organizations exercise strategic choice within the limits imposed by their task environments (Goodstein, 1994; Greening & Gray, 1994; Koberg, 1987; Milliken, Dutton, & Beyer, 1990; Oliver, 1991; Powell,

1991; Ungson, James, & Spicer, 1985). The focus of these investigations generally has been on actions taken by organizations in response to customers, suppliers, competitors, regulations and institutional pressures.

An example of such a study was conducted by Ungson, James and Spicer (1985). Their study examined the effects of regulatory agencies on organizations in the wood products and electronics industries. They concluded that a more comprehensive model to assess regulatory pressures is needed. Their findings proved that firm size and age are systematically related to the differences that regulatory agencies have on the planning and goal - setting activities of organizations. However, they suggested that organizational variables other than size and age might moderate the effects of regulatory agencies on the firm. They also suggested that these other variables included executive leadership, values of the dominant coalition, ideological and strategic variables, and historical and cultural factors (Meyer, 1982; Miles, 1982; Sonnenfeld, 1981).

The present study draws on the collective findings of the organizational adaptation research to include both internal and task environmental factors as determinants of the a possible adaptive processes. Specifically, this study focuses on perceived organizational centralization (referred to hence forth simply as centralization), managerial perception of regulatory uncertainty, managerial ideology, and organizational slack as antecedents or determinants of a firm's adaptive process. This study extends the current body of research to capture a complex system of interacting variables and their combined impact by framing this adaptive process as one of organizational innovation and change.

The innovation literature closely aligns with the adaptation literature in identifying internal and external components of an organization critical to its effectiveness and capacity to compete. A number of authors have examined the adoption of innovations in organizations and concluded that, like organizational adaptation, this process is influenced by a number of different factors, including the individual, organizational and task environment (Butler, 1988; Damanpour, 1987, 1991; Kim, 1980; Kimberly & Evanisko, 1981; Schoenecker, Daellenbach, & McCarthy, 1995). The overlap in these determinants -- mainly composed of structural variables, but also including process, resource, cultural and perceptual variables -- reinforce the potential value of an integrative study such as the present one.

Innovation and Organizational Adaptation

Innovation has been said to be the lifeblood of change (Schoenecker, Daellenbach & McCarthy, 1995). As early as 1950, Schumpeter recognized that innovation was a significant force affecting the competitive strategies of markets and firms. While not all innovations are as expansive as those described by Schumpeter, given that they may not transform the organization or its industry, innovations can provide an organization with the means to remain competitive in a dynamic situation (Stopford & Baden-Fuller). Thus, innovations are a primary means through which adaptation occurs (Eisenhardt & Tabrizi, 1995; Henderson, 1994; Porter, 1985; Schroeder, 1990; Schoenecker, Daellenbach & McCarthy, 1995; Schumpeter, 1950). As task environments change, effective organizations adapt to the new conditions by introducing change into the outputs, structure, or processes of the organization. For the purpose of this study, these changes --

whether they have been internally generated, borrowed from outside, or already used by other members of the industry -- represent innovations to the adopting organization (Damanpour, 1987). As such, voluntary organizational changes or responses to task environmental pressures represent innovations to the adopting organization.

Emerging social imperatives on the firm such as environmental regulations have challenged firms to combine and deploy resources in new ways in order to remain competitive. Technology has played a significant role in shifting the competitive balance. Beard and Dess (1988) saw technology as an important mechanism affecting the survival of organizations. They asserted that technology is a critical determinant in the creation, stabilization and extinction of organizations. In organizational evolution, they further asserted, major technological innovations assume the dynamic role that mutations play in biological evolution. Porter (1985), Cooper (1985) and Kantrow (1980) shared the belief that technology can affect a firm's competitive advantage by ultimately affecting its performance. Smart and Vertinsky (1984) even believed that technology may a useful dimension on which to base competition during crisis situations.

In industries where compliance is primarily based on rules governing technology -- requiring specific tools, techniques, and/or physical equipment -- firms tend to become technological undifferentiated. These technology-forcing rules create what Jennings & Zanbergen (1995) termed as "organizational mimicry". According to these researchers, organizational mimicry represents a practice, whereby, an organization will simply mimic similar organizations in the industry rather than questioning the practice's value which, de facto, translates into simple notion of following the leader. As a result of organizational

mimicry the competitive role of technology, under technology-forcing conditions, may be neutralized. For this reason, technological innovations were believed to be of limited strategic value and were not explored in this study.

While several authors have argued that there is little value in making the distinction between technological and administrative innovations because of their interdependence (Leavitt, 1965; Ruttan & Hayami, 1984; Van de Ven, 1986), this interdependence suggests the importance of administrative innovations under technology-forcing conditions. The success of developments in technical innovations hinges on an interdependence between technical and administrative components (Leavitt, 1965; Ruttan & Hayami, 1984; Van de Ven, 1986). Where rulemaking and precedent exist that limit technological choices, then competition necessarily depends on administrative components. Dean and Brown (1995) confirmed this idea somewhat in their assessment of environmental regulations as barriers to new firm entry. They found that administrative economies of scale may exist in a firm's regulatory compliance activities due to large fixed-cost components that can create cost advantages when spread over a larger volume of production. And while they and other researchers (Brock & Evans, 1985, Scherer & Ross, 1990) have argued that these administrative requirements create barriers to entry, they have also confirmed that administrative choices have the potential to create competitive advantages through cost reduction and improved productivity.

Administrative innovations according to Damanpour (1987:677) are those innovations that change an organization's structure or its administrative processes. They are only indirectly related to the basic work activity of the organization and are more

immediately related to its management. Clearly, in a technology-forcing framework, competitive advantage is more likely to be derived from administrative innovations. Therefore, administrative innovations were the focus of this study. Though only the administrative innovations related to a firm's ecological responses were examined in this study.

Innovative Ecological Responsiveness

In a meta-analysis of the innovation literature, Damanpour (1991) found that the type of organization and the scope of innovations distinctively separate the relationships between the determinants and innovation. In other words, he found that industry and the number of innovations are inextricably tied to those characteristics that affect a firm's innovative actions. Additionally, he proposed that organizational performance may depend more on the extent to which organizational innovations complement each other rather than on the type of innovation alone. Damanpour's findings suggested that further theory development would need to focus not only on the number of innovations, but also on the "comprehensiveness" of innovations across an organization. Consequently, the current study focused first on the determinants of innovative ecological responsiveness, and then on its performance implications. Two dimensions of innovative responsiveness were examined. Innovation intensity, which simply refers to the number of innovations implemented by an organization, was one dimension examined. The breadth of innovations which may be characterized as the "comprehensiveness," or range of innovations across an organization was the other dimension of innovative responsiveness examined.

Innovative Intensity. Innovation intensity, or the number of innovations was expected to be high in organic organizations. Organic organizations possess (1) open, lateral communication channels, (2) decentralized decision making mechanisms, and (3) progressive organizational cultures conducive to the development and adoption of innovations (Damanpour, 1987, 1991; Kanter, 1983; Kaemmerer, 1978). The converse was expected in mechanistic organizations. As organizations attempt to respond to changes in the task environment, it was expected that they would implement a number of innovative responses in an effort to increase organizational flexibility. And finally, the availability of resources was expected to be directly related to the number of innovations implemented.

Financial performance was expected to be indirectly related to innovative intensity, at least in the short-run. Logically, the more innovations a firm adopts, the more it spends. Thus, it was expected that firms implementing numerous innovations would not perform as well as those implementing few innovations.

Breadth of Innovation. Breadth of innovation was characterized as the range or scope of innovations. The breadth of innovation sought to assess what the innovation literature termed the “comprehensiveness” of innovations. Adaptation theory provided a means of operationalizing this concept. This theory suggests that the range of activities implemented by a firm in a changing task environment occur along a costliness continuum. Specifically, Koberg (1987) found that organizations implement the least costly activities first and most frequently, and the most costly activities last and least frequently. This

adaptation pattern indicated that firms with a broad breadth of innovative responses would commit more resources than firms with a narrow breadth of innovation.

While more resources would be committed by firms with a broad breadth of innovation, it was not expected that these firms would be poor financial performers. In fact, in accordance with Damanpour's (1991) postulation, it was believed that firms with a broad breadth, or a wide scope of innovations would experience a positive effect on financial performance. Inherent in this notion is the concept of synergy, whereby, the sum of the parts is greater than the individual parts. In other words, it was expected that due to a synergistic effect, firms with a broad breadth of ecological innovations would be better performers.

Organizational Centralization and Innovativeness

The importance organizational structure is interwoven with both the innovation and adaptation literature. Damanpour (1987) found that the hierarchy of authority, control and communication in mechanistic organizations might better facilitate the implementation of innovations, while the emphasis on lateral communication and the network structures of organic organizations might better facilitate the initiation of innovations. Eisenhart and Tabrizi (1995) challenged the relevance of organic processes to effective organizational adaptation. They postulated that improvisational processes which combine real-time learning with focus and discipline and powerful leaders may be the key elements to organizational adaptation and innovation. At issue in this debate is the role of centralization in the adaptation and innovation processes.

Chandler (1962) characterized centralization as representing two aspects of structure -- the lines of authority and the information flow through these lines. He stated that these two components are intended to reflect simultaneously the goals, motives or needs of the organization's members and the constraints imposed on the organization by its task environment (Aldrich and Pfeffer, 1976; Child, 1972; Jelinek, 1986; Sadler and Barry, 1970). Collectively, he stated, these two dimensions address the degree of centralization, or locus of authority, within an organization. As such, he defined centralization as the degree to which authority for decisions rests in controlling units of the organization and is concentrated in the top levels of management (Champion, 1975; Hall, 1977; Jackson and Morgan, 1982; Miller, 1976; Miller and Droge, 1986; Reimann, 1973; Van de Ven, 1976). Burns and Stalker (1961) classified organizations with a high degree of centralization and its affiliated characteristics as being mechanistic. Conversely, organizations with decentralized structures were categorized as being organic. When Burns and Stalker first classified firms as being mechanistic or organic, their intention was to distinguish patterns of adaptation to technological and commercial changes. They were particularly concerned with how firms organized for creativity and innovation. Their research revealed that in industries characterized by high rates of change, successful firms adopted an organic form. While mechanistic organizations, characterized by centralization and a well-defined chain of command tended to be more successful in stable markets. Subsequent studies have affirmed a positive relationship between the characteristics of an organic organization and those of an innovation organization (Hull & Hage, 1982; Miller & Friesen, 1982). According to Lawrence and Dyer (1983), organic organizational

structures are generally the best suited to coping with or adapting to a turbulent environment. Organic structures, with their low degree of formality, high degree of information sharing and decentralized hierarchy of authority are believed to enhance organizational flexibility (Koberg, 1987: 799).

These findings suggest that centralization limits innovation and impede adaptation. They further suggest that centralization, with its higher degree of control, authority and linear communication, is more likely to foster congruency between the organization's responses. A decentralized organization with its open lines of communication and network structure has been found to be more conducive to the initiation, though not the implementation of innovative solutions. Centralization with its strict lines of authority is said to stifle collaboration and creative thinking. Additionally, centralization is believed to restrict timely access to critical resources necessary to develop innovative solutions by significantly slowing the process with its requirements of multiple authorizations and strict adherence to a "chain-of-command." As such, organizations with highly centralized structures would tend to have fewer innovations. Therefore, the following hypotheses were set forth:

Hypothesis 1a: Centralization is negatively related to innovation intensity.

Hypothesis 1b: Centralization is negatively related to breadth of innovation.

Regulatory Uncertainty and Innovativeness

Organizational adaptation has been linked to managerial perceptions of task environmental uncertainty (Duncan, 1972; Hrebiniak & Snow, 1980; Miles, 1975; Miles &

Snow, 1978; Thompson, 1967). According to Carter (1990), managerial perceptions constitute the intervening link between the task environment and the organization's actions (Child, 1972; Milliken, 1990). Wernerfelt and Karnani (1987) found these perceptions of uncertainty can arise from four different sources: (1) demand structure, (2) supply structure, (3) competitors, and (4) externalities. Demand uncertainty, they characterized as arising from concerns about the size and dimensions of the market, particularly during the early stages of the industry life cycle. They attributed supply uncertainty to either the internal operations of the firm or from external developments in technology. For instance, they stated that quite often a dominant firm can dictate standards for product specifications while smaller firms have to accommodate existing standards. The third form of uncertainty, termed "competitive uncertainty," according to these researchers emanates from unpredictable circumstances inside competitive firms, the nature of competitors, their strategies, and their responses to each other's strategies. The fourth form of uncertainty they concluded arises from the effects of externalities, or external factors such as social pressures and government intervention exerting demands on the industry.

The patterns of managerial responses to uncertainty are said to vary by industry (Hrebiniak & Snow, 1980). Perceptions of importance, predictability and controllability create pressures for internal adjustments (Miles & Snow, 1978). For example, managers in high growth industries are likely to create more contingencies than those in stable

sectors (Galbraith, 1979; Porter, 1983; Thompson, 1967). Moreover, the choice of which actions to take is also believed to be largely dependent on the costs associated with responding (Carter, 1990; Koberg, 1987).

Over the past two decades, the rapid growth in the social and ecological regulation of businesses has resulted in substantial costs in complying with regulatory requirements (Arthur Andersen & Co., 1993; Carter, 1990; Ungson, James, & Spicer, 1985; Weidenbaum, 1981). Expectations of new regulatory legislation has been found to induce severe anxiety among managers who are affected (Carter, 1990). Consequently, regulations, as elements of high costs and importance, are seen as uncertainties upon which organizational decision making is perceived to be contingent.

Proponents of economic price theory argue that regulatory changes alter the market structure. According to these researchers the market structure may be altered by a number of factors ranging from the costs associated with monitoring the regulatory environment to feelings of frustration resulting from interacting with government agencies (Birnbaum, 1984; Carter, 1990; Weidenbaum & De Fina, 1978). At a minimum, regulatory uncertainty is believed to translate into increased record keeping and administrative costs (Dean & Brown, 1995).

Other theorists (Hannan & Freeman, 1977; Utterback & Abernathy, 1975; Wernerfelt & Karnani, 1987) have argued that flexibility improves a firm's ability to respond to high uncertainty. They assert that a firm subjected to high uncertainty will try to improve its ability to survive in the widest possible range of task environments. That is, the firm will form more contingencies. If perceptions of uncertainty prompt managers

attempt to survive in the widest range of task environments, then these perceptions would seem to stimulate a wide range of adaptive responses. From an ecological perspective, this might mean that the number, but not necessarily the scope, of ecological responses would increase as the perception of regulatory uncertainty increased and vice - versa. Because theory states that firms adapt along a costliness continuum, it was expected that firms would attempt to create as many contingencies as possible, though being careful to not over-commit resources on any particular response. Thus, uncertainty was believed to preclude the implementation of more costly activities.

Hypothesis 2a: Perceived regulatory uncertainty is positively related to innovation intensity.

Hypothesis 2b: Perceived regulatory uncertainty is negatively related to breadth of innovation.

Managerial Ideology and Innovativeness

Few theorists refute the value of culture in organizational innovation and adaptive process. Even fewer theorists have attempted, however, empirically to understand the relationship between culture and these processes. A considerable body of conceptual work has been set forth, including Kanter's (1985) work where she described organizational culture as a "facilitating condition" and Barney's (1986) notion that organizational culture is a source of sustained competitive advantage when it is valuable, rare and imperfectly imitable. And while numerous researchers have attempted to define culture (Ansoff & Baker, 1986; Kilman et al, 1985; Pettigrew, 1979; Schein, 1985), or define its essence in measurable ways, culture and its role in organizational innovation and adaptation continue to be elusive concepts.

Ideology is one aspect of culture that has received some limited empirical testing. Ideology is defined as the explicit and publicly expressed beliefs and values of an organization's key decision makers (Goll & Zeitz, 1991). Most studies on ideology, however, have been content analyses of themes in speeches delivered by top executives (Seider, 1974; Sussman, Ricchio, & Belohlav, 1983). A few studies have confirmed the importance of managerial ideology to responses on various issues (Greening and Gray, 1994; Gray, 1983; Miles, 1987), innovation and performance (Marcus, 1988) and managerial characteristics and strategic responses (Hambrick & Finkelstein, 1987; Hitt & Tyler, 1991). Goll and Zeitz' (1991) research, nonetheless, represents the most comprehensive efforts to measure ideology. These researchers attempted to identify the various dimensions of ideology to develop a typology. Although their research offered limited insights, they were able to identify two ideology types: traditional and progressive.

Goll and Zeitz's ideological types divided along the dimensions of participation, social responsibility and organic management. Low scores for all three dimensions characterized an organization with a traditional ideology. An organization with high scores for all three dimensions constituted one with a progressive ideology.

Given the individual components of these two archetypes, this study hypothesized that an organization with a traditional ideology would be less likely to engage in a large number of innovative activities, as well as a broad range of activities. This was projected to be due primarily to limited participation in the decision making process, lack of concern for individual employee, community and overall social issues. Secondly, a traditional ideology, according to Goll and Zeitz' archetype, suggests that management is unaware or

not concerned about social imperatives and their implications for the organization; therefore, it is not likely that new initiatives would be commonplace in such an organization. And finally, the mechanistic management style inherent in a traditional ideology would create many of the barriers promulgated by a mechanistic structure.

A progressive ideology, on the other hand, would have the potential to foster teamwork and synergistic results. Additionally, a commitment to social responsibility by top management typically influences the activities of members throughout the organization. The organizational climate encouraged by a progressive ideology would foster open and fluid lines of communication, which might, in turn, give rise to a variety, and possibly a wide range, of innovative solutions.

When key decision makers' overt beliefs and values do not encourage participation, social responsibility and organic management, employees are not likely to exercise what Kanter (1985) termed "spontaneous entrepreneurship." Kanter said that in order for innovation to occur, three "power tools" are needed; they are (1) information, (2) resources and (3) support. These tools are needed to create clusters of structures and processes for empowering innovative responses because:

- Open communication systems help potential "entrepreneurs" locate the information needed to shape and sell projects;
- Network-forming arrangements help them to be in a position to build a coalition of supporter; and
- Decentralization of resources helps to get them the resources needed for mobilizing action.

Conversely, Kanter and others state that a traditional ideology is likely to encourage secrecy, turf wars, ethical violations and low motivation to succeed. Not only does the traditional ideology limit creativity, it also has the potential to limit the overall benefits of any such efforts. In view of these finding, the following hypotheses concerning managerial ideology are set forth:

Hypothesis 3a: Progressive managerial ideology is positively related to innovative intensity.

Hypothesis 3b: Progressive managerial ideology is negatively related to breadth of innovation.

Organizational Slack and Innovativeness

Organizational slack determines the extent to which an organization can afford (1) to take on new and innovative projects, (2) to absorb failure through individual ingenuity, (3) to explore new ideas in advance of an actual need, (4) to engage in information collection activities, and (5) to expand in existing and new markets (Damanpour, 1987; Jennings & Seaman, 1994; Koberg, 1987; Keats & Hitt, 1988; Rosner, 1968). Jennings and Seaman (1994: 461) aptly described the effect of reduced slack on the organization when they stated that it induces a managerial paralysis causing rigidity which propels the organization to decreased performance.

Hypothesis 4a: Organization slack is positively related to innovation intensity.

Hypothesis 4b: Organization slack is positively related to breadth of innovation.

Financial Performance

Miles and Snow's (1978) seminal research on strategy, structure and performance provided tremendous insights on organizational adaptation. These researchers demonstrated the fact that a strong positive relationship exist between organizational adaptation and financial performance. They identified four archetypes of organizational adaptation: (1) Defenders, (2) Prospectors, (3) Analyzers, and (4) Reactors. The archetypes captured a holistic view of the organization and its interactions with its task environment. Implicit in their typology was the notion of performance. Subsequent studies, however, have explicitly examined the relationship between adaptation and performance (Bourgeois, 1985; Chakravarthy, 1982; Jennings & Seaman, 1994). As Miles and Snow concluded, these subsequent studies indicate that firms that close themselves off from their task environments are more likely to perish.

Structural adaptation models (Birnbaum, 1984, 1985; Carter, 1990; Cook, Shortell, Conrad, & Morrissey, 1983; Fennell & Alexander, 1987; Koberg, 1987) take this notion a step further by suggesting that organizational adjustment follows a hierarchy of adaptive responses. According to these theorists, organizations adopt the least costly responses most frequently, and the most costly responses least frequently. In a technology-forcing situation, it stands to reason that since technological responses are required by various rules and regulations, they are largely a fixed cost to the organization, thus they represent the least costly responses. Administrative responses in this context are discretionary. Figuratively speaking, they are above the "regulatory line." Their adoption by an organization under technology-forcing conditions represent the most costly

responses. Consequently, the more administrative, or discretionary innovations adopted by an organization in a regulated situation, the lower the organization's financial performance was expected to be. Conversely, it was hypothesized that a wide breadth of innovative ecological responses would create a synergistic effect which would have a less adverse effect, if not a positive effect, on financial performance. The expected relationships are summarized by the following hypotheses:

Hypothesis 5a: Innovation intensity is negatively related to financial performance.

Hypothesis 5b: Breadth of innovation is positively related to financial performance.

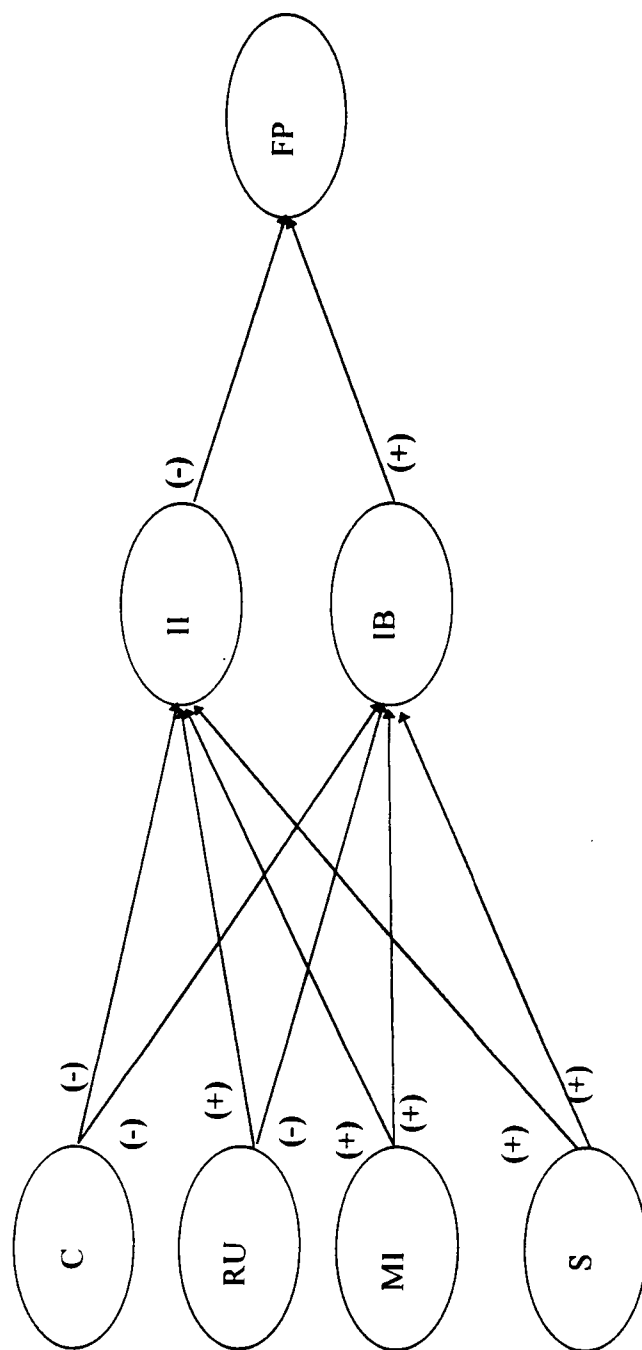
Summary

This chapter presented a theoretical framework for the current study. It integrated the organizational innovation theory with the adaptation theory to collectively define the antecedents, or determinants of a firm's innovative ecological responsiveness. It then focused on the limited body of empirical research in both sets of literature to establish the relationship between a firm's innovative ecological responsiveness and financial performance. A set of hypotheses, summarized in Table 3-1 was developed. A graphical depiction of these hypotheses is presented in Figure 3-1.

TABLE 3-1

Summary of Hypotheses

H1a:	Centralization is negatively related to innovative intensity
H1b:	Centralization is negatively related to breadth of innovation
H2a:	Regulatory uncertainty is positively related to innovative intensity
H2b:	Regulatory uncertainty is negatively related to innovative breadth
H3a:	A progressive managerial ideology is positively related to innovative intensity
H3b:	A progressive managerial ideology is positively related to breadth of innovation
H4a:	Slack is positively related to innovative intensity
H4b:	Slack is positively related to breadth of innovation)
H5a:	Innovative intensity is negatively related to ROA
H5b:	Breadth of innovation is positively related to ROA



C = Centralization	II = Innovative Intensity
RU = Regulatory Uncertainty	IB = Innovative Breadth
MI = Managerial Ideology	FP = ROA
S = Slack	

FIGURE 3-1

Theoretical Model

CHAPTER 4

METHODS

This chapter presents the methodology that was used in this study. Before discussing the sample and measures, a brief overview of the history and structure of the electric service industry is provided. This overview provides a context for the study. It illustrates the evolution and complexity of the electric service industry, as well as the financial challenges that the industry is facing as a result of the ecological pressures and regulations. Moreover, this overview helps to clarify the various forms of ownership that characterize the industry, and why this study focused only on investor owned companies. This industry overview is followed by a discussion of the sample and data collection methods. Next, a discussion of the measures and their operationalization is presented. Finally, the data analyses procedures are discussed.

The Setting

Industry History and Structure. In 1882, Thomas Edison opened the first commercial urban power plant. From this time until the turn of the century, electric utilities were small, with service areas confined to a few city blocks surrounding a generating station. In 1902 there were 3,620 central electric stations, of which 2,085 were privately owned and 815 were municipally owned (Edison Electric Institute (EEI), 1989). The early plants distributed electricity only through direct current (DC). Consequently, the distribution radius was small. George Westinghouse was the first to develop a competitive alternating current (AC) technology that helped increase the radius of distribution. This invention, along with the invention of the transformer enabled generated

energy to be increased to a relatively high voltage for transmission and then lowered for distribution and customer use. Accordingly, larger areas could be served by a single generator more economically (Garfield, 1964). From 1900 to the Great Depression, large economies of scale characterized the industry. This led to a growth in utility service areas -- first beyond city limits, then across state lines. Today 3,500 entities deliver electricity to customers in all parts of the United States.

Industry Structure To minimize capital construction efforts, as well as increase economic efficiency and reliability, utilities have continued to pursue strategies to share their resources through formal and informal power pools. Utilities are interconnected in a network of high voltage transmission lines. Nearly all utilities in the U.S. operate in tandem with other utilities in one of three interconnected power grids, namely the Eastern, Western, and Texas power grids. These three interconnected power grids allow utilities to rely on each other in times of emergencies, thereby reducing the level of reserve generating capacity any individual utility needs to maintain. In addition, interconnections allow utilities to take advantage of economic opportunities to purchase power from other utilities when less expensive power is available, such as where coal-fired generation is available to replace more expensive oil-fired generation.

Four major ownership structures deliver electricity across this sophisticated grid system: (1) investor owned utilities (IOUs), (2) federal agencies, (3) municipal utilities, and (4) rural electric cooperatives. Each ownership type has its own goals, organizational structure and financing methods. IOUs are said to be the most successful in serving large markets where generation economies of scale can produce lower prices for consumers.

The more than 200 IOUs (or power producers since deregulation now allows non-utility generators to compete on a virtually equal basis in the market) represent the predominant part of the industry, accounting for about three-fourths of all electric producers' capacity, generation, sales, and revenues (EEI, 1992; United States Energy Information Administration (EIA), 1986). These IOUs are privately owned, profit-oriented businesses. They possess government granted service monopolies. In return, they must serve all customers, charging reasonable and nondiscriminatory prices. Most of these companies generate, transmit and distribute electricity. The exceptions are holding companies that control various operating companies. Many operate across several states. They are highly capital intensive and are financed by the issuance of stock, the sale of long-term debt, and internally generated revenues (retained earnings, depreciation, deferred taxes, and investment tax credits).

The federal government is primarily a generator and wholesaler of electricity in 34 states. Its first involvement in the power business was selling surplus power from western irrigation dams. Later, it sold power from multiple-use dams that it built to improve navigation and control floods (EIA, 1985). The federal government sells its electricity through four power marketing administrations (PMAs) to cooperatively owned or publicly owned systems, which have preference to this low cost power. Two federal agencies are the main producers of hydroelectric generation -- the U.S. Army Corps of Engineers and the Interior Department's Bureau of Reclamation. The Corps of Engineers operates throughout the country; the Bureau of Reclamation in the West. All of the electricity generated by these two agencies is marketed by the four PMAs: Bonneville, Southeastern,

Southwestern, and Western Area (EIA, 1986). The PMAs serve all areas except the Northeast, Midwest, and Hawaii. The Alaska PMA operates its own dams and distributes power from them (EIA, 1986). These PMAs are funded as part of the federal budget process. They must repay all capital costs, plus operating and maintenance costs invested by the Government in hydroelectric projects within 50 years. Another entity, the Tennessee Valley Authority (TVA) is the largest Federal power producer. It is charged with serving the electrical needs of the seven-state Tennessee Valley, in addition to controlling floods and improving navigation. The heavy reliance on federal aid and preferential sale of electricity to municipal and rural systems make it difficult to compare federal utilities with IOUs. For this reason, federal power producers and their associated PMAs were not examined in this study.

Municipal utilities are the most numerous type of system. They operate in all states except Hawaii, which relies solely on private power. In contrast to IOUs, municipal utilities typically serve where markets are too small for significant economies of scale (EEI, 1992). Municipally owned utilities are non-profit local government agencies controlled by entities such as a city council or an independent utility board. They are financed from local treasuries or revenue bonds secured from electricity sales. Municipal utilities are concentrated in the Tennessee Valley, Missouri Basin and the Pacific Northwest largely due to the proximity of low-cost federal hydropower. Nationally, municipal utilities rank second in terms of the number of customers, sales, and revenues (EIA, 1986).

Rural electric cooperatives are a product of the New Deal years. In 1936, Congress established the Rural Electrification Administration to expand electric service to rural areas. Today there are about 1,000 rural electric cooperatives in the nation. Most cooperatives are distribution only, although a few generate and transmit electricity. For the most part, however, they purchase power from federal PMAs and investor owned utilities. They operate in 46 states, predominately the Southeast, Midwest, Plains states, and the Southwest. They are incorporated under state law and are typically directed by a Board of Directors. They are financed from various sources: the Rural Electrification Administration, the National Rural Utilities Cooperative Finance Corporation, the Federal Financing Bank, and the Bank for Cooperatives (EIA, 1986).

The small size and ownership structure of both municipal and rural electric power producers limits the scope and, perhaps, the flexibility that these companies have to innovate. Given this limitation, it would not seem reasonable to compare this sector of the industry with IOUs. Additionally, both municipal and rural electric cooperatives tend to rely more on purchased power than on their own generated power, and this may bias the type of ecological responses that implemented in this sector of the industry. Thus, comparing these types of companies with IOUs may serve to distort the results of this study. In other words, comparing municipal and rural electric cooperatives with IOUs may falsely suggest that organizational characteristics influence differences in ecological responsiveness which, in turn, may lead to differences in financial performance. When in actuality, comparing two groups of companies as distinctly different as these may only reflect differences in the generation capacity.

Regulatory Overview. Local regulation was most typical in the infancy of the electric service industry. Local governments regulated electricity sales by awarding franchise contracts. After the growth of utilities beyond city boundaries, state regulation eventually supplanted local regulation. New York and Wisconsin enacted statutes that served as models when they established regulatory bodies. By 1930, nearly all states had regulatory commissions. The federal government did not become involved in the regulatory process until Congress initiated federal involvement by authorizing the sale of surplus power from its irrigation projects. A few years later, Congress passed the Federal Water Power Act to encourage the development and utilization of the nation's water resources. The Water Power Act created the Federal Power Commission (the predecessor of today's Federal Energy Regulatory Commission) and gave it jurisdiction to license hydroelectric projects on navigable waters.

During this same time period, significant consolidation occurred within the industry. This included mergers by small private and public power companies, and the formation of large utility holding companies (EEI, 1992). These holding companies often brought economies of scale to local utilities by merging individual plants into interconnected regional systems. In fact, the pace of mergers quickened so that by 1932, three holding companies controlled nearly 50 percent of the electric utilities in the United States. This growth and the accompanying issuance of a multitude of securities attracted Congress' attention. Senate and House investigations uncovered serious financial irregularities (EEI, 1992). The outcome was the 1935 passage of the Public Utility Holding Company Act (PUHCA). PUHCA applied to electric and gas holding companies.

Its primary objective was to ensure that any concentration of power by these companies served the public good. This regulation required holding companies to (1) limit their systems to physically integrated and coordinated properties; (2) simplify complex corporate and capital structures and eliminate any unfair distribution of voting power; and (3) issue and sell securities that reasonably reflected the financial position of the company, and (4) ensure that the terms and conditions of the issuance and sell of securities were in the public interest (Hawes, 1987; EEI, 1992).

The Securities and Exchange Commission (SEC), charged with implementing PUHCA, sought to institute a process that would permanently simplify holding company systems. Between 1935 and 1950, 759 companies were separated from holding companies. The number of registered holding companies declined from 216 to 18 over the period 1938-1958 -- eight of these were electric companies (Hawes, 1987).

During the 1950s and early 1960s, the national economy was relatively sound and the fuel prices were stable. Interest rates were modest. Consumers enjoyed declining electric rates, demand grew at an astounding pace, and the regulatory climate was generally congenial. Nuclear power emerged during this period. In 1957, the first central station commercial nuclear reactor began operation in Shippingport, Pennsylvania (Hawes, 1987; EEI, 1992).

By the mid-1960s, declining efficiency and rising production costs portended changes on the horizon (EEI, 1992). Not only were environmental concerns being expressed, but utilities were beginning to experience the cost impacts of environmental controls. Requirements to reduce pollution from plants became an appreciable cost to

utilities (EEI, 1992). One of the most dramatic events to affect the industry during this time was the 1965 East Coast Blackout. This blackout brought to the forefront transmission reliability difficulties that added to the woes the industry was already experiencing. The industry, however, responded quickly to the reliability problems by establishing the North American Electric Reliability Council (NERC) with nine regional councils to promote a reliable and adequate bulk power supply for the future.

The 1970s ushered in a period of dramatic reduction in the rate of load growth resulting in overcapacity for many companies. The industry also had to deal with an inflationary economy, increases in fossil fuel prices, mounting environmental concerns, and difficulties in the nuclear power industry. Moreover, the 1973 Arab oil embargo was a staggering blow to oil dependent utilities. Another important development during this period was a marked change in the relationship between utilities and their regulators. State regulators were facing significant public pressure to hold down rates, while new federal regulations sought to protect the environment, reduce dependence on foreign fuels, improve power system planning and management, promote nuclear safety, and encourage renewable energy sources (EEI, 1992). To address federal regulatory concerns, the Federal Energy Regulatory Commission (FERC) emerged in 1977. The Department of Energy Organization Act created FERC as an independent agency within the Department of Energy (DOE). FERC inherited most of the interstate regulatory functions over the electric power industry (EEI, 1992). The SEC, on the other hand, has remained a factor in shaping the direction of the industry. The SEC's primary areas of interest were now on

the financing of registered holding company systems, the creation of new holding companies, attempts by companies to diversify, and the ramifications of utility takeovers.

These changes, particularly those in the past two decades, have created a turbulent and somewhat tumultuous climate in which electric producers must compete. The rate of change in regulations has been attributed to creating a highly uncertain task environment, and serves as an excellent backdrop for examining companies facing high uncertainty and change. While electric power producers were the focus of this study, there are certain to be ramifications for many other types of companies, regulated or not, operating in a turbulent task environment.

Environmental Laws. Concern for the natural environment has stimulated new federal requirements that have had far-reaching implications for the electric service industry (Alm, 1982; EEI, 1992). The system of federal environmental legislation that has evolved has three underlying purposes: (1) encouraging compliance, (2) establishing appropriate penalties for those entities that fail to behave in an environmentally responsible manner, and (3) creating a mechanism that places the burden for correcting environmental damage on those who were the cause of it.

The National Environmental Policy Act (NEPA) of 1969 was the first major environmental legislation to affect the utility industry. It required utilities to complete an environmental impact statement (EIS) for any proposed action significantly affecting environmental quality. An EIS had to accompany all licensing requests for nuclear plants, hydroelectric plants, and some coal-fired plants. Each EIS had to include analyses of the environmental impact of the proposed action, any alternatives to the proposed action, and

the irreversible resource commitments that would result from implementing the proposed action. These requirements proved costly to electric utilities and their customers by forcing the delay and revision of construction plans, as well as the retrofitting of control technologies. The 1970 Clean Air Act required utilities to reduce polluting emissions and limited the use of tall stacks. The first set of amendments to this Act in 1977 recodified federal air quality laws and sought to increase industry attention to the use of pollution control equipment and "cleaner" fuels and combustion processes. The 1990 amendments to the Clean Air Act, entitled the Clean Air Act Amendments (CAAA), defined compliance implementation in three phases.

Even though there has been legislation in effect since 1899 to protect and control the threat of water pollution, it was not until the 1970s that Congress became aggressively committed to the protection of water. By 1971 it was apparent that past federal pollution control programs were inadequate. One-third of the nation's sampled drinking water was unsafe. Ten million fish were dying daily in a Florida bay. Major waterways near industrial and urban areas were unfit for most purposes (University of Miami Law Review, 1991). The 1972 Federal Water Pollution Control Act (FWPCA) limited allowable utility waste discharges into water. This Act represented a turning point in federal policy toward water pollution and sought to restore and maintain the chemical, physical, and biological balance of the nation's waterways (EEI, 1992). Amendments in 1977 to the Clean Water Act (CWA) of 1948 made mid-course correction to FWPCA, particularly with respect to the obligations of individual dischargers (Brown, 1991). With the 1977 Amendments, the

entire statute has been renamed the Clean Water Act. The Amendments have additionally made the control of toxic pollutants more important.

Drastic changes to the Clean Water Act were also made in 1987. These amendments dealt mainly with the attainment of the previous water quality goals of CWA. These 1987 amendments authorized the Environmental Protection Agency (EPA) as the governing body, and defined standards and enforcement measures. In short, the Act prohibits the discharge of any pollutant, including heat, from any point source that could ultimately contaminate surface water except as authorized by a National Pollution Discharge Elimination System (NPDES) permit.

According to a 1987 publication by EEI entitled "Electricity and the Environment: Answers to Your Questions," utilities spend billions of dollars to comply with federal environmental laws. EEI (1987) estimated that the utility industry capital costs for required environmental protection facilities totaled \$30.3 billion from 1969 to 1982. About one-third of the total cost for a new power plant is taken up by the necessary pollution control equipment. EEI further contends that this cost is understated. It does not reflect the added cost of operating and maintaining the pollution control equipment. Nor does it include the cost of building power facilities attributable to the construction delays resulting from environmental regulations.

As is evident from the magnitude of these environmental laws and regulation, competition in the electric service market is constrained in many ways. The companies that establish leadership within the industry will be compelled to find non-technology

strategies to compete. Because of the latitude that these regulations permit outside the technological realm of electric generation, administrative innovations may prove to be a crucial tool in the future evolution of the industry.

Measuring Innovative Ecological Responsiveness

Identification of the Ecological Activities. An extensive review of the literature revealed 26 innovative ecological activities typically implemented by electric power producers. A number of these activities were identified by the research in a 1993 report entitled, "A Strategy for Sustainable Energy Development and Use for Ontario Hydro." Each of these 26 activities are administrative rather than technological in nature, and their implementation would potentially represent innovations to the adopting company.

The activities cut across a number of functional areas. In general, these innovative activities focus on changes in five categories, namely: (1) planning and evaluation, (2) operational innovations, (3) public relations activities, (4) pricing and service delivery, and (5) strategic alliances. Implementation of a number of the activities would tend to be relatively inexpensive and easy, whereas, implementation of others would be complicated and quite costly. To understand the costliness continuum (Koberg, 1987) represented by these 26 activities, the input of three industry experts was sought.

Ranking the Ecological Activities. Input from the three industry experts was solicited through second questionnaire (see Appendix 1). This questionnaire was mailed in March 1997 to an environmental expert at (1) the Edison Electric Institute (EEI), (2) the Federal Energy Regulatory Commission (FERC), and (3) the American Public Power Association (APPA).

Each of these experts was given a description of each activity and asked to rank the 26 activities in ascending order according to the average estimated cost of implementation (Kelm, Narayanana, & Pinches, 1995; Miller & Chen, 1994). It was asked that a "1" be assigned to the activity least costly to implement, and a "26" be assigned to the activity most costly to implement. They were advised consider start-up costs in their deliberations, and to assume that the scale of implementation would be that of an "average" company.

Each expert was given a general description/definition of each, and asked to rank all of the activities in ascending order according to the average estimated cost of implementation (Kelm, Narayanan, & Pinches, 1995; Miller & Chen, 1994). The interrater reliability among these experts' ranking was determined using a Spearman rank correlation. The correlation among these experts was significant and positive ($r = .67$, $.74$, and $.83$). Discrepancies in experts' ranking of each activity were resolved by averaging the three rankings for a given activity to determine the activity's average rank.

Pilot Testing

Prior to mailing the questionnaire to the study sample, it was pilot tested with 24 rural electric cooperatives in November 1996. This sector of the electric service industry was chosen because other than IOUs, it is geographically the most diverse sector of the industry. In an attempt to include a geographically diverse set of companies, the top 24 largest rural cooperatives (based on sales) were targeted for pilot testing. As with the study sample, the chief financial, operating and environmental/regulatory officers in each

company were surveyed. The same stringent sampling techniques that were used with the study group were employed in conducting the pilot study.

Seventeen individuals from 13 companies returned questionnaires, yielding a 54% response rate. Follow-up calls to respondents indicated that the survey instrument took approximately 30 minutes to complete. Additionally, several respondents indicated that section on "perceived financial performance" was unclear. Slight changes in the wording were made to improve the clarity of this section.

Survey Administration Procedures

As explained in the previous section, the electric service industry was examined in this study because of the notable ecological pressures facing the industry and their implications for the future of the industry. Only the electric service industry was examined so as not to confound managerial perceptions and measures of the task environment (Miles & Snow, 1978). Additionally, concerns about differences in organizational culture and the degree of innovativeness across industries are other reasons only the electric service industry was examined (Bantel & Jackson, 1989; Chatman & Jehn, 1994; Damanpour, 1991; Schoenecker, Daellenbach, & McCarthy, 1995).

The primary sampling frame for this study consisted of top managers from 232 electric power producers. These 232 power producers included all 193 investor owned utilities, 20 non-operating holding companies and 19 wholesale generating companies located throughout the United States (Electrical World Directory of Electric Power Producers, 1996 edition, 1995). Three top managers from each of these power producers were surveyed. The positions targeted from each of these companies included (1) the

chief financial officer, (2) the chief operating officer, and (3) the chief environmental/regulatory officer. A number of industry publications, including the Electric World Directory of Electric Power Producers, 104th, 1996 Edition, Utility Data Institute (UDI) Who's Who at Electric Power Plants, Sixth Edition, 1996 and annual reports were used to identify these three individuals in each company. The chief financial, operations and environmental officers were surveyed between February and April 1997 because it was believed that they would have a good purview of their company's ecological activities and operating philosophies.

This questionnaire was used to assess (1) perceived organizational centralization, (2) perceived regulatory uncertainty, (3) perceived managerial ideology, and (4) a subjective measure of financial performance, as well as to identify which of 26 innovative ecological activities had been implemented over the past three years. Organizational slack and return on assets (ROA), an objective measure of financial performance were assessed using archival data from sources such as the Electric Light and Power (EL&P) U.S. Electric Utility Industry Directory, Pocket Guide to U.S. Electric Utilities, Third Edition, FERC Form No. 1: Annual Report of Major Electric Utilities, Licensees and Others and Moody's Public Utility Manual.

Each manager was mailed a cover letter, a copy of the questionnaire along with an insert defining the ecological activities, and a return envelope (see Appendix 2).

Questionnaires were distributed to managers via first class mail in stamped rather than metered envelopes (Dillman, 1978; Sudman, 1985). Each survey recipient not interested in participating in the study was asked in the cover letter to return the uncompleted survey

to the researcher along with their name and decision not to participate. Sudman (1985) suggested that such an unusual request has the potential to increase response rate. Each respondent was given 10 days to respond to the questionnaire. After this time period, a reminder postcard was mailed to recipients who have not yet responded. One month after the initial mailing, a replacement questionnaire, definition insert and cover letter were mailed in order to allow the recipients an additional opportunity to participate in the study.

Although the unit of analysis for this study was at the company level, questionnaires were mailed to 564 managers in 232 companies. Whenever possible, a survey was sent to the three targeted position in each company. Unfortunately, in several of the smaller companies, only one or two individuals were surveyed since managers in these organizations tended to serve multiple roles. All in all, a total of 102 companies responded to the questionnaire. Only one respondent did not complete the survey, yielding a final sample size of 101 companies and an overall response rate of 44%. Table 4-1 shows the distribution of positions of the 131 individuals who responded to the survey.

TABLE 4-1

Distribution of Positions of Survey Respondents

Position	Number of respondents
Chief Executive Officer	49
Chief Financial Officer	35
Chief Governmental/Regulatory Officer	47
Total	131*

* 24 companies had multiple respondents -- all three officers at five companies responded and 19 companies had 2 respondents

A comparison of means using the t-test of Independent Samples was performed comparing net generation and ROA for companies responding to the questionnaire with those that did not. No significant differences for either measure was found between the respondents and non-respondents. These results suggest that the respondents appear to be representative of the original sample.

Due to multiple respondents in some companies, discrepancies were resolved in the following manner: (1) for the multi-item independent variables, centralization, regulatory uncertainty, and managerial ideology, the mean of the respondents' score was used to represent the company; and (2) discrepancies about which activities had been implemented in a given company, when participating the responses of the CEO were given first priority, with those of the chief environmental/regulatory officer being given secondary priority among the three managers surveyed.

Dependent Variables

Innovation Intensity. For the purposes of this study, innovative intensity was measured simply as the number of innovative ecological activities implemented over the three-year period, 1994-1996, with an adjustment for company size. Damanpour (1991: 578) found that studying a comprehensive set of innovations is a more effective moderator for understanding the relationship between determinants and innovation. His findings suggest that studies of organizational innovation based on a large number of innovations provide a more valid profile of adoption behavior than studies based on a few innovations. Given Damanpour's findings, measuring innovation intensity as the number of innovative ecological activities adopted by a company is seen as an appropriate measure. For the

purposes of this study, innovation intensity was operationalized as the number of the 26 innovative ecological activities that managers indicated were implemented in their companies over the past three years, divided by the logarithm of the company's average net power generated from 1994 to 1996, measured in megawatt-hours (MWhs).

The size adjustment was made this variable to incorporate the findings of both the organizational innovation and adaptation research that support the notion that organizational size matters (Greening & Gray, 1994; Gupta, Dirsmith, & Fogarty, 1994; Miles, 1987; Pfeffer, & Salancik, 1978; Scott, 1992; Ungson, James, & Spicer, 1985). As for the organizational innovation literature, Damanpour (1989) found a significant positive relationship between size and innovation ($r = .323 \pm .032$). Bantel and Jackson (1989) confirmed a highly significant relationship between size and innovation. They found a curvilinear relationship between size and innovativeness in that innovativeness increases as a firm's size increases up to a certain point. Past a certain size threshold, however, they found that innovativeness decreases.

Pfeffer and Salancik (1978: 135) found that size effects the adaptation process since size and visibility make an organization a more likely target for groups ranging from consumer rights' organizations to antitrust enforcement agencies. Greening and Gray (1994) confirmed this finding when they noted that large firms experience more media exposure and interest group pressure than small firms. Scott (1992) described size as a contextual variable in that it is related more to an organization's interface with its task environment, whereby large size may signal a complex relationship.

Breadth of Innovation. While innovative intensity was defined simply as the number of activities implemented with an adjustment for company size, this measure fails to consider the fact that not all activities -- primarily because of cost -- are likely to occur with equal frequency (Koberg, 1987; Miller & Chen, 1994). Because the lower cost activities will tend to be adopted with a higher frequency, efforts to not overweigh these low cost innovations were taken to fully understand the strategic and economic implications of a company's ecological responsiveness. Consequently, a second dimension of ecological responsiveness, termed "breadth of innovation" was developed as a measure of the scope or range of implemented activities along a cost continuum. This measure was also adjusted for size using the logarithm of net generation in MWhs.

Miles and Snow (1978) were the first to develop a weighted average of a firm's activities. In their study of hospitals' organizational adjustments, they combined the scores of hospital administrators' perceptions of their task environment to construct a contingency index for each hospital. However, Miller and Chen (1994) developed a more sophisticated weighted measure in their study of the airline industry. The current study adopted the Miller and Chen's approach with some modifications.

The weighted measure of a firm's ecological responsiveness termed "breadth of innovation" was calculated as the sum of the average rank (obtained from the three industry experts) of each activity implemented by a company, divided the total number of activities implemented by that company to render the measure comparable across companies. The quotient was then divided by the logarithm of the company's average net

power generated from 1994 to 1996, measured in megawatt-hours (MWhs) in order to adjust the measure for company size. In summary, this measure was calculated using the following equation:

$$\text{Breadth of innovation} = [(\text{Sum } z_{ij} / j) / \ln c_i] , \text{ where}$$

z_{ij} , represents the average rank of each j ($= 1, \dots, 26$) activity implemented for each of the i ($= 1, \dots, 232$) electric power producers; c represents logarithm of the average net power generated from 1994 to 1996, measured in megawatt-hours (MWhs).

Standardizing ecological responsiveness in this manner helped to have the effect of weighting rare and costly decisions such as price and fuel changes more heavily than common decisions such employee recognition programs (Koberg, 1987; Miller & Chen, 1994).

Financial Performance. A 1994 meta - analysis by Miller and Chet on strategic planning and firm performance found that strategic planning positively influences firm performance. And though, previous studies suggested mixed results, Miller and Chet found that methods factors are primarily responsible for the inconsistencies. Specifically, their study found that the inappropriate use of archival versus informant sources of performance data had an impact. Their research has raised concerns about temporal precedent requirements in causal models such as the one examined in this study. For this reason, current performance measures are needed to assess the impact of past activities on a firms' performance. Dess and Robinson (1984) along with Venkatraman and Ramanujam (1987), and Lumpkin and Dess (1995) found that subjective measures of

performance are adequate measures when objective measures are not available.

Additionally, these researchers found that subjective measures can be consistent with objective measures.

Economic performance in this study was assessed using both archival and subjective measures. Three questionnaire items asking top managers to compare their company to companies of similar sales volume in their region were used to formulate a subjective measure of financial performance.

Return on assets (ROA), calculated as net income after taxes divided by total assets 1993 through 1995, was used as an objective measure of performance. Data for this measure were taken from either the FERC Form No. 1 or Moody's Public Utility Manual.

The correlation between the subjective and objective measures of financial performance was quite low. For this reason, the subjective measure of financial performance, "perceived financial performance," measured by the three questionnaire items was dropped from further analysis. ROA was the sole measure of financial performance used in this study.

Independent Variables

Perceived Centralization. The Aston studies (Pugh, Hickson, Hinings, & Turner, 1968) represent one of the most comprehensive assessments of centralization. They and several other researchers have defined centralization as the locus of authority to make decisions affecting the organization (Miller, 1987; Pugh et al., 1968; Wally & Baum, 1994). Unfortunately, the work of the Aston group is quite dated, and too cumbersome to

elicit the attention of today's managers. Wally and Baum (1994), however, developed a parsimonious measure of centralization in their study of the determinants of the pace of strategic decisions. Using five-point Likert scale questionnaire items, they measured centralization as the degree to which a respondent's firm engaged in delegation and consensus seeking. For the purposes of this study, Wally and Baum's definition of centralization was used. Specifically, centralization was defined as the degree to which a firm engages in delegation and consensus seeking. Four questionnaire items, using a five-point Likert scale were used to assess this measure. The scores for each item were averaged and summed to create a scaled measure of centralization.

Perceived Regulatory Uncertainty. Empirical studies of the measurement properties of previous scales by Duncan (1972) and Bourgeois (1985) assessing perceived task environmental uncertainty suggest that these scales may not be adequate. Comparisons between these two studies suggest that Duncan (1972) may have overestimated the complexity of a firm's task environment, as well as inaccurately assessed the existence of what he defined as the five task environmental dimensions: (1) customer, (2) supplier, (3) competitive, (4) sociopolitical and (5) technological. Bourgeois (1985) found that factor loadings for Duncan's five dimensions clearly indicated that the competitive dimension is not a separate component, but instead loads on the customer and supplier components. Moreover, Milliken's (1987) review suggested that these scales may not be consistent with the conceptual definition of perceived task environmental uncertainty. She defined perceived task environmental uncertainty as occurring when managers are unable to predict future changes in elements of the task

environment, or when they possess an incomplete understanding of the relationships between these elements. This definition of task environmental uncertainty is, *de facto*, consistent with Miles and Snow's (1978: 195) conceptual definition. Miles and Snow, in essence, stated that perceptions of task environmental uncertainty are determined by the predictability of conditions in the organization's task environment. They measured these perceptions with a scale of 25 items, divided among six subscales. A seven-point Likert rating, with 1 indicating that the factor is predictable and 7 indicating that the factor is unpredictable was used. Reliabilities for the Miles and Snow's scale and its subscales was later provided by Ireland, Hitt, Bettis and dePorrás (1987). The Cronbach alpha coefficient reported for the overall scale was .80. Subscale alpha coefficients were as follows: .69 for suppliers, .66 for competitors, .60 for customers, .75 for financial markets, .89 for government and regulatory agencies, and .78 for labor unions. A more recent assessment the Miles and Snow's scale by Buchko (1994) found marginal support. Buchko attributed discrepancies in his findings largely to the fragile and unstable nature of the perceptions of task environmental uncertainty. Thus, he concluded that the Miles and Snow scale was reasonably adequate for research purposes.

Although the Miles and Snow's scale is a more widely used scale of task environmental uncertainty, its has received marginal support and is quite complex to administer in questionnaire form. Carter (1990) took a more parsimonious approach to minimize validity concerns. She measured regulatory uncertainty simply as a result of variations in the way the federal government and other third party payers influenced physicians organizations. An approach similar to Carter's was used in this study to assess

regulatory uncertainty. Three questionnaire items were used to determine to the extent to which federal, state, and local environmental regulations had changed in the past year. Responses to each of three questionnaire used a five-point Likert scale rating. Items ranged from 1 to 5, where “1” indicated that regulatory pressure had decreased greatly and “5” indicated that regulatory pressure had increased greatly (Carter, 1990). The scores for each item were averaged and summed to create a scaled measure of perceived regulatory uncertainty.

Perceived Managerial Ideology. An important element of culture, ideology refers to the explicit and publicly expressed beliefs and values of an organization’s key decision makers (Goll & Zeitz, 1991). Managerial ideology effects beliefs, values and behavior at all levels of the organization (Pfeffer, 1981). When operationalized, Khandwalla (1976) suggested that these beliefs and values translate into management style. In short, he stated that they shape the course of actions, policy statements, official directives, and the like in an organization.

Several researchers have examined the various dimensions of ideology (Aupperle, Carroll & Hatfield, 1985; Burns & Stalker, 1961; Donaldson & Lorsch, 1983; Khandwalla, 1976; Lodge, 1978, 1987; Mintzberg, 1973; Ouchi, 1981; Wartick & Cochran, 1985). From these research efforts, Goll and Zeitz (1991) identified nine general dimensions of ideology:

- Individualism;
- Corporate social responsibility;
- Government involvement;
- Risk-taking;
- Organicity;
- Technocracy;

- Participation;
- Coercion; and
- Orientation to profit

Using an n-factor analysis of the 27 items that had been used to define these nine dimensions, Goll and Zeitz (1991) identified 3 factors. The three factors were the only ones among eight with eigenvalues greater than 1.0. Seven items loaded on the first factor, which they called “progressive decision making.” “Social responsibility” was a second factor consisting of three items that was confirmed. The third factor, “organicity,” included two of the original items for this dimension, as well as one from three other theoretical dimensions. A post-hoc test of reliability demonstrated a 0.85 score for the seven-item progressive decision-making factor, a 0.74 score for the three-item social responsibility factor, and a 0.71 score for the five-item organicity factor. The authors further found that 72 percent of the common variance of the original 27 items was explained by these 15 items. Therefore, the three factors were accepted as reliable.

The present study adopted the four items from the progressive decision making factor and the 3 items from the social responsibility factor. The organicity factor was believed to be redundant of the centralization measure used in this study. For this reason, none of the items from the organicity factor were used. A total of seven items were included in the questionnaire to measure managerial ideology.

Using a five- point Likert scale, respondents were asked on the questionnaire to rate each of 7 assertions according to the degree to which it reflects or agrees with the explicit and publicly expressed beliefs and values of their company. A scale of “1” for strongly disagrees to “5” for strongly agrees was used. A single measure combining the

two dimensions, progressive decision making and social responsibility, was formed to assess managerial ideology.

Using Goll and Zeitz' (1991) typology, a company with a low score (below the mean) for the managerial ideology measure could be characterized as having a traditional ideology.

A company with a high score for managerial ideology (above the mean) could be characterized as having a progressive. The scores for each item were averaged and summed to create a scaled measure of managerial ideology.

Organizational Slack. Slack in this study was defined as the amount of resources a firm has on hand to implement discretionary activities (Bromiley, 1991). It was operationalized as the average quick ratio, or current assets divided by current liabilities, between 1993 and 1995. Bourgeois and Singh (1983) divided slack into three categories: (1) available, (2) recoverable and (3) potential.

This categorization of slack for electric service industry may be somewhat limited in applicability. Assessing slack, particularly as it relates to sales growth is problematic for this industry due to restrictive power rates imposed by state Public Utility Commissions (PUCs). Rates are set through a two-step process. First, the revenue requirement for the utility is determined by both the utility and its PUC. Secondly, charges, by way of rates, are established to recover all or a reasonable portion of this revenue from ratepayers or customers (EPRI, 1992). This process distorts the effect of sales since changes in sales revenues from year to year may not reflect a growth in capacity or demand. Changes may merely reflect a different rate at which the PUC allows the power producer to recover costs.

Bromiley (1991) operationalized “available slack” as a company’s current assets divided by its current liabilities. This operationalization of slack seemed to be an appropriate measure organizational slack given the regulatory constraints on costs recovery in this industry. For this reason, it was used in this study. Data for 1993 through 1995 was collected primarily through FERC Form 1.

Data Analysis

First off, since both subjective and objective measures were used in this study to define the variables in the theoretical model, there were no concerns for common method variance. Secondly, the questionnaire items were submitted to a factor analysis to identify the latent variables associated with the data. Next, Cronbach’s alpha was used to test the reliability of the multi-item scaled measures. This analysis was followed by an analysis of the descriptive statistics and correlations of the measures. Specific values for these tests are provided in the following chapter.

Hypothesis testing was performed using the LISREL 8 program (Jöreskog & Sörbom, 1993). LISREL was used for two reasons. First, it allowed the researcher to focus on the overall pattern of relationships between the endogenous and exogenous variables consistent with the causal flow of the theoretical model. The second reason for choosing LISREL was that it allows one to estimate structural and measurement models simultaneously through confirmatory factor analysis and least squares estimations (Goldberger, 1972; Gupta, Dirsmith, & Fogarty, 1994). Figure 4-1 illustrates the theoretical structural model set forth in this study. Each gamma (γ) represents a

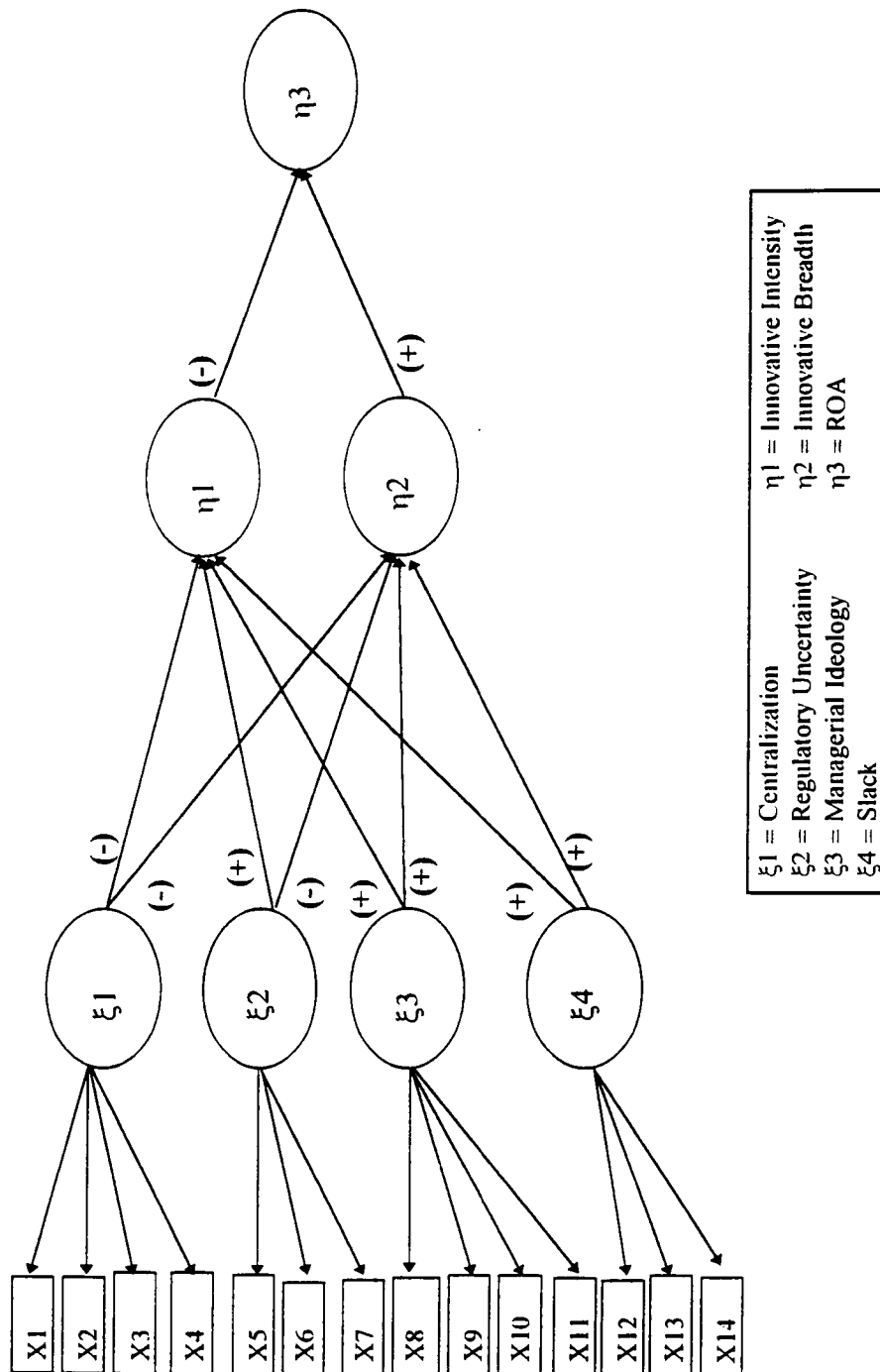


FIGURE 4-1
Theoretical Structural Model

hypothesized causal path between the independent variables. The beta (β) parameters represent the causal path between the three dependent variables.

Three regression analyses were performed to compare with the LISREL results. An F-statistics was used to assess the significance of each of the three regression models. The LISREL and regression analyses results were parallel. These results are discussed in detail in the following chapter.

Summary

This chapter presented an overview of the industry and a context for the current study. Additionally, the sample and data collection methods were discussed. Following this discussion, the measures for each of the independent and dependent variables in the theoretical model were defined. Finally, the data analysis methods were discussed.

CHAPTER 5

RESULTS

In this chapter the results of the major statistical analyses conducted are presented, beginning with discussion of the factor analysis of the measured variables. Attention then turns to the descriptive statistics and correlations of the measures in statistical analyses section. This is followed by an analytic assessment of fit for the model. Next, findings regarding the research hypotheses are considered. Finally, additional data analysis is presented based on the results of regression analyses.

Factor Analysis

The variables were submitted to a factor analysis using principal components extraction and varimax rotation. A five-factor solution resulted. A scree plot of the data supported this solution (see Figure 5-1). An examination of the loadings on each factor indicated that the managerial ideology items split between two factors. These two factors were treated as separate dimensions of managerial ideology in the model. The first of these two factors (consisting of 4 items) measures those dimensions of managerial ideology that relate to matters external to the organization and was named Managerial Ideology (External). The second of the two factors (consisting of 3 items) measures those dimensions related to matters internal to the organization and was named Managerial Ideology (Internal). The factor Perceived Financial Performance is reflected in the three questionnaire items focused on sales growth, net income to assets, and overall performance with values ranging from .81 to .90. Factor loadings for Managerial Ideology (External) ranged from .65 to .87, while for Managerial Ideology (Internal) they

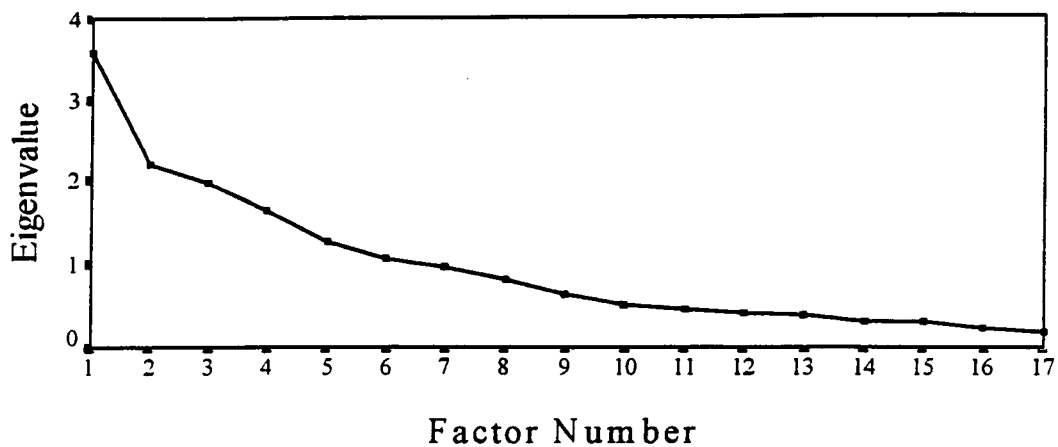


FIGURE 5-1

Factor Scree Plot

ranged from .67 to .82. Both managerial ideology factors were factorially “pure” to the extent that other variables in each column had appreciable zero or near-zero loadings. Regulatory Uncertainty was factorially complex. One of the four centralization items (ability to influence decision making) loaded with .54 on the Regulatory Uncertainty factor. However, the items related to federal, state, and local regulations all loaded highly on this factor. Loadings for these items on Regulatory Uncertainty ranged from .49 to .84. As mentioned previously, one of the four centralization items loaded with the regulatory uncertainty factor, and another one of the items failed to load over .40 on any factor. Using essentially the same questionnaire items as Wally and Baum (omitting only one item requiring managers to identify the layers of management needed to reach decisions on new products, services or processes), the Cronbach’s alpha for the centralization subscale in this study was .50. The Cronbach alphas for the regulatory

uncertainty subscale was .55; the financial performance subscale .85; and the two managerial ideology subscales, internal and external, .71 and .76, respectively.

The Perceived Financial Performance factor accounted for 21.0 percent of the total common factor variance. Managerial Ideology (External) accounted for an additional 12.9 percent, with Managerial Ideology (Internal) accounting for another 11.6 percent of the variance. The fourth and fifth factors, Regulatory Uncertainty and Centralization accounted for 9.6 and 7.5 percent of the variance, respectively. All of the factors had eigenvalues greater than 1.0. Table 5-1 shows the final results of this factor analysis.

Descriptive Statistics

Table 5-2 presents the means, standard deviations, correlations and reliabilities among the scales and latent variables. Each of the variables was plotted and checked for normality. All the variables had a reasonably normal distribution. The scale correlations show that the two dimensions of managerial ideology were significantly, though not highly related to each other ($r = .27, p < .01$). Moreover, innovative intensity was significantly related to both the internal and external dimensions of managerial ideology ($r = .18, p < .05$ and $r = .33, p < .001$). Regulatory uncertainty was significantly related to breadth of innovation ($r = .24, p < .01$), and ROA ($r = .23, p < .01$). Interestingly, slack was not significantly related to any of the variables. Because the two measures of economic performance, perceived financial performance and ROA, were not significantly related to each other, perceived financial performance was dropped from further analysis. Previous

TABLE 5-1

Rotated Factor Matrix^a

	Perceived Financial Performance	Managerial Ideology (External)	Managerial Ideology (Internal)	Regulatory Uncertainty	Centralization
Key decisions ^b	.051	-.186	-.279	-.348	.000
Consensus seeking ^b	.118	.092	-.215	.115	.811
Information seeking ^b	-.028	.023	.154	-.174	.869
Influence decision making	.011	.291	.248	.536	.122
Federal regulations	.103	-.120	.128	.493	-.140
State regulations	-.147	.002	.028	.844	.043
Local regulations	.234	.102	-.121	.671	-.025
Total sales growth	.812	.142	.021	.110	.186
Net income to total assets	.883	-.085	.052	.068	-.095
Overall performance	.900	.093	.102	.013	.030
Systematic searching	.299	.185	.674	.042	.000
Participative decision making	.032	.068	.786	.168	-.047
Explaining changes	-.047	.103	.815	.027	-.018
Community involvement	.061	.713	.194	-.125	-.024
Addressing social problems	-.057	.652	.149	.219	-.151
Meeting society expectations	.047	.865	.137	.081	.100
Assessing social performance	.138	.750	-.076	.076	.307
Eigenvalue	3.58	2.20	1.97	1.64	1.26
Percentage of variance explained	21.00	12.90	11.60	9.70	7.40

^aN = 102;

Boldface indicates loadings over .40

^bItem was reverse coded

TABLE 5-2
Descriptive Statistics, Correlations, and Reliabilities of Latent Variables^{a,b}

Variable	Mean	s.d.	1	2	3	4	5	6	7	8	Reliability
1. CENTRALIZATION	11.65	2.20	-----	-.04	-.42	-.48	-.10*	-.28*	-.17*	-.07**	(0.50)
2. REGULATORY UNCERTAINTY	11.63	1.42	.04	-----	.15*	.09*	-.01*	.02*	.03*	.06**	(0.66)
3. MANAGERIAL IDEOLOGY (INTERNAL)	12.92	1.64	-.01	.14	-----	.34	.10*	.26*	-.18*	-.01	(0.57)
4. MANAGERIAL IDEOLOGY (EXTERNAL)	15.47	2.43	.19*	.12	.27*	-----	-.05*	.34*	.11*	.07**	(0.57)
5. SLACK	1.08	0.79	-.04	-.04	.11	-.06	-----	-.07*	-.14*	-.04**	
6. INNOVATIVE INTENSITY	0.48	0.27	.06	.07	.18*	.33**	-.07	-----	.02**	.13**	
7. BREADTH OF INNOVATIONS	1.00	0.38	.06	.24*	-.13	.06	-.14	.02	-----	.25**	
8. ROA	0.90	0.16	.08	.05	-.01	.08	-.12	.12	.23**	-----	

^a N = 101; scale correlations fill the lower half of the matrix; factor correlations fill the upper half of the matrix

^b The alpha coefficient of reliability for scales with two or more items are displayed in parentheses at the end of the appropriate row

* p < .05

** p < .01

research has established a precedence, whereby, archival measures are presumed to be a less biased assessment of a firm economic performance when they do not correlate highly with perceptual measures.

Confirmatory factor analysis provided data about the correlations and significance levels for the factors. As indicated by Table 5-2, a number of the factor correlations were significant. Unlike the scale correlations, the factor correlations for innovation intensity and breadth of innovation proved to be significantly related to all the other factors in the model.

Reliabilities for all of the multi-item latent variables were calculated. With the initial exception of the centralization measure (CENTRAL), reliabilities for all the latent variables were adequate (see Table 5-2). The centralization measure was problematic. The Cronbach's alpha for centralization was extremely low when using all four centralization items. Factor analysis with only the centralization items revealed that two factors were reflected in the four items. Subsequent LISREL and regression analyses indicated that only items 1 and 4 were significant. LISREL analyses were with all 4 items versus only items 1 and 4 did not modify any of the other parameter estimates or the standardized path estimates. Regression analyses were similarly unaffected. For this reason, only items 1 and 4 were retained. The reliability of the centralization measure, using only items 1 and 4, improved to .50.

The completely standardized solution of the individual parameter estimates provides further support for the model. All of the individual parameters were significant in

the model (see Table 5-3). The financial performance estimates reflected the strongest relationship. These LISREL estimates were consistent with other data analysis.

Analytic Assessment of the Model

The analytic assessment of the model used LISREL 8 (Jöreskog & Sörbom, 1993). Three indicators of goodness of fit were used to confirm the viability of the model. In general, the indicators suggest a viable model. The chi-square (X^2) for this study did not indicate that the probability of the measurement matrix is of the form implied by the model. The chi-square was 236.8 with 169 degrees of freedom ($p < .001$). Since chi-square measures the difference between the sample covariance (correlation) matrix and the fitted covariance (correlation) matrix, a small and insignificant chi-square suggests a better fit between the specified model and data (Jöreskog & Sörbom, 1993; Hayduk, 1989). A zero chi-square, for example, would suggest a perfect fit. It should be noted that the chi-square measure is sensitive to sample size (Jöreskog & Sörbom, 1993; Hayduk, 1989).

The root mean square error of approximation (RMSEA) is a fit measure that takes account of the error of approximation in the population (Jöreskog & Sörbom, 1993). This makes the RMSEA less responsive to sample size than the chi-square measure. According to Browne and Cudeck (1993) the RMSEA represents a measure of discrepancy per degree of freedom. They suggest that a value of 0.05 indicates a close fit and that values up to 0.08 represent reasonable errors of approximation in the population. The RMSEA for this study was 0.06, which suggest that the hypothesized model holds approximately in the population. The third and final measure used to assess goodness-of-fit was the comparative fit index (CFI). The CFI is among a class of fit indices designed to measure

TABLE 5-3

Completely Standardized Solution of the Individual Parameter Estimates
using the
Maximum Likelihood Estimation Method^a

	Centralization	Regulatory Uncertainty	Managerial Ideology (Internal)	Managerial Ideology (External)
Key decisions ^b	.45*			
Influence on decision making	-.77*			
Federal regulations		.40*		
State regulations		.98*		
Local regulations		.42*		
Systematic searching			.68*	
Participative decision making			.73*	
Explaining changes			.62*	
Community involvement				.55*
Addressing social problems				.51*
Meeting societal expectations				.94*
Assessing social performance				.71**

^a N = 102^b item was reverse coded

* p < .05

** p < .01

how much better the model fits as compared to a baseline model, usually the independence model, a model in which all observed variables are uncorrelated (Jöreskog & Sörbom, 1993; Bentler, 1990). Indices in this class are supposed to lie between 0 and 1. These indices are independent of sample size and degrees of freedom, in contrast to the X^2 which performs poorly against the criteria of sample size and degrees of freedom (Marsh, Balla, & McDonald, 1988). Bentler and Bonett (1980) suggest that a value of .90 or higher for the CFI indicates an adequate fit of model to data. The CFI for this study was 0.86 which indicates adequate fit. Table 5-4 shows the goodness-of-fit statistics.

TABLE 5-4
Goodness of Fit Indicators

Measures	Fit Statistics
X^2	236.84
df	115
p	< .01
RMSEA	0.06
CFI	0.87

Hypothesis Testing

Table 5-5 presents the structural parameter estimates for the hypothesized model. Figure 5-2 presents the final structural model with all significant paths and their significance levels. Based on these data, support for the research hypotheses will be discussed in the following sections.

Hypothesis 1a predicted a negative relationship between centralization and innovative intensity. Centralization was operationalized to reflect the degree to which a respondent's firm engaged in delegation and consensus seeking. This variable was reverse coded to

TABLE 5-5
Standardized Path Estimates

Latent Variable	Paths	Standardized Path Estimates
Centralization	Centralization → Innovative Intensity	-.15
Regulatory Uncertainty	Centralization → Breadth of Innovation	-.18
	Regulatory Uncertainty → Innovative Intensity	-.08
	Regulatory Uncertainty → Breadth of Innovation	.21 [†]
Managerial Ideology (Internal)	Managerial Ideology (Internal) → Innovative Intensity	.14
Managerial Ideology (External)	Managerial Ideology (Internal) → Breadth of Innovation	-.31*
	Managerial Ideology (External) → Innovative Intensity	.22 [†]
Slack	Managerial Ideology (External) → Breadth of Innovation	.10
	Slack → Innovative Intensity	-.95
	Slack → Breadth of Innovation	-.18
Innovative Intensity	Innovative Intensity → ROA	.12
Breadth of Innovation	Breadth of Innovation → ROA	.23*

^a N = 101

* p < .05

[†] p < .10

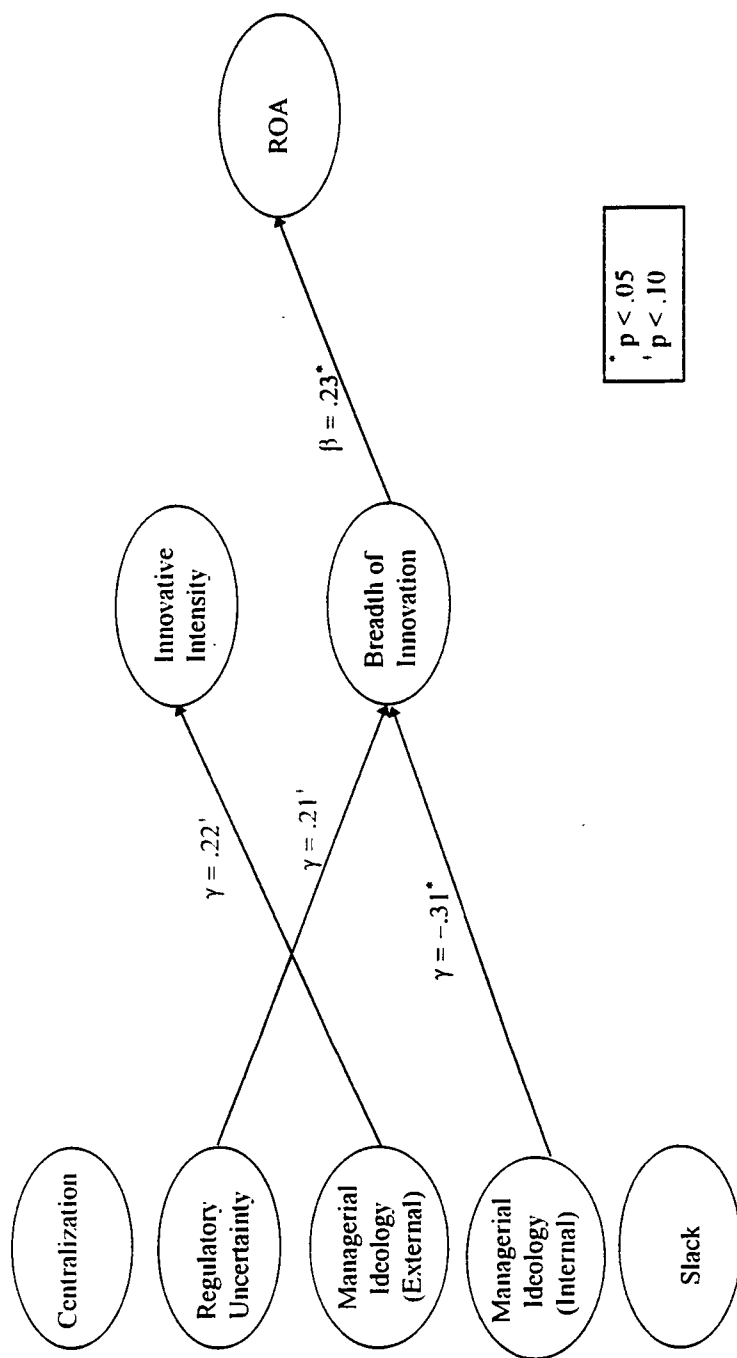


FIGURE 5-2
A Path Model of Innovative Ecological Responsiveness

reflect a high score for a highly centralized organization and vice versa for a decentralized organization. Innovative intensity, on the other hand, measured the number of ecological activities that a respondent's firm had implemented in the past three years. A negative relationship between these two variables implied that firms that were more centralized would engage in fewer innovative activities, thus there would be fewer ecological activities implemented in these firms. Statistical results did not reveal any significant results between these two variables. Therefore, this hypothesis was not supported.

Hypothesis 1b similarly postulated that centralization restricts the breadth of innovative activities that a respondent's firm would have implemented in the past three years. Simply stated, this hypothesis postulated a negative relationship between centralization and the breadth of innovative ecological activities. This hypothesis implied that a more centralized organization would be less likely to implement along a cost continuum a broad range of innovative activities. Since centralization tends to concentrate power and decision-making activities, it was believed that innovation would be limited both in frequency and scope. However, no statistical results supported a significant relationship between centralization and breadth of innovation, thus this hypothesis was not supported.

Hypothesis 2a stated that regulatory uncertainty was positively related to innovative intensity. This hypothesis was rooted in the theory that states that when firms are faced with regulatory uncertainty -- a form of task environmental uncertainty -- then they tend to attempt to create many contingencies. These firms create these contingencies by using resources to implement several alternatives in order to increase their flexibility.

This flexibility means more ecological activities are implemented, and that there would be a positive relationship between regulatory uncertainty and the number of activities implemented. No results supported this relationship, thus this hypothesis was not supported.

Hypothesis 2b was not supported. This hypothesis stated that regulatory uncertainty would be negatively related to the breadth of innovation. The basis for this hypothesis was based on research by Koberg (1987) that asserted that the choice of which activities to pursue depends largely on costs. Consequently, firms will pursue the least costly activities most often which. This reasoning would mean that while firms might initiate a number of ecological activities to create multiple contingencies, they would also tend to implement more low cost ecological activities, thus limiting the range of innovative activities implemented.

A significant positive relationship was found, however, between regulatory uncertainty and breadth of innovation ($\gamma = .21, p < .10$). Regulatory uncertainty and breadth of innovation were significantly related in both the correlation and structural results.

Hypothesis 3a predicted a positive relationship between progressive managerial ideology and innovative intensity. Managerial ideology, defined as a company's explicitly and publicly expressed beliefs and values, was separated into two dimensions after factor analysis results. These two dimensions reflected an internally- and an externally-focused managerial ideology.

A significant positive relationship was found between the externally-focused dimension of managerial ideology ($\gamma = .22$, $p < .10$) and innovative intensity. Thus, partial support for hypothesis 3a was found.

Hypothesis 3b concluded that progressive managerial ideology would be positively related to the breadth of innovation. As such, it was hypothesized that a progressive managerial ideology would encourage "spontaneous entrepreneurship" throughout the organization, thereby, broadening the scope or breadth of innovation. This hypothesis was not supported.

Structural results, however, found a significant negative relationship between progressive managerial ideology (internal) ($\gamma = -.31$, $p < .05$) and the breadth of innovation. This relationship suggest that traditional ideology has a significant impact on the scope of innovative ecological activities that a firm may undertake.

Slack, or the amount of resources a firm has on hand to implement discretionary activities was thought to be positively related to the number of innovative activities implemented by a firm. Hypothesis 4a projected a positive relationship between these two variables. Previous research found high levels of slack to be associated with high levels of innovations or risk-taking. However, data analysis results in this study did not support this hypothesis. Slack was not significantly related to innovative intensity.

Hypothesis 4b stated that there was a positive relationship between slack and breadth of innovation. The primary tenet for this hypothesis is in the body of research that supports the notion that firms with available resource, or slack have more strategic options than firms without resources. In other words, firms with higher levels of slack are able to

develop a broader scope of contingencies. This would, in essence, mean a wider breadth of activities. Contrary to this hypothesis, there was no support for this relationship.

The relationship between innovative intensity and ROA was projected in hypothesis 5a to be negative. Statistical results did not support this relationship. There was no statistical significance found for the path between these two variables.

Breadth of innovation was found to be positive and significantly related to ROA as postulated in hypothesis 5b. This relationship was confirmed ($\beta = .23$, $p < .05$).

Confirmation of this relationship suggest that there is a positive relationship between the scope of activities that a firm undertakes and its economic performance.

Regression Results

Regression analysis was conducted to corroborate the results of the structural analysis. As presented in Table 5-6, the relationships supported by structural analysis are supported by regression analysis. The regression coefficients were also consistent with the relative magnitude of the other relationships in the models.

All three of the models that were analyzed were found to have F statistics significant at the $p < .05$ level. In general, R^2 values were low. The greatest amount of variance explained was 12% in the model where the centralization, regulatory uncertainty, managerial ideology and slack are used to predict innovative intensity.

Summary

This chapter presented the results of the descriptive, correlation, structural and regression analyses. It also included an assessment of the research hypotheses (see Table 5-7). While none of the research hypotheses were fully supported, two hypotheses were

Table 5-6

Results of Regression Analyses^a

Variable	Ecological Responsiveness		Economic Performance
	Innovative Intensity	Breadth of Innovation	ROA
Centralization	-.030	-.002	
Regulatory Uncertainty	.019	.248**	
Managerial Ideology (Internal)	.103	-.173*	
Managerial Ideology (External)	.291**	.065	
Slack	-.063	-.108	
Innovative Intensity			.122
Breadth of Innovation			.232**
F	2.59*	2.21*	3.67*
R ²	.12	.10	.07
Adjusted R ²	.08	.05	.06

^a Statistics are standardized regression coefficients

* p < .05

** p < .01

TABLE 5-7

Summary of Empirical Results

Hypothesis		LISREL	Regression
H1a:	Centralization is negatively related to innovative intensity		
H1b:	Centralization is negatively related to breadth of innovation	Not supported Not supported	Not supported Not supported
H2a:	Regulatory uncertainty is positively related to innovative intensity		
H2b:	Regulatory uncertainty is negatively related to innovative breadth	Not supported Not supported	Not supported Not supported
H3a:	A progressive managerial ideology is positively related to innovative intensity		
H3b:	A progressive managerial ideology is positively related to breadth of innovation	Partially supported Partially supported	Partially supported Partially supported
H4a:	Slack is positively related to innovative intensity		
H4b:	Slack is positively related to breadth of innovation	Not supported Not supported	Not supported Not supported
H5a:	Innovative intensity is negatively related to ROA		
H5b:	Breadth of innovation is positively related to ROA	Not supported Supported	Not supported Supported

.. A significant positive relationship was found

... Relationship held for one dimension of managerial ideology

partially supported. A significant path was found to exist between externally focused managerial ideology and innovative intensity. A second significant path was supported by the data between the organizational antecedents, regulatory uncertainty and internally focused managerial ideology, and breadth of innovation and ROA. The relationship between internally focused managerial ideology and breadth of innovation was negative.

CHAPTER 6

DISCUSSION

The basic purpose of this study was to examine the organizational “antecedents” and “downstream” economic effects of ecological responsiveness in the electric service industry. There were three steps used to achieve this objective. The first was to identify a set of voluntary, non-technology ecological responses available to electric power producers. The next step was to examine the relationship between certain organizational characteristics (or antecedents) and these ecological responses. And the final step was to probe the impact of various patterns of these responses on financial performance.

A comprehensive research model was developed this research, bringing together the fundamental tenets of innovation theory with those of organizational adaptation to (1) extend the body of knowledge for both sets of literature and (2) to provide managers in the electric service industry with additional insights for making decisions about ecological responsiveness. Data to empirically test this model were drawn from industry experts, top managers of electric power produces across the U.S., and archival sources.

The results of the empirical analyses were presented in the previous chapter. Only one of the specific hypotheses was supported directly, though there was partial support for one other. The findings of this study suggest that culture and context have an impact on a firm’s ecological responsiveness which, in turn, effects economic performance. The major findings of this research are summarized in the discussion that immediately follows. After

the findings section, a discussion of their implications will follow. This discussion will then be followed by a section on the limitations of the study. The final section of this chapter will focus on suggestions for future research.

Discussion of Findings

As mentioned above, this study focused on two major sets of relationships, namely the relationship between organizational antecedents and ecological responsiveness, and relationship between ecological responsiveness and economic performance. We will first turn our attention to the first set of relationships and, then, to the second set.

Centralization and Innovative Intensity. Organizational structure was presumed to have a significant relationship with adaptation and innovation. Hypotheses affirming this relationship can be found in both the organizational adaptation and innovation literature. A number of researchers have confirmed the probability of innovation being highest when leadership is democratic and collaborative, and structure is organic rather than mechanistic (Hrebiniak & Joyce, 1985; Koberg, 1987; Lawrence and Dyer, 1983; Mintzberg, 1979; Woodman et al., 1993). In a meta-study of organizational innovation, Damanpour (1991) found a negative relationship between centralization and innovation. He and other researchers have attributed this relationship to a lack of delegation, consensus seeking and collaborative, open communication channels, all of which have been found to foster innovative actions. Contrary to expectations, however, this study did not find evidence to support this relationship.

Perhaps, the lack of a significant relationship between centralization and the other variables in the models was due to one of two reasons, if not both. The first of these two

reasons is construct validity, or the way in which the construct was measured for this study. The two measures of dispersion, variance and standard deviation were examined for the four centralization items. The variance and standard deviation measure for all items were with reasonable limits (see Table 6-1). They were no notable discrepancies observed in these items.

TABLE 6-1
Measure of Dispersion for Centralization Variable^a

	Mean	Standard Deviation	Variance
Item 1: Key decisions ^b	2.59	1.08	1.16
Item 2: Consensus seeking ^b	2.64	.98	.95
Item 3: Information seeking ^b	2.67	1.05	1.11
Item 4: Influence on decision making	3.76	1.08	1.17

^a N = 102

^b item was reverse coded

Results of the factor analysis, however, provide some evidence of the problem.

The four items used to measure this construct loaded on more than one factor. Item 1 did not load over .40 on any factor, while item 4 loaded with the regulatory uncertainty factor.

This suggest that item 4 and regulatory uncertainty measure a similar construct.

Examination of the relevant questionnaire items indicate that the item 4 and regulatory uncertainty may measure a construct concerned with the extent to which an individual believes s/he has control over actions affecting the organization. Additional support for a construct validity problem were evidenced by (1) the factor reliability ($r = .06$) and (2) the LISREL estimates where only two of the four items significantly supported the centralization construct.

The second reason as to why centralization may not have been a significant variable in this research is that only one industry was examined. Previous studies in both the innovation and organizational adaptation literature have typically examined centralization and other structural dimensions of authority, formalization, and complexity across several industries. By focusing on only one industry, organizational structure may not play a significant role. Competition and other market forces may compel firms in the electric service industry to adopt similar structures.

Centralization and Breadth of Innovation. There was also not a significant relationship between centralization and breadth of innovation. The reasons for this outcome may be related to the aforementioned discussion about construct validity and industry constraints.

It was hypothesized that centralization would be negatively related to breadth of innovation. This hypothesized relationship stemmed from Damanpour's (1987) findings that administrative intensity was positively related to the implementation of innovations. He found that tight controls, vertical communication, and the hierarchial delegation of authority in a centralized structure were more likely to influence the implementation of innovations, while the elements of a decentralized structure are more likely to facilitate the initiation of innovations. Thus, centralized structures would tend to be more systematic and deliberate in the innovations adopted by the organization, which would potentially be few in number, but broader in scope.

Regulatory Uncertainty and Innovative Intensity. It was quite surprising that there was not a significant and positive link between regulatory uncertainty and innovative

intensity. Extant organizational adaptation theory holds that decision makers respond to task environmentally induced uncertainty through responses by initiating multiple contingencies in an effort to increase their flexibility, thereby controlling for the uncertainty (Birnbaum, 1984; Ungson et al., 1985; Utterback & Abernathy, 1975; Wernerfelt & Karnani, 1987). This adaptive response stimulates, and even encourages, a plethora of new ideas and behaviors. Therefore, it was hypothesized that the implementation of innovative intensity would be positively related to regulatory uncertainty. Interestingly, regulatory uncertainty had no significant relationship to innovative intensity. Top managers' perceptions of regulatory uncertainty did not influence the number of innovations adopted by a firm.

Regulatory Uncertainty and Breadth of Innovation. Managers' perceptions of regulatory uncertainty did, on the other hand, influence the breadth of ecological innovations implemented. Koberg (1987), Carter (1990) and other structural adaptation theorists found that a firm's response to regulatory uncertainty follows a hierarchical cost continuum. The least costly activities tend to be adopted the most frequently, and the most costly are adopted the least frequently. For this reason, it was hypothesized in this study that in the face of high regulatory uncertainty, electric power producers would more readily adopt a number of low cost ecological innovations. Because these innovations would tend to be lower in cost and cluster toward the lower end of the cost continuum this hypothesized pattern suggested that a negative relationship would exist between regulatory uncertainty and breadth of innovation. The results did not support this relationship. Instead, a positive and significant relationship was supported by the research

data. This finding implies that, in spite, of high regulatory uncertainty, the breadth of ecological innovations adopted by electric power producers tends to be broad in scope and high in cost.

This finding may lend credence to the argument that high task environmental uncertainty forces firms to hedge their bets and spread their resources on several scenarios in order to maintain their flexibility. This finding also suggests that the scope of innovation implemented by the firm, rather than the number of innovations, may be perceived as creating organizational flexibility.

Managerial Ideology and Innovative Intensity. Goll and Zeitz (1991) state that managerial ideology clearly resembles and overlaps with culture, on the one hand, and strategic plans and goals, on the other, since all three contain belief and value assumptions and are meant to guide the firm's actions. These researchers also agree with others (Hartley, 1983; Starbuck, 1982; Wolters, 1981) that ideology provides legitimization both to outsiders and members of the organization. And while theoretically the difference between culture and ideology may be somewhat more clear, on an operational level, because of the ability of both concepts to provide legitimacy for desired courses of action, it is difficult to distinguish between the two concepts. Legitimacy for desired courses of action is said to occur in a number of ways. First, management's beliefs determine how the task environment is conceptualized and assessed. Secondly, values and beliefs interact in the selection of organizational goals and strategies. And thirdly, managerial values and beliefs help to shape policy and individual behavior in the organization. Thus, the amount and type of innovation within an organization is related to top decision makers' values

regarding change (Davis, 1984; Hage & Dewar, 1973; Hambrick & Mason, 1984; Schendel & Hofer, 1979; Shrivatava, 1985; Sturdivant et al. 1985).

Given the profound impact of ideology on the actions of the firm, this study hypothesized a positive relationship between ideology and innovative. Consistent with Goll and Zeitz' research, managerial ideology proved to be a multi-dimensional concept. Factor analysis indicated that the items used in this study separated into two variables. One variable clearly represented management's beliefs and values about the firm's interaction with its external constituents and stakeholders. The other variable represented management's belief and values concerning internal procedures and processes.

Though managerial ideology proved to be multi-dimensional, it was nonetheless expected that both dimensions of the construct would have a significant and positive relationship with innovative intensity. Quite surprisingly, only one dimension of ideology, the external one, had a significant positive relationship to innovative intensity. This relationship implies that an organization with a progressive managerial ideology with an orientation toward external stakeholders might adopt a number of innovations in order to appease these stakeholders, thus attempting to legitimize its position.

Managerial Ideology and Breadth of Innovation. At first glance, the negative link between internal managerial ideology and breadth of innovation was befuddling and counter-intuitive. Research examining administrative intensity, however, provided some insights for these results. As mentioned previously, high levels of administrative intensity were positively related to the successful adoption of innovations. This relationship suggests that since the adoption of innovation depends on the structure, directiveness and

tight coordination characteristic of a mechanistic organization a traditional ideology would be more conducive to implementing innovations. An internal focus coupled with a traditional ideology suggest a greater potential for organizational integration, thus creating a greater potential for synergistic behavior leading to a broader scope of activities being implemented.

Slack and Innovative Intensity. Statistical results showed that slack was insignificant in the model. It was hypothesized that slack would be positively related to innovative intensity. Theorists have found that the amount of discretionary activities a firm engages is positively related to the amount of "cash on hand." Given this established relationship, this study hypothesized that the more slack a company experienced the greater the number of innovative ecological activities it would implement. This was not supported by the research data. No significant relationship was found between slack and innovative intensity.

Perhaps, lack of significance result between these two variable is due to the fact that all of the activities identified are voluntary, and slack is implicit in the implementation of the activities themselves. Although the correlation between slack and innovative intensity was not notably high, however, this relationship may be construed by the adjustment for size used in the calculation of the innovative intensity measure.

Slack and Breadth of Innovation. The relationship between slack and breadth of innovation was also hypothesized to be a positive one. This relationship was not supported by the research data. Again, as with innovative intensity, the relationship

between slack and breadth of innovation may be confounded by the fact that the adoption of an activity, in and of itself, is a measure of organizational slack.

Though not specifically hypothesized in this study, it would have been expected that the magnitude of the relationship between organizational slack and breadth of innovation would have been greater than that between slack and innovative intensity. This reasoning is based on the fact that breadth of innovation focuses on a range of activities from low cost to high cost. Consequently, it would have been expected that the greater the organizational slack the broader the range of innovations that a firm would adopt.

Innovative Intensity and ROA. Innovative intensity was not significantly related to ROA. As stated earlier, all of the activities identified in this study were voluntary. It was thought that these “above-the-line” activities would negatively affect a firm’s economic performance given that they represent discretionary expenditures. Results did not support this hypothesized relationship.

Breadth of Innovation. The positive relationship between breadth of innovation and ROA was expected. Theorists say that organizations that are guided by an internally consistent sense of direction are more likely to be successful (Picken, 1991; Simon, 1964). A wide breadth of innovation suggests that a firm may place more emphasis on the scope and congruency of adaptive responses rather than the number of responses. As such, it may be inferred that there is a more attention placed on creating synergy among the adopted activities which results in better economic performance. The relationship between breadth of innovation and ROA suggests that firms may acquire a competitive advantage

by strategically implementing a broad scope of innovative ecological activities. This finding suggest that the advantage is derived from either creating a synergistic relationship among the innovations or increasing organizational flexibility.

Implications of the Findings

This study adds to a limited body of empirical work in both the organizational adaptation and innovation research. It also helps to show that organizational adaptation and innovation are complementary theoretical explanations for understanding the determinants of organizational innovation and adaptive patterns.

From the standpoint of innovation theory, this study is among a few to empirically examine the link between innovation and economic performance. The significant relationships between managerial ideology and ecological responsiveness, as well as the one between ecological responsiveness and ROA provide useful insights for both academicians and practitioners.

The results suggest that there are organizational determinants that influence the number and scope of innovations undertaken by an a firm. Specifically, this study found regulatory uncertainty and an internally-focused managerial ideology are determinants in predicting the breadth of innovations implemented by a firm which, in turn, have a positive relationship to ROA. A managerial ideology focused on external concerns seemed to be a determinant of innovative intensity. Taken together these findings suggest that (1) a firm's ideological perspective influences its choice of innovative adaptive strategies; (2)

regulatory uncertainty impacts the breadth of innovations adopted rather than the number of innovations; and (3) the number of innovations adopted by a firm is directly related to its economic performance.

Perhaps, the findings of this study may also help to move us a step closer in establishing a contingency theory of organizational innovation. Damanpour (1991) stated that in order to move toward a contingency theory of organizational innovation, the type of organization and the scope of innovation will more distinctively separate the determinants-innovation relations. By “controlling for” both of these elements in this study, it is hoped that the results will help in supporting future efforts to fully understand the contingencies of organizational innovation.

As it relates to organizational adaptation research, this study presents additional data to confirm Carter’s (1990) concerns about the “true” adaptive patterns of firms in turbulent task environments. Her study of small firms called into question the validity of the adaptive pattern that says that firms adapt along a costliness continuum. She called for future research to explore modification in this adaptive pattern. The results of this study suggest that adaptation is not based on costliness (at least, not in monetary terms). Although Firms may adapt along a “costliness” continuum, this study suggests that cost is assessed in ways other than dollars and cents. The positive relationship between regulatory uncertainty and breadth of innovation suggests that in situations of high regulatory uncertainty, firms are more concerned about creating a range of contingencies, rather than the sheer number of contingencies. And while this finding does not fully refute

the structural adaptation research. It does, however, suggest that adaptation under high task environmental uncertainty may be influenced by factors other than cost or any other easily quantifiable measures.

Finally, the findings of this study have several implications for the practitioner. The first of these implications is that managerial ideology and regulatory uncertainty influence the scope of innovative ecological responsiveness that a firm will implement. If a firm has a progressive managerial ideology with a primarily external orientation, then it will tend to adopt numerous low cost innovations; whereas, a firm with a traditional managerial ideology and a primarily internal orientation will tend to adopt a broad range of activities. This antecedent - response pattern suggests that culture and context play an important role in shaping a firm's adaptive strategy. Even more importantly, the pattern of adaptation is positive related to economic performance. Namely, a wide breadth of innovations is associated with a good ROA.

Conventional wisdom in dealing with ecological issues, both in the electric service industry and other regulated industries, says that there is more value in being proactive and preemptive. The results of this study seem to lend some support to this proposition. The positive relationship between breadth of innovation and ROA suggests that when firms implement a wide range of innovations (and note, all of the innovations identified were voluntary), they may create a synergistic effect, thus positively balancing ecological concerns with economic performance.

Limitations of the Study

Although this study provides new insights into both organizational adaptation and organization innovation, the results should be considered preliminary. Many other questions need to be answered about the complex relationships along the causal paths cited. The cross-sectional nature of this study precludes making any definitive inferences about causality. Other researchers (e.g., Damanpour, 1991) have suggested that future studies of organizational innovation be longitudinal and multidimensional.

The complexity of the relationship between the antecedents of organization innovation is evidenced by the fact that the model only explained a small portion of the variance. This suggests that the “true” relationships and causal paths are probably multi-dimensional. Additional empirical research is needed to fully integrate and understand the complexity of the theoretical components of both organization innovation and adaptation.

A final caveat concerns the generalizability of these findings to other industries, especially non-regulated industries. The electric service industry represents a “special case” of an industry facing ecological pressures. Many of the relationships may not hold in less stringently regulated industries. Future studies should examine an industry or set of industries where regulatory concerns are not as high to better understand the relationships predicted by the model in this study.

Suggestions for Future Research

Beyond the implications for further study needed to overcome the limitations of this study, there it is hoped that the current findings will serve as a basis for looking more closely at the way in organizations use innovation to adapt to changing task environments,

as well as the provide insights about the organizational antecedents that condition certain adaptive patterns. The findings of this study suggest that the adaptation of innovation is influenced by managerial ideology and its orientation (either inside or outside the organization). Subsequently, it can be inferred from this study that innovative responsiveness in a firm may be characterized using several archetypes. Additional research is needed to fully develop a typology of the relationship between managerial ideology and ecological responsiveness.

Research involving a more diverse group of companies will help us to better understand whether these archetypes are real or imaginary, as well as whether they provide useful insights into understanding to balance ecological responsiveness with economic performance.

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APPENDICES

APPENDIX 1

COVER LETTER, QUESTIONNAIRE, AND INSERT TO INDUSTRY EXPERTS

UNIVERSITY OF TENNESSEE
KNOXVILLE, TENNESSEE 37996-0545
Department of Management
408 Stokely Management Center

Dear Sir:

Changes in the electric service marketplace are making it more and more difficult for electric power producers to balance environmental responsiveness and positive financial performance. As part of a doctoral research project here at the University, we would like to examine the delicate balance between these two elements. The enclosed questionnaire lists 26 ecological activities commonly implemented by electric power producers. We would like you to take a few minutes to rank order these activities by cost in order for us to gain insights into the issue of the environment and financial performance.

We recognize that the scale of a particular activity in any company would impact costs. However, in ranking these activities, we would like for you to assume a similar scale for each activity in an average-sized company. We would also like you to include in your consideration start-up costs.

We assure you that your input is completely confidential. Your completion of the questionnaire is voluntary, and indicates your willingness to participate in this study. If you have questions, please contact Johnnie Williams by telephone at (205) 837-6511 or by e-mail at jwmse@traveller.com.

A summary of results of this study will be made available to all study participants. Thank you for your assistance.

Sincerely,

William Q. Judge
Associate Professor

Johnnie Williams
Doctoral Candidate

Ranking Ecological Activities

There are a number of non-technology activities that electric power producers may choose in addressing environmental issues. Using the following list of activities, please rank them in ascending order based on cost of implementation with "1" representing the lowest cost activity, and "26" representing the most costly activity to implement. (Please see insert for definitions of any of the following activities.)

A1	Environmental management system(s)	
A2	Environmental compliance division(s)	
A3	"Green" audits	
A4	"Green" funds	
A5	"Green" bonds	
A6	Life cycle/full cost accounting	
A7	Emissions trading	
A8	Voluntary externality adder(s)	
A9	Voluntary DSM (non-technology options)	
A10	Voluntary renewable fuel program(s) (non-technology options)	
A11	Environmental awareness program(s)	
A12	Re-skilling program(s)	
A13	Employee recognition & award program(s)	
A14	Entrepreneur seed funds	
A15	Internal energy management program(s)	
A16	"Buy Green" program(s)	
A17	Recycling program(s)	
A18	Reforestation program(s)	
A19	"Green" publications	
A20	Membership in "Responsible Citizen" program(s)	
A21	Sustainable forestry program(s)	
A22	Voluntary mining reclamation project(s)	
A23	Voluntary constructed wetland project(s)	
A24	External advisory board(s)	
A25	International offsets project(s)	
A26	Acquired or divested a business unit to improve ecological impact	

Definition of Ecological Activities

"Green" charters -- A formal statement, usually issued by the CEO, to guide an organizational commitment to ecologically responsible activities (e.g., "A Strategy for Sustainable Energy Development and Use for Ontario Hydro," NEESPLAN IV).

Environmental management system(s) -- Activities and processes to monitor and control ecological activities both internal and external to the utility (e.g., DSM evaluation systems, internal energy management systems).

Environmental compliance group(s) -- Designated work unit(s) whose primary function is to provide policy support to various other organizational units to ensure organizational compliance with governmental regulations.

"Green" audits -- Voluntary organizational assessments to determine the extent to which the utility has and continues to respond to ecological demands (may be objective or subjective in nature).

"Green" fund(s) -- Investment options (e.g., stocks, annuities, etc.) offered to employees where funds are earmarked for ecologically responsible activities and companies.

"Green" bonds -- Investment options, bonds only, offered to employees where funds are earmarked for ecologically responsible activities and companies.

Life cycle costing -- An accounting system which allows a utility to internalize the associated ecological "costs" of all phases of the electric generation process, ranging from raw material extraction to generation to end-use equipment disposal.

Emissions trading -- EPA policy that allows a utility with several facilities to decrease pollution from some facilities while increasing it from others so long as the total results are equal to or better than previous limits. Utilities that reduce their emissions may "bank" their "credits" or sell them to other companies (EPA, 1989).

Voluntary externality adder(s) -- A method used voluntarily to adjust the cost of energy sources so that utility net benefits are consistent with social (utility plus society) net benefits. In other words, adders are accounting devices designed to correct a perceived bias in the resource planning process against less polluting resources such as DSM and renewables (Hobbs, 1992).

Voluntary DSM -- Non-mandated measures taken by utilities to influence the amount and timing of customer electricity demand.

Voluntary renewable fuel programs (non-technology options) -- Policies, plans and projects designed to promote the voluntary use and development of renewable fuels such as biomass, wind power, landfill methane, municipal solid waste and waste heat to generate electricity.

Environmental awareness program(s) -- Education, public awareness, and training projects aimed promoting the concepts and practices of sustainable energy development.

Reskilling program(s) -- Special training or funds set aside to train employees, especially those who are declared surplus or are employed in areas that are likely to have limited or negative growth, to use new environmental technologies and management practices.

Definition of Ecological Activities (Continued)

Employee recognition & award program(s) -- Monetary or non-monetary awards to individual (s) or team (s) designed to encourage employee participation in identifying and implementing opportunities to promote environmentally friendly practices and technologies.

Entrepreneur seed funds -- Self-financing funds made available to employees who identify opportunities for potential investments that meet clear ecological criteria for and promise substantial savings/profits in a reasonable period of time.

Internal energy management program(s) -- The behavioral component of energy efficiency with targeted training for employees on ways to reduce internal energy use and costs.

"Buy Green" program(s) -- Procurement policies and practices design to encourage the purchase of materials and services that improve energy efficiency and environmental responsibility.

Recycling program(s) -- Corporate and community outreach projects designed to minimize the generation of waste by recovering usable products that might otherwise become waste. Examples are the recycling of aluminum cans, wastepaper, refrigerator/freezers, coal and oil ash, etc.

Reforestation program(s) -- Domestic efforts to ensure that deforested areas equal or exceed the amount of forest lost due to facility construction, including distribution systems.

"Green" publications -- Corporate or community outreach publications design to increase environmental awareness.

Membership in "Responsible Citizen" program(s) -- Efforts to manage the corporate image through cooperative activities with external organizations and associations.

Sustainable forestry program(s) -- Corporate domestic outreach efforts to improve forestry practices.

Voluntary mining reclamation project(s) -- Voluntary efforts to cleanup contaminated and/or damaged lands created by poor mining practices.

Voluntary constructed wetland project(s) -- Domestic efforts to re-create natural swamps, bogs, marshes and other regularly saturated areas in order to ensure biodiversity.

External advisory board(s) -- Formally sanctioned groups of corporate stakeholders who work cooperatively with the utility to address sustainable energy issues.

International offsets project(s) -- Corporate international projects aimed at improving forestry practices, methane recovery and recycling of chlorofluorocarbons (CFCs) in order to offset CO₂ and other greenhouse gases (GHGs) emitted from its power plants.

Acquired or divested a business unit to improve ecological impact -- Activities such as plant closure, purchase of new facilities, etc. to created a more ecologically sustainable corporate portfolio.

APPENDIX 2

**COVER LETTER, FOLLOW-UP POSTCARD, FOLLOW-UP LETTER,
QUESTIONNAIRE, AND INSERT TO TOP MANAGERS**

UNIVERSITY OF TENNESSEE
KNOXVILLE, TENNESSEE 37996-0545
408 Stokely Management Center

Dear ____ (Manager's Name) ____ :

Tremendous changes are occurring in the electric service marketplace. Deregulation of generation, the growing possibility of transmission open access, and rapidly expanding environmental requirements are challenging power producers to find new ways to remain competitive. Many in the industry believe that these changes preclude environmental leadership. Yet, the demands to be environmentally responsible continue to grow. While much has been said, little research has been done to understand how to deal with the environment in an economically positive way. As part of a doctoral research project here at the University, we would like to examine the delicate balance between financial performance and environmental responsiveness. The enclosed questionnaire probes the organizational, regulatory, and financial components of electric power producers across the country in order to gain insights into this issue. Please take a few minutes to complete this questionnaire.

In order that the results of this study be comprehensive and representative, a questionnaire has been sent to other individuals in your company. Whenever possible we would like to incorporate the perspective of the chief operating, financial and regulatory/environmental officers in each company. Your completion of the questionnaire is voluntary, and indicates your willingness to participate in this study. If you are certain that you do not wish to participate in this study, please return the blank questionnaire to me along with your name, indicating that you do not wish to participate.

You may be assured of complete confidentiality. The questionnaire has an identification number for mailing purposes only. This is so that we may check your name off the mailing list when your questionnaire is returned. Your name will never be placed on the questionnaire.

A summary of results of this study will be made available to all study participants.

We would be happy to answer any questions you might have. Please write or call. The telephone number of Johnnie Williams is (205) 837-6511. She may also be contacted by e-mail at jwmse@traveller.com.

Thank you for your assistance.

Sincerely,

William Q. Judge
Associate Professor

Johnnie Williams
Doctoral Candidate

Ten days ago we wrote to you requesting assistance with a doctoral research project to better understand the balance between financial performance and environmental demands in the electric service industry. We have not yet received a completed questionnaire or a returned questionnaire indicating your decision not to participate in the study. If you have since completed and returned the questionnaire, please accept our sincere thanks and apology for contacting you again. If not, could we please ask you to do so within the next few days?

Again, participation is voluntary and responses are completely confidential. If you have questions, please contact Johnnie Williams by telephone at (205) 837-6511 or by e-mail at jwmse@traveller.com.

Sincerely,

William Q. Judge
Associate Professor

Johnnie Williams
Doctoral Candidate

UNIVERSITY OF TENNESSEE
KNOXVILLE, TENNESSEE 37996-0545
Department of Management
408 Stokely Management Center

Dear ____ (Manager's Name) ____ :

About a month ago we wrote to you requesting your participation in a doctoral research project to better understand the balance between financial performance and environmental demands in the electric service industry. While we have received a number of completed questionnaires, our records do not indicate that we have yet receive a reply from you. If you recently returned the questionnaire, thank you very much. If you put my earlier request aside, may we ask you to again consider participating in this research? Your participation is important, as the accuracy and practical value of the findings which emerge from this study are enhanced with the response of each additional individual.

We have enclosed a replacement questionnaire and a pre-paid return envelope should the originals have been misplaced.

Again, participation is voluntary and responses are completely confidential. If you have questions, please contact Johnnie Williams by telephone at (205) 837-6511 or by e-mail at jwmse@traveller.com. We look forward to receiving your response and to adding your name to those who have already responded and requested a copy of the summary results of this research.

Sincerely,

William Q. Judge
Associate Professor

Johnnie Williams
Doctoral Candidate

SURVEY
OF
ELECTRIC POWER
PRODUCERS'
ENVIRONMENTAL
ACTIVITIES

Survey # _____

SECTION 1: Organizational Structure

The delegation of authority to make decisions is said to affect the activities that are implemented in a company. Using the following scale, to what extent do the following assertions apply to your company?

- 1 means you strongly disagree with the statement**
2 means you moderately disagree with the statement
3 means you are indifferent toward the statement
4 means you moderately agree with the statement
5 means you strongly agree with the statement

(Circle your answer)

C-1	Key decisions are delegated in this company	1	2	3	4	5
C-2	Consensus on decisions must be reached for action to occur	1	2	3	4	5
C-3	Although one may know what should be done, usually one must seek more information when making decisions	1	2	3	4	5
C-4	I can stop, reverse, or inspire the implementation of decisions in this company	1	2	3	4	5

SECTION 2: Environmental Regulations

Environmental regulations are said to have had a significant impact on the electric power industry. Using the following scale, to what extent do you believe the impact of environmental regulations on your company has changed over the past 5 years?

- 1 means has decreased greatly
- 2 means has decreased slightly
- 3 means has not changed
- 4 means has increased slightly
- 5 means has increased greatly

(Circle your answer)

RU1	The impact of federal environmental regulations on this company	1	2	3	4	5
RU2	The impact of state environmental regulations on this company	1	2	3	4	5
RU3	The impact of local environmental regulations on this company	1	2	3	4	5

SECTION 3: Financial Performance

Financial performance may be assessed in many ways. Some measures are designed to assess operational efficiency, while others are designed to measure business success. Using the following scale, how do you compare your company's current performance in the categories listed below with other electric companies in your region ?

- 1 means lowest 20 percentile
- 2 means from 21 to 40 percentile
- 3 means 41 to 60 percentile
- 4 means from 61 to 80 percentile
- 5 means top 20 percentile

(Circle your answer)

P1	Total sales growth	1	2	3	4	5
P2	Net income to total assets (ROA)	1	2	3	4	5
P3	Overall performance/success	1	2	3	4	5

SECTION 4: Managerial Ideology

The beliefs and values of a company's managers are said to influence the actions of the company. Using the following scale, to what degree do each of the perspectives listed below reflect the explicit and publicly expressed beliefs and values of your company?

- 1 means company strongly disagrees**
2 means company moderately disagrees
3 means company indifferent
4 means company moderately agrees
5 means company strongly agrees

(Circle your answer)

MI1	Systematically searching for opportunities and problems	1	2	3	4	5
MI2	Recognizing the importance of participative decision making	1	2	3	4	5
MI3	Explaining proposed changes to those affected by them	1	2	3	4	5
MI4	Offering individual fulfillment through involvement in community	1	2	3	4	5
MI5	Monitoring opportunities to solve social problems	1	2	3	4	5
MI6	Performing in a manner consistent with the philanthropic expectations of society	1	2	3	4	5
MI7	Viewing philanthropic behavior as a useful measure of corporate performance	1	2	3	4	5

SECTION 5: Ecological Responsiveness

There are a number of non - technology activities that electric power producers may choose in addressing environmental issues. Using the following list of activities, indicate those activities that your company has implemented in the past three years. Leave blank those activities that your company has not implemented. (Please see insert for definitions of any of the following activities.)

A1	Environmental management system(s)	
A2	Environmental compliance division(s)	
A3	"Green" audits	
A4	"Green" funds	
A5	"Green" bonds	
A6	Life cycle/full cost accounting	
A7	Emissions trading	
A8	Voluntary externality adder(s)	
A9	Voluntary DSM (non-technology options)	
A10	Voluntary renewable fuel program(s) (non-technology options)	
A11	Environmental awareness program(s)	
A12	Re-skilling program(s)	
A13	Employee recognition & award program(s)	
A14	Entrepreneur seed funds	
A15	Internal energy management program(s)	
A16	"Buy Green" program(s)	
A17	Recycling program(s)	
A18	Reforestation program(s)	
A19	"Green" publications	
A20	Membership in "Responsible Citizen" program(s)	
A21	Sustainable forestry program(s)	
A22	Voluntary mining reclamation project(s)	
A23	Voluntary constructed wetland project(s)	
A24	External advisory board(s)	
A25	International offsets project(s)	
A26	Acquired or divested a business unit to improve ecological impact	

Thank You!

Your completion of this questionnaire is greatly appreciated. It will help significantly in understanding ways in which to balance economic concerns with environmental pressures.

Please feel free to use the remainder of this page for any comments, questions, or elaborations on your answers to this questionnaire. Again, thank you for your assistance.

Definition of Ecological Activities

"Green" charters -- A formal statement, usually issued by the CEO, to guide an organizational commitment to ecologically responsible activities (e.g., "A Strategy for Sustainable Energy Development and Use for Ontario Hydro," NEESPLAN IV).

Environmental management system(s) -- Activities and processes to monitor and control ecological activities both internal and external to the utility (e.g., DSM evaluation systems, internal energy management systems).

Environmental compliance group(s) -- Designated work unit(s) whose primary function is to provide policy support to various other organizational units to ensure organizational compliance with governmental regulations.

"Green" audits -- Voluntary organizational assessments to determine the extent to which the utility has and continues to respond to ecological demands (may be objective or subjective in nature).

"Green" fund(s) -- Investment options (e.g., stocks, annuities, etc.) offered to employees where funds are earmarked for ecologically responsible activities and companies.

"Green" bonds -- Investment options, bonds only, offered to employees where funds are earmarked for ecologically responsible activities and companies.

Life cycle costing -- An accounting system which allows a utility to internalize the associated ecological "costs" of all phases of the electric generation process, ranging from raw material extraction to generation to end-use equipment disposal.

Emissions trading -- EPA policy that allows a utility with several facilities to decrease pollution from some facilities while increasing it from others so long as the total results are equal to or better than previous limits. Utilities that reduce their emissions may "bank" their "credits" or sell them to other companies (EPA, 1989).

Voluntary externality adder(s) -- A method used voluntarily to adjust the cost of energy sources so that utility net benefits are consistent with social (utility plus society) net benefits. In other words, adders are accounting devices designed to correct a perceived bias in the resource planning process against less polluting resources such as DSM and renewables (Hobbs, 1992).

Voluntary DSM -- Non-mandated measures taken by utilities to influence the amount and timing of customer electricity demand.

Voluntary renewable fuel programs (non-technology options) -- Policies, plans and projects designed to promote the voluntary use and development of renewable fuels such as biomass, wind power, landfill methane, municipal solid waste and waste heat to generate electricity.

Environmental awareness program(s) -- Education, public awareness, and training projects aimed promoting the concepts and practices of sustainable energy development.

Reskilling program(s) -- Special training or funds set aside to train employees, especially those who are declared surplus or are employed in areas that are likely to have limited or negative growth, to use new environmental technologies and management practices.

Definition of Ecological Activities (Continued)

Employee recognition & award program(s) -- Monetary or non-monetary awards to individual (s) or team(s) designed to encourage employee participation in identifying and implementing opportunities to promote environmentally friendly practices and technologies.

Entrepreneur seed funds -- Self-financing funds made available to employees who identify opportunities for potential investments that meet clear ecological criteria for and promise substantial savings/profits in a reasonable period of time.

Internal energy management program(s) -- The behavioral component of energy efficiency with targeted training for employees on ways to reduce internal energy use and costs.

"Buy Green" program(s) -- Procurement policies and practices design to encourage the purchase of materials and services that improve energy efficiency and environmental responsibility.

Recycling program(s) -- Corporate and community outreach projects designed to minimize the generation of waste by recovering usable products that might otherwise become waste. Examples are the recycling of aluminum cans, wastepaper, refrigerator/freezers, coal and oil ash, etc.

Reforestation program(s) -- Domestic efforts to ensure that deforested areas equal or exceed the amount of forest lost due to facility construction, including distribution systems.

"Green" publications -- Corporate or community outreach publications design to increase environmental awareness.

Membership in "Responsible Citizen" program(s) -- Efforts to manage the corporate image through cooperative activities with external organizations and associations.

Sustainable forestry program(s) -- Corporate domestic outreach efforts to improve forestry practices.

Voluntary mining reclamation project(s) -- Voluntary efforts to cleanup contaminated and/or damaged lands created by poor mining practices.

Voluntary constructed wetland project(s) -- Domestic efforts to re-create natural swamps, bogs, marshes and other regularly saturated areas in order to ensure biodiversity.

External advisory board(s) -- Formally sanctioned groups of corporate stakeholders who work cooperatively with the utility to address sustainable energy issues.

International offsets project(s) -- Corporate international projects aimed at improving forestry practices, methane recovery and recycling of chlorofluorocarbons (CFCs) in order to offset CO₂ and other greenhouse gases (GHGs) emitted from its power plants.

Acquired or divested a business unit to improve ecological impact -- Activities such as plant closure, purchase of new facilities, etc. to created a more ecologically sustainable corporate portfolio.

VITA

Johnnie Williams was born in Memphis, Tennessee. She grew up in urban communities in both Memphis and Chicago, Illinois.

After graduating with honors from White Station High School in Memphis, she enrolled in Rollins College in Winter Park, Florida. She received a Bachelor of Arts degree from Rollins with a dual major in Biology and English. She later received a Master of Science in Planning from the University of Tennessee in Knoxville (UTK).

While completing the Ph.D. in Business Administration at UTK, she has worked in a number of positions, including serving as an environmental manager at one of the largest electric power producers in the U.S. Her most recent position was as a college professor teaching management courses, including strategic management and international business.