FACTORS INFLUENCING THE ADOPTION OF ADMINISTRATIVE INNOVATIONS

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ABSTRACT

The purpose of this dissertation was to investigate the influence of selected environmental and organizational factors on the adoption of administrative innovations in order to better understand strategic adaptation by organizations. General systems theory, various organizational theories, strategic adaptation and management theories, and adoption and diffusion of innovation literature were used to develop a theoretical framework to address four primary and sixteen secondary hypotheses. The administrative innovation used for this study was the magnet hospital concept for enhancing attraction and retention of registered nurses in order to address a persistent workforce shortage in U.S. hospitals. Secondary data related to U.S. hospitals from the American Hospital Association, Bureau of Health Professions, and American Nurses Credentialing Center was used to test hypothesized relationships employing logistic regression methods.

It was found that the groups of environmental and organizational influences singularly and jointly influenced adoption of administrative innovations supporting strategic management theory. It was also found that organizational influences were more salient than environmental influences theoretically supporting the resource based view of the firm in strategic adaptation. Specifically, it was found that environmental and organizational complexity, community resources, and control of domain were all positively and

significantly associated with adoption of administrative innovations versus competition, network externalities, slack resources, and external communications network that were not significant. The control variables of size of hospital and type of hospital were both positive and significant.

Scholars can use these results to extend knowledge of each of the factors investigated and a number of additional factors that were identified in different settings incorporating moderators, mediators, and additional controls employing longitudinal designs. Particularly compelling is the need for future research on the influence of these factors in different stages of the adoption process and in different phases of the diffusion process. Practitioners can use these findings to assess the potential for successful adoption of the magnet concept by their hospitals and to better plan their strategy for addressing persistent workforce shortages.

DEDICATION

This dissertation is dedicated to my beloved wife Nena Frost Sanders, RN, DSN who has been my constant inspiration as a scholar and as my partner in this life's journey. Her unending encouragement and support made this part of the journey possible as it has all that has gone before. This work is also dedicated to my dearly-loved children, Kimberly and Kennan, whose understanding support has sustained me. I hope this work will be an inspiration to them in their journey.

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LIST OF ABBREVIATIONS

AHA	American Hospital Association
ANCC	American Nurses Credentialing Center
ARF	Bureau of Health Resources Area Resource File
GST	General Systems Theory
HRSA	Health Resources and Services Administration
MSA	Metropolitan Statistical Area
MSV	Market Structure View
RN	Registered Nurse
RBV	Resource Based View

CHAPTER I

INTRODUCTION

The purpose of this dissertation is to investigate the influence of environmental and organizational factors on the adoption of administrative innovations in order to better understand strategic adaptation by organizations. This study will test a model relating a set of selected environmental and organizational factors to the adoption of an administrative innovation. The administrative innovation that will be studied is the magnet hospital concept for enhancing recruitment and retention of registered nurses (RNs) by U.S. hospitals (McClure & Hinshaw, 2002).

This chapter provides an introduction to the study. Background on the problem to be addressed is first reviewed and then the research problem is formally stated. The theoretical framework that guided the research is then described. Next, the program of study is reviewed and the research questions are presented. Terms are then defined, scope and limitations are addressed, and assumptions are explained. Finally, the justification and rationale for the study is presented.

Background

The United States (U.S.) health care system is in the midst of a shortage of RNs (Buerhaus, Staiger & Auerbach, 2003). The current shortage was estimated to number some 125,000 to 150,000 nurses near the turn of the millennium and was amply documented in a number of national studies (AHA, 2001; AHA, 2002; AONE, 2002;

Buerhaus, Staiger & Auerbach, 2000; Gelinas & Bohlen, 2002; HRSA, 2002; HRSA, 2006; JCAHO, 2002; Kimball & O'Neil, 2002; Salsberg, 2003). This shortage had risen to approximately 220,000 nurses in 2005, some 10% below demand (HRSA, 2006). It has been estimated that there will be a shortage 15% below needs totaling some 410,000 nurses by 2010 (HRSA, 2006). Recent projections indicate this shortage growing to a deficit of approximately one million nurses by 2020, meeting only 64 percent of projected demand (HRSA, 2006). These projections represent a worsening deficit from the 800,000 (or 71% of projected demand) nurse shortage projected in 2002 for 2020 (HRSA, 2002). While cyclical shortages of nurses have been a recurrent problem since the late 1940's (Feldstein, 1999), the latest shortage has been characterized as an "impending crisis" facing the U.S. health care system in general and hospitals in particular, since hospitals are the nation's largest employer of nurses (Herman, Olivio & Gioia, 2003).

U.S. hospitals are in need of innovative solutions to address the persistent problem of nursing shortages. One institutionally focused innovation that has evolved over the past 20 years to attract and retain RNs is the concept of magnet hospitals (McClure, Poulin, Sovie & Wandelt, 1983). Magnet hospitals implement a set of organizational practices that have been shown to increase hiring, reduce turnover, and improve the quality of patent care among other positive outcomes (McClure & Hinshaw, 2002). In 1993, a formal program for attaining designation as a magnet hospital was established by the American Nurses Credentialing Center (ANCC), an affiliate of the American Nurse's Association (ANCC, 2002). While substantial scholarship has been devoted to nurse, hospital, and patient outcomes of adopting the magnet hospital concept,

little research has focused on factors influencing adoption of this administrative innovation (McClure & Hinshaw, 2002). Research to identify factors influencing adoption of the magnet hospital concept as an administrative innovation is needed.

Scholarship related to strategic adaptation is useful to understanding adoption of innovations as an important mechanism for aligning organizations and their environment. Organizations are engaged in a continuous process of strategic adaptation to environmental forces in order to survive (Kast & Rosenzweig, 1985; Ginter, Swayne, & Duncan, 2002). Adaptation requires that organizations make strategic choices concerning initiatives they will undertake, using their organizational capabilities, to achieve alignment with their environment (Child, 1997; Barney, 1991). These choices can involve development of novel responses (i.e., inventions) to environmental demands (Rogers, 2003) and/or mimicry of apparently successful responses by other organizations (i.e., imitation) (Abrahamson, 1991). Which responses are selected and whether they can be successfully enacted by a particular organization depends on a number of factors specific to the organization and its environment (Kimberly & Evanisko, 1981; Hamel & Prahalad, 1994). Insight into environmental and organizational factors that influence innovation adoption is informative to better understanding strategic adaptation by organizations.

An innovation is a change to a social system that involves introduction of new ideas, technologies, processes, or other alterations that are new to the social system (Rogers, 2003). As noted, innovations can be novel new ideas or adoption of changes already used by other organizations (Rogers, 2003). The adoption of an innovation is a process that unfolds through a series of identifiable stages (Cooper, 1998; Wilson,

Ramamurthy & Nystrom, 1999; Rogers, 2003). While there are a number of different schema of the adoption process (Zaltman, Duncan & Holbek, 1973; Cooper, 1998), one of the most widely adopted models views adoption as, "the process through which an individual or other decision-making unit passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and confirmation of this decision" (Rogers, 2003: 168). This definition suggests that the five stages of knowledge, persuasion (i.e., feasibility), decision, implementation, and confirmation capture the innovation adoption process (Rogers, 2003). Thus, innovation adoption involves a series of choices over time that cumulatively lead to embracing and assimilating an innovation or abandoning further consideration at one step in the process. Each stage provides inputs to the next stage and also serves as a potential rejection point. While each of these stages represents a potential outcome in the adoption of an innovation, it is successful completion of the implementation stage that validates that adoption took place and lays the foundation for continuing adoption that represents the confirmation stage. Understanding factors that influence successful implementation of an innovation are particularly important in understanding adoption of an innovation.

Statement of the Problem

The problem addressed in this dissertation is the need to improve understanding of the influence of environmental and organizational factors on the adoption of administrative innovations in order to better understand strategic adaptation by organizations. A number of studies have examined an array of factors influencing the

adoption of administrative innovations with some findings inconsistent with theoretical expectations and/or inconclusive while a number of new factors need to be investigated in terms of their explanatory influence (Kimberly & Evanisko, 1981; Damanpour, 1991). In addition, administrative innovations have been understudied compared to other types of innovations and more sophisticated multivariate studies are needed to better under the joint effect of influential factors (Ravichandran, 2000; Rogers, 2003). Finally, no empirical studies have been found that examine the influence of environmental and organizational factors on adoption of the magnet hospital concept as an adminisrative innovation. As a consequence, a useful contribution to the scholarly literature can be made by examining the influence of carefully selected environmental and organizational factors on adoption of the magnet hospital concept as an administrative innovation. This research study seeks to address this need.

Theoretical Framework

The phenomenon of interest in this study is the adoption of innovations by organizations. The research proposition underlying this study is that environmental and organizational factors (Kimberly & Evanisko, 1981) influence innovation adoption by organizations (Cooper, 1998, Wilson, Ramamurthy, & Nystrom, 1999). General system theory (von Bertalanffy, 1968; Kast & Rosenzweig, 1985), organization theory (Hannan & Freeman, 1977; Pfeffer & Salanick, 1978; DiMaggio & Powell, 1983), strategic choice (Child, 1972, 1997) and strategic management theory (Learned, Christensen, Andrews, & Guth, 1965; Mintzberg, Ahlstrand & Lampel, 1998; Ginter, Swayne, & Duncan, 2002),

and diffusion of innovation (Rogers, 2003) literature provide the theoretical basis for this study.

General Systems and Organization Theory

Organizations are engaged in a continuous process of adaptation to attain and maintain favorable positioning relative to their environment (Emery & Trist, 1965; Lawrence & Lorsch, 1967; Thompson, 1967). As social systems that are subsystems of their larger environmental suprasystem (Katz & Kahn, 1978; Kast and Rosenzweig, 1985), organizations must attain and maintain alignment with their environmental suprasystem because of their dependence on it for resources necessary for survival (Pfeffer & Salanick, 1978). Factors in an organization's environmental suprasystem exert selection pressures that can lead to survival or extinction depending on whether the organization is positioned in a favored environmental niche (Hannan & Freeman, 1977) or otherwise achieves competitive advantage (Porter, 1980). Favored environmental positions are explicitly sought by organizations via the strategic choices they make (Child, 1972; Andrews, 1987; Child, 1997). Thus, organizations are continuously engaged in an iterative process of adaptation to changes in their external environment in order to survive (Ginter, Swayne, & Duncan, 2002).

Strategic Choice

In order to sustain resource transactions with their environment, organizations make strategic choices concerning alternative actions they will take to adapt to environmental forces (Child, 1997). These choices can involve development of novel

responses (i.e., invention) to environmental demands (Rogers, 2003) and/or mimicry of apparently successful responses by other organizations (Abrahamson, 1991). Indeed, explicit institutional pressures are exerted on organizations by relevant actors in their environment that encourage isomorphic conformance to established patterns set by other organizations in coping with environmental demands (DiMaggio & Powell, 1983). Which responses are selected and whether they can be successfully enacted by a particular organization depends on a number of factors specific to an organization (Hamel & Prahalad, 1994). For example, transaction costs economics (Williamson, 1981) and interorganizational networks (Jaffee, 2001) are influential in strategic choice as is the ability of an organization to overcome its own structural inertia in implementing adaptive change (Hannan & Freeman, 1984).

Strategic Management

Strategic management theory suggests that organizations engage in both intentional formulation of planned strategies and unintentional formation of emergent strategies that are synthesized into the actual strategy realized by an organization as it seeks to align its internal capabilities with its external possibilities (Mintzberg & Waters, 1985). The strategic management process, popularized by the design school of management theorists (Mintzberg, Ahlstrand & Lampel, 1998), maintains that organizations should analyze their external environment for threats and opportunities and examine their internal capabilities for strengths and weaknesses. These analyses then provide the basis for formulating deliberate strategies to mitigate weaknesses and threats,

while capitalizing on organizational strengths to exploit opportunities (Learned, Christensen, Andrews, & Guth, 1965).

Strategies are derived from the relative dominance or blending of two streams of intellectual thought concerning the role of external forces and internal capabilities (Shortell & Kaluzny, 2006). The market structure view (MSV) suggests that organizations seek to take advantage of or mitigate the impact of the structure of markets and the conduct of competitors via their strategies (Porter, 1980; 1985). In the resource based view (RBV) theorists see organizations as bundles of resources that represent capabilities and core competencies that can be used to create sustainable competitive advantage by favorably positioning organizations in their environment based on their unique capabilities, resources, activities, structures, and other distinctive factors (Barney, 1991; Hamel & Prahalad, 1994; Barney, 2001). Strategies derived from these different views reflect the relative salience of external and internal factors to an organization.

Strategic Adaptation and Innovation

Both organization theory and strategic management theory suggest that environmental and organizational factors are salient in the adaptation process. The adaptation process primarily involves organizational actions that seek alignment of organizations with environmental demands. Strategic choice is the process by which organizational powerholders decide upon courses of strategic action and undertake initiatives within their network of internal and external organizational relationships, through proaction and reaction, to implement these choices (Child, 1997: 45-46). Initiatives chosen by organizational powerholders may be novel new actions and/or

mimicry of actions taken by other organizations, both of which represent innovations (Rogers, 2003). Thus, adoption of innovations by organizations is an important adaptive mechanism for reconciling organizations and their environment to achieve strategic "fit" (Black, 2003; p. 158). Thus, understanding environmental and organizational factors that influence the adoption of innovations is important to understanding organizational adaptation or fit.

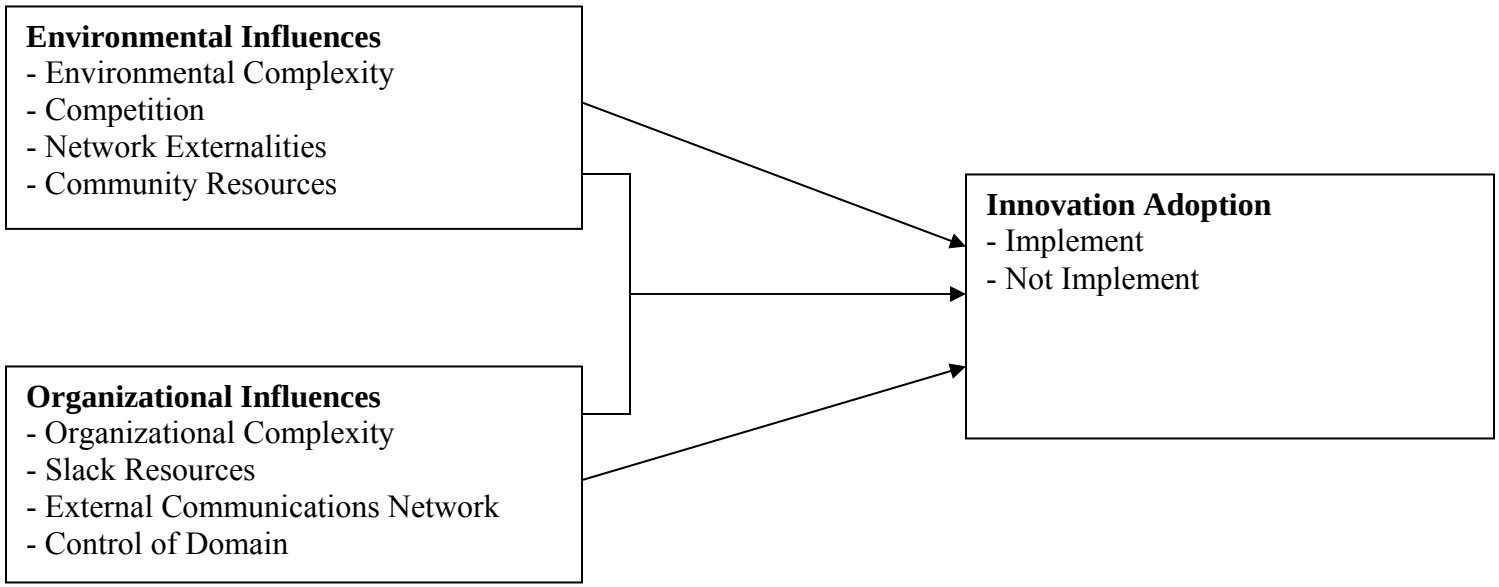
In summary, environmental and organizational factors are salient in the adaptation of organizations to their environment. The adoption of innovations is a means of achieving adaptive fit. The adoption of innovations by organizations is a process consisting of multiple stages. Successful implementation is the key stage indicating adoption of an innovation. Thus, understanding the influence of environmental and organizational factors on the implementation stage of adoption will be informative to better understanding strategic adaptation by organizations.

Program of Study

The problem addressed in this study is the influence of environmental and organizational factors on adoption of administrative innovations in order to better understand strategic adaptation by organizations. In accord with the theoretical framework described above, Figure 1 depicts relationships between environmental and organizational influences and innovation adoption. Based on a review of scholarly literature, the variables of environmental complexity, competition, network externalities, and community resources were used to capture environmental influences on innovation adoption at the implementation stage. Common health services research and health

economics data (i.e., suburban/urban location, Herfindal Index, percentage of other adopters in market, health professionals/1000 population) from secondary sources, such as the American Hospital Association Annual Survey (AHA) and the Bureau of Health Manpower's Area Resource File (ARF), were used to measure each of these variables. Likewise, organizational complexity, slack resources, external communications network, control of domain, size, and hospital type were used to capture organizational influences on adoption. Again, common health services research data (i.e., number of services, occupancy, system membership, RNs/bed, number of beds, for-profit or not-for-profit status) were used to measure these variables. Rogers' (2003) implementation stage was used to capture the adoption process. The measure of adoption was obtained from the American Nurses Credentialing Center (ANCC) related to whether a hospital was designated as a magnet hospital or not during the study period. Data were obtained for U.S. hospitals for the period 1999-2004. Logistic regression methods were used to determine both the significance and direction of the association of environmental and organizational factors collectively and individually with innovation adoption.

FIGURE 1
Environmental and Organizational Influences on Innovation Adoption



Research Questions

To facilitate studying the influence of environmental and organizational factors on adoption of administrative innovations in order to better understand strategic adaptation, the following research questions were posed:

1. What, if any, influence do environmental factors have on innovation adoption? If environmental factors are influential, which environmental factors significantly influence innovation adoption and what is the direction of this influence?
2. What, if any, influence do organizational factors have on innovation adoption? If organizational factors are influential, which organizational factors significantly influence innovation adoption and what is the direction of this influence?
3. If environmental and organizational factors both influence innovation adoption, is one set of factors more influential than the other? If one set is more influential, which set is more influential?
4. What, if any, influence do environmental and organizational factors, acting jointly, have on innovation adoption? If environmental and organizational factors are jointly influential, which of the environmental and organizational factors significantly influence innovation adoption and what is the direction of this influence?

Definition of Terms

For purposes of this study, the following terms have been defined theoretically and operationally.

An *innovation* is any idea, object or practice that is perceived as new by members of a social system (Rogers, 2003). Innovation encompasses internally generated and/or

externally embraced changes in technology, products, programs, processes, and systems, including administrative and organizational practices, among other possible changes that are new to an adopting organization (Damanpour, 1991).

Administrative innovations or organizational innovations are a subset of innovations that focus on programs, processes, practices, and systems related to management of the organization (Kimberly & Evanisko, 1981; Damanpour, 1991; Rogers, 2003). In the context of this study, the magnet hospital concept, as operationalized by the ANCC Magnet Recognition Program (2002), was considered an administrative innovation.

The *innovation adoption process* is defined as, "the process through which an individual or other decision making unit passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and confirmation of this decision" (Rogers, 2003: 168). For purposes of this research Rogers' fourth stage of implementation was used to capture the adoption process

The *implementation stage* occurs when an organization actually puts an innovation into use (Rogers, 2003). In this study, successful implementation was operationally measured by whether a hospital was formally designated as a magnet hospital by the ANCC Magnet Recognition Program (2002).

Influential or determinant factors of adoption are considered to be phenomena that sway an organization in adoption of an innovation (Kimberly & Evanisko, 1981). Factors are categorized as environmental or organizational influences or influence factors in this study.

Environmental influences or influence factors are characteristics of the context out of which an organization emerged and/or within which it operated that are influential in innovation adoption (Kimberly & Evanisko, 1981). Environmental influences investigated in this study were environmental complexity, competition, network externalities, and community resources.

Environmental complexity seeks to capture a composite of the environmental forces acting on an organization (Dansky, Milliron, & Gamm, 1996; Kimberly & Evanisko, 1981). Forces in an organization's environment create contingencies to which the organization has to respond (Ravichandran, 2000). Typically these forces are viewed as creating an environmental context that is either turbulent or stable depending on the intensity and interplay of these forces (Mintzberg, 1979). For purposes of this research, this factor was operationally defined as location and was measured by whether a hospital was located in a less urban (i.e., Micropolitan) or more urban (i.e., Metropolitan) area (Alexander, D'Aunno, & Succi, 1996; Dansky, Milliron, & Gamm, 1996; Krein, 1999; Molinari, Alexander, Morlock, & Lyles, 1995).

Competition seeks to capture the contention between organizations for acquisition of resource inputs and disposition of production outputs within market areas (Bernstein and Gauthier, 1998; Feldstein, 1999). In this study, competition was operationally defined as the ratio of a hospital's market share to that of competitors as measured by the hospital's Herfindahl Index (Ginn & Young, 1992; Tami, 1999; Trinh & O'Connor, 2000).

Network externalities seek to capture the number of adopters of an innovation, particularly competitors, in place at any given time and the impact this has on the

adoption decision of other potential adopters (Kraut, Rice, Cool, & Fish, 1998). For purposes of this study, this factor was operationally defined as the presence of other adopters in a hospital's market area (i.e., county) and was measured as the percentage of competitors in the market that had already adopted the magnet hospital concept (Krein, 1999).

Community resources seeks to capture the availability of critical resources in an organization's environment. Physician supply per thousand population has frequently been used in the health services research literature to measure workforce resource availability in a community (Alexander, D'Aunno, & Succi, 1996; Bigelow & Mahon, 1989; Krein, 1999; Zajac & Shortell, 1989). Given the focus of this study, community resource availability was operationalized as the healthcare workforce within a hospital's market as measured by the number of health professionals per thousand population within its county.

Organizational influences or influence factors are characteristics of organizations that are influential in innovation adoption (Kimberly & Evanisko, 1981). Organizational determinants investigated in this study were organizational complexity, slack resources, external communications network, control of domain, size and type of hospital.

Organizational complexity seeks to capture the overall scope of an organization's operations in terms of its degree of specialization, functional differentiation, and degree of professionalism (Damanpour, 1991). In this study, organizational complexity was defined as a hospital's scope of services and was measured by the number of services offered by the hospital (Gautam & Goodstein, 1996).

Slack resources seeks to capture the resources an organization has available beyond what is required to maintain ongoing operations (Damanpour, 1991). Slack resources have been noted as a critical factor in analyzing strategic options open to hospitals (Bigelow & Mahon, 1989). In this research, slack resources were measured by hospital occupancy percentage (Provan, 1987; Glandon & Counte, 1995; Krein, 1999).

External communications network seeks to capture the degree of interaction and embeddedness of an organization with other relevant elements in its environment representing the degree of consequent conformity pressures (Damanpour, 1991). In this research, this factor was operationally defined as network participation and was measured by whether a hospital was a member of hospital system (Krein, 1999; Wheeler, Burkhardt, Alexander, & Magnus, 1999).

Control of domain refers to the means and extent power is exercised by professional participants in an organization to secure and protect an arena of professional decision-making and activity and to promote fidelity to professional standards (Flood & Scott, 1978; Flood & Scott, 1987). The greater the control of domain of a professional group, such as nursing, the greater the influence they exert over outcomes relevant to their professional arena, such as adoption of the magnet hospitals concept. This factor was defined as a hospital's nursing supply in this study and was measured by the number of RNs per bed in operation at the hospital (Alexander, D'Aunno, & Succi, 1996; Wheeler et al., 1999).

Size of hospital is a measure of the scope of operations and was included as a control variable because of the ambiguous relationship of this factor to innovation adoption (Kimberly & Evansiko, 1981). Size of a hospital was operationally defined as

number of beds and is measured by the number of staffed beds in operation (Alexander, D'Aunno, & Succi, 1996; Gautam & Goodstein, 1996; Trinh & O'Connor, 2000; Wheeler et al., 1999).

Type of hospital ownership was used as a control variable due to differing objectives attributed to for-profit versus not for-profit hospitals relating to financial versus quality maximization (Feldstein, 1999; Marsteller, Bovbjerg, & Nichols, 1998; Jones, DuVal, & Lesparre, 1987). Type of hospital is operationally defined as for-profit or not for-profit status and is measured dichotomously (Alexander, D'Aunno, & Succi, 1996; Trinch & O'Connor, 2000; Wheeler et al., 1999; Zajac & Shortell, 1989).

The *magnet hospital concept* is a set of organizational practices implemented by a hospital that are intended to influence the behavior of RNs such that they choose to initiate and remain in an employment relationship with the hospital (McClure & Hinshaw, 2002). These practices are summarized as the fourteen "Forces of Magnetism" Urden & Monarch, 2002: 106).

A *magnet hospital* is a U.S. hospital that has been formally designated by the American Nurses Credentialing Center Magnet Recognition Program as successfully implementing a number of administrative, clinical, and professional development practices consistent with the magnet hospital concept (ANCC, 20025) based on the fourteen "Forces of Magnetism" (Urden & Monarch, 2002: 106).

The *American Nurses Credentialing Center (ANCC)* is the professional standards organization sponsored by the American Nurses Association that operates the Magnet Recognition Program to establish standards and conduct evaluation reviews to award formal designation as a magnet hospital (ANCC, 2005).

Scope and Limitations

There are a number of limitations that inherently constrained the scope of this study. First, only selected U.S. hospitals were included in the study. Second, this was essentially a cross-sectional study using only hospitals designated or redesignated by the ANCC as a magnet hospital in different years between 1999 and 2004 and non-designated hospitals for 2004. Third, only ANCC designated magnet hospitals were included in this study. There could have been hospitals that implemented magnet practices that did not seek ANCC designation. Fourth, only a limited number of organizational and environment factors were included in the study to capture the impact of these influences. Fifth, no moderators or mediators that might have influenced adoption were explicitly considered in the study. Sixth, there was no consideration of preceding or concurrent innovations that might have also influenced adoption of the magnet hospital concept. Finally, it is possible that there were conditions that were not controlled that could have influenced results. However, the variables and their measures used in this study are those commonly found in other studies of hospitals in the organizational, health economics, and health services research literature and the methods employed are believed to be appropriate based on the available data and the research objectives.

Assumptions

There are a number of assumptions that underpin this study. First, a nursing shortage is an environmental and organizational issue that is sufficiently salient to

hospitals to require a strategically adaptive response. Second, the U.S. nursing shortage was a salient issue to hospitals during the period 1999 to 2004. Third, hospitals will adopt administrative innovations to address a nursing shortage. Fourth, the magnet hospital concept is perceived by hospitals as an administrative innovation that addresses a nursing shortage. Fifth, hospitals are influenced by a number of environmental and organizational factors when adopting innovations to address a shortage of nurses. Sixth, organizational and environmental factors can be identified that influence adoption of the magnet hospital concept by hospitals. Seventh, the multi-stage process hospitals use to decide to adopt an administrative innovation can be adequately captured by the implementation stage of the process. Eighth, organizational and environmental factors and successful implementation can be operationalized and measured. Ninth, the selected variables and measures operationalizing the environmental and organizational factors and adoption are valid for the purposes of this study. Finally, important variables are not omitted that might significantly influence results.

Justification and Rationale

This research advances understanding of the influence of specific organizational and environmental factors on the adoption of administrative innovations. Of particular importance, this research helps clarify the role of influence factors with ambiguous prior findings and explores emergent factors. In addition, this research specifically examined these influence factors relative to adoption decisions in health care organizations. Significantly, the proposed study is the first empirical contribution to the literature on

factors influencing adoption of the magnet hospital concept as an administrative innovation.

This research makes several particularly useful contributions to the scholarly literature. First, conceptually linking influential factors and adoption using organization theory, strategic management, strategic choice, and innovation literatures in framing this research and formulating hypotheses provides a useful theoretical synthesis. Second, use of both organizational and environmental factors and their joint influence on innovation adoption contributes an analysis of multiple determinants that is needed in the adoption literature. Third, this research contributes to better understanding the adoption of administrative innovations that have been understudied compared to adoption of other types of innovations (Kimberly & Evanisko, 1981; Damanpour, 1991; Ravichandran, 2000). Fourth, this study contributes to better assessing the potential for successful adoption of innovations by organizations, identifying where adoption difficulties may be encountered, and targeting interventions to better facilitate adoption. Fifth, this study also makes a unique contribution by providing the first scholarly research on adoption of the magnet hospital concept as an administrative innovation.

From the standpoint of managerial practice, this research also makes several useful contributions. First, this research contributes to identifying those organizations that are suitable candidates for adoption of the magnet hospital concept as an administrative innovation to address workforce shortages. Second, this research will facilitate successful adoption by allowing administrators to assess the readiness of their organizations to adopt such innovations and thereby anticipate the problems and successes that they might expect in such adoption efforts. Third, better understanding

factors that influence the adoption of innovations can help administrators make more prudent resource allocation decisions and thereby contribute to controlling rising health care costs. Finally, better understanding innovation adoption will help administrators enhance the survival prospects for their organizations by better aligning their strategies to salient organizational and environmental factors.

Summary

Organizations face the need to constantly adapt to the demands of their environment in order to survive. Adaptation requires making strategic choices concerning actions an organization will take to align with environmental demands. Adaptive actions inevitably involve introducing changes to an organization. These changes may be novel inventions by the organization or imitational mimicry of adaptive responses by other organizations. In either case, these changes represent innovations adopted through a multi-stage process. Understanding the environmental and organizational factors that influence adoption of innovations via the adoption process is useful to better understanding strategic adaptation.

This study examined a theoretical model that relates a number of environmental and organizational factors to innovation adoption. Because of a pervasive shortage of RNs in U.S. hospitals, adoption of the magnet hospital concept as an administrative innovation that has proven effective in recruitment and retention of nurses was used to test this model. This research will advance scholarly understanding of innovation adoption as a means of strategic adaptation and assist managers in facilitating adoption of administrative innovations in general and the magnet hospital concept in particular.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

This chapter reviews literature relevant to the proposed research study. First, historical background on the adoption and diffusion of innovations is reviewed. Also reviewed in this section is literature related to the U.S. nursing shortage and the magnet hospital concept. Second, the literature is reviewed by relevant components including literature related to: (a) strategic adaptation; (b) innovation adoption and diffusion; (c) the adaptation – innovation linkage; (d) type of innovation; (e) factors influencing innovation adoption; and (f) the innovation adoption process. Third, what is known and unknown from the literature is summarized in accord with the research model for this study. Finally, the contribution that this research is expected to make to the literature is addressed.

History of the Topic and Problem

This section provides a brief historical overview of innovation scholarship as an introduction to the topic of interest to this study, namely factors influencing the adoption of administrative innovations. The need for additional research to clarify ambiguous relationships and investigate emergent factors is identified as the problem of interest to this research. Next, the U.S. nursing shortage and magnet hospital concept are addressed

to provide background information on the administrative innovation that will be used in this research.

Innovation Adoption

Innovation is critical to the competitiveness and survival of organizations (Harris, 2002; Roberts 2002; Schumann, Prestwood, Tong & Vanston 1994). Innovation is generally viewed as any idea, object or practice that is perceived as new by members of a social system (Rogers, 2003), and as such encompasses both internally generated and/or externally embraced changes in technology, products, programs, processes, and systems, including administrative and organizational practices, among other possible changes that are new to an adopting organization (Damanpour, 1991). By way of distinction, adoption of an innovation can be viewed as a process encompassing the identification, acceptance, and implementation of an innovation, whereas diffusion of an innovation refers to the number of adopters in place at a given point in time (Rogers, 2003).

Innovation research is a product of scholarship over the past century. Innovation research began in 1903 when the French sociologist Gabriel Tarde identified the "S – shaped" curve that represents the cumulative adoption time path or temporal pattern of the diffusion process of an innovation among a group of potential adopters (Rogers, 2003). Modern innovation research can be traced to the early 1940s and the work of two sociologists, Ryan and Gross, who studied the diffusion of hybrid corn seed among Iowa farmers (Rogers, 2003). These researchers verified that the rate of adoption of the new hybrid seed followed the S-curve model and, when classified according to the amount of time it took different farmers to adopt the new seed, identified different categories of

adopters (Ryan & Gross, 1943). These findings energized research related to adoption and diffusion of innovation, sparking interest by scholars in a wide variety of scientific fields in the following decades (Rogers, 2003).

Out of this vast scholarship, innovation research of interest to this dissertation can be generally classified into two streams of scholarly literature, namely whether innovation adoption should be regarded as a discrete event or a process (Cooper, 1998). Advocates of innovation adoption as a discrete event view innovation as occurring when resources are committed and risk is assumed (Cooper, 1998). Studies in this line of research tend to focus on predictors of implementation such as organizational characteristics (e.g., firm size, age, type), contextual characteristics (e.g., market concentration, industry maturity), and/or individual characteristics of decision makers (e.g., education, tenure, position) (Kimberly & Evanisko, 1981; Cooper, 1998). The second stream in innovation adoption literature is the process of innovation perspective which argues that innovation occurs in a series of identifiable stages (Cooper, 1998; Wilson, Ramamurthy, & Nystrom, 1999). Different scholars have identified different numbers of stages in this process, ranging from as few at two to as many as twenty-one and have noted differences in the sequence of stages and iteration between stages in some cases (Zaltman, Duncan & Holbek, 1973; Cooper, 1998). It should be noted that the event and process streams of research are not necessarily in opposition to each other. For example, event advocates do not necessarily ignore the process involved in innovation adoption as much as they focus on only one stage in the process, usually the implementation stage (Cooper, 1998). Indeed, it has been noted that organizations which successfully innovate follow a similar pattern of steps or phases such that those imitators

that fail to follow these phases will run the risk of failure of their innovation (Burgelman & Sayles, 1986).

Studies of adoption of administrative innovations generally have not considered the entire adoption process (Frambach & Schillewaert, 2002) because of the complexity inherent in delineating each and all of the stages in the process (Wilson, Ramamurthy, & Nystrom, 1999). Many studies have focused on a single dichotomous adoption/non-adoption decision at one stage as the outcome variable, such that research considering the different steps or stages in the adoption process are limited (Kimberly & Evanisko, 1981; Olshavsky & Spreng, 1996; Wilson, Ramamurthy, & Nystrom, 1999) even though it has been noted that determinants of the innovation process may differ at each stage (Wilson, Ramamurthy, & Nystrom, 1999).

The Nursing Shortage and Magnet Hospital Concept

This section reviews literature related to the U.S. nursing shortage and the magnet hospital concept. The magnet hospital concept for recruitment and retention of RNs is the administrative innovation used to test the research model in this study. The magnet hospital concept evolved in response to a persistent shortage of nurses in the U.S. health care delivery system and, as such, represents an administrative innovation that organizations can use to adapt to this environmental problem.

Registered Nurses are the largest group of healthcare providers in the U.S. healthcare delivery system and hospitals are the largest employers of this workforce (AACN, 2002). In a 2002 report, the nursing workforce was estimated to be approximately 2.7 million members with only 82 percent or 2.2 million actively

employed in the healthcare system (AACN, 2002). That same year, the Health Resources and Services Administration (HRSA) predicted a 20 percent shortage of RNs to meet the needs of the U.S. healthcare system within a decade, which translated into an unprecedented shortage of more than 400,000 RNs (HRSA, 2002). More recent estimates by HRSA have raised the predicted shortage to approximately a million RNs by 2020 (HRSA, 2006).

Hospitals have experienced cyclical shortages of RNs since the 1940s when the demand for graduate nurses began to grow at a steady pace (Feldstein, 1999). While the latest shortage is only the most recent in a persistent pattern, it has been characterized as an "impending crisis" (Herman, Olivio & Gioia, 2003) due to the convergence of a number of demographic, institutional, and cultural factors that have not been seen before (Berliner & Ginsberg, 2002; Buerhaus & Staiger, 1999; Janiszewski-Goodin, 2003; Wiener & Tilly, 2002).

A number of factors have coalesced to create and perpetuate a nursing shortage. Hospital vacancy rates for RNs have been increasing since the mid-1990's according to a General Accounting Office (GAO) report that found both an increase in RN vacancies and time to fill RN positions (GAO, 2001). In 1999, the RN vacancy rate was nine and one half percent and rose to thirteen percent in 2001, and was projected to reach fifteen percent in 2003 (AHA, 2001). Aside from this trend, the Bureau of Labor Statistics projected there will be growth in demand for new and replacement RNs of 25.6 percent from 2000 to 2010, which translates to slightly over 500,000 additional nurses needed (Salsberg, 2003). In addition, RNs are one of the fastest aging health professions. Their

average age increased by 5.4 years from 1989 to 1999 to an average age of 43, with nursing school faculty even older at an average age of 54 (Salsberg, 2003).

The current U.S. nursing shortage is believed to have begun in the mid-1990's (Buerhaus, Staiger & Auerbach, 2003) and has been amply documented in a number of studies (AHA, 2001; AHA, 2002; AONE, 2002; Gelinas & Bohlen, 2002; HRSA, 2002; HRSA, 2006; JCAHO, 2002; Kimball & O'Neil, 2002; Salsberg, 2003). The HRSA estimated this shortage to number some 168,000 RNs in 2003 (HRSA, 2006) approximately nine percent below demand. Other researchers have projected that this shortage could result in a shortfall 20% below projected RN requirements by 2020 (Buerhaus, Staiger & Auerbach, 2000). Recently, available data indicate the nursing shortage continues (Buerhaus, Staiger, & Auerbach, 2004). Re-entry of older nurses into the workforce, a rise in the number of foreign-born nurses, growth in nursing school graduates, and increased numbers of males entering nursing have raised supply to provide some relief. Some projections still indicate a shortage of at least 600,000 to 800,000 nurses by 2020 (Buerhaus, Staiger, & Auerbach, 2004), several times the current shortage. Indeed, the most recently available projections from HRSA indicate a shortage of one million nurses by 2020 with only 64 percent of the demand for RNs being met (HRSA, 2006). Regardless of the source of the projections, the existing RN shortage in the U.S. healthcare system is forecasted to significantly intensify.

A number of adverse outcomes have been documented as arising from a shortage of RNs. For example, such shortages have been found to negatively impact quality of nursing care, undermine the profession's efforts to raise educational credentials, undercut efforts to improve working conditions and employment terms, and discourage potential

entrants from joining the nursing profession (Aiken, 1990; Aiken & Salmon, 1994). A number of these negative consequences have served to perpetuate and deepen the current nursing shortage.

The magnet hospital concept evolved in response to the pattern of recurrent and persistent U.S. nursing shortages. The magnet concept is a set of fourteen organizational practices that encompass the following characteristics: quality of nursing leadership, organizational structure, management style, personnel policies and programs, professional model of nursing care, quality of care, quality improvement, consultation and resource availability, autonomy, teaching role, community role, image of nursing, interdisciplinary relations, and professional development (Urden & Monarch, 2002). Research findings have indicated that hospitals which implemented the magnet concept were able to avoid, or at least mitigate, the impact of nursing workforce shortages (McClure & Hinshaw, 2002).

A major nursing shortage in the early 1980's gave rise to a movement within the nursing profession to identify hospitals that were able to consistently demonstrate superior staffing outcomes regardless of labor market shortages (McClure & Hinshaw, 2002). It was noted by nursing researchers that, in spite of nursing shortages there were some hospitals, "that were actually experiencing high success rates in their recruitment and retention efforts" (McCluire & Hinshaw, 2002: vii). The American Academy of Nursing provided leadership to a movement to study those hospitals that did not seem to suffer from nursing shortages. In 1981, the Academy of Nursing appointed a task force of leading nursing scholars and practitioners to investigate the practices of those hospitals that were able to create an environment that consistently attracted and retained

professional nurses in order to provide quality patient care, essentially acting as "magnet hospitals" (McClure, Poulin, Sovie & Wandelt, 1983: 2). Specifically, this approach was intended to identify hospitals with a reputation for staff satisfaction, low turnover, and high quality, while operating in competitive labor markets (Buchan, 1999).

Findings of the task force's qualitative research were documented in a landmark 1983 report (McClure et al., 1983) that identified a number of common administrative practices, professional practices, and professional development practices shared by the forty-one magnet hospitals that were studied. These practices were summarized as the fourteen "forces of magnetism" (Urden & Monarch, 2002: 103). The task force concluded that these magnet practices could be adopted and/or modified by other hospitals that wanted to proactively address their nursing shortage. Indeed, these findings provided the basis for a magnet movement that has been underway since 1983.

The magnet hospital concept and its impact has been the subject of extensive research by nursing scholars over the past two decades. Several research streams have emerged over these decades seeking to identify those factors underlying the forces of magnetism in terms of organizational traits, patient care outcomes, and nurse outcomes (McClure & Hinshaw, 2002). Two major streams of research have flowed from the original 1983 study. Kramer and her colleagues have published a succession of articles since the mid-l980s that have focused on the evolution of the magnet concept and changing characteristics of magnet hospitals. Aiken and her colleagues at the University of Pennsylvania's Center for Health Outcomes and Policy have produced a series of studies over the same period that focused on organizational characteristics of magnet hospitals and their impact on both patients and nurses. Finally, there is a small pool of

studies produced by various individual researchers that have supplemented these two major research programs. It has been noted that the McClure et al. (1983) study identified the characteristics of magnet hospitals and that the Kramer and Aiken streams of research demonstrated the importance of these characteristics (Hinshaw, 2002). Aiken concluded that the empirical research that has accumulated over the past two decades has provided, "the evidence base to make magnet hospitals a very promising vehicle for the development of professional nurse practice environments in this country and abroad" (Aiken, 2002: 82).

The Aiken research stream has been particularly important to theoretical understanding of organizational traits creating a professional nurse practice environment to attract and retain RNs. A professional nursing environment has been defined as a practice setting that facilitates nurses, "autonomous decision making and control over a patient's nursing care" (Ritter-Teitel, 2002: 35). Aiken and her colleagues proposed a theoretical framework for explaining organizational traits that lead to superior patient care and nurse outcomes (Aiken & Sloane, 1997a, b; Aiken, Clarke, & Sloane, 2000; Aiken, Sochalski, & Lake, 1997). In this model, nurses serve to create and operate a patient surveillance system to detect adverse events in the patient's health status and to detect and prevent medical errors. To accomplish this task, nurses exercise professional responsibilities for patient care within the organizational structure of a hospital in accord with its policies and practices that either facilitate or constrain the exercise of the nurses' professional responsibilities. The bureaucratic structure of the hospital also provides resource inputs that nurses use, such as the number of nurses and other caregivers (i.e., patient care team) relative to the number of patients (e.g., RN to patient ratio), supplies,

equipment and facilities, and various supportive services. Nurses use these resources within their structural and behavioral environment to provide care that leads to subsequent patient and nurse outcomes.

In the Aiken et al. model (Aiken, 2002) nurse work environment is composed of structural and behavioral dimensions that create the magnet properties of the hospital. The structural dimension relates to the model of care used (e.g., team versus primary nursing, mix of staff, degree of centralization/decentralization of decision-making, policies and practices). The behavioral dimension relates to physician-nurse relations, co-worker relationships, leadership, and autonomy. A combination of these dimensions influences a nurse's ability and time to detect patient problems and initiate remedial action to accomplish patient rescue. Magnet hospitals are seen as having a combination of traits that facilitate patient surveillance and prompt responses to problems in order to achieve better patient outcomes. This combination of traits and the associated improvement in patient outcomes bolsters the environment of professional nursing practice to increase attraction and retention of nursing staff. It is creation of a professional nursing environment that is seen as the basis of the attraction and retention properties of magnet hospitals (Aiken, 2002).

The results of two decades of magnet research have demonstrated a number of positive outcomes from magnet practices (Kramer, 1990; Havens & Aiken, 1999; Scott, Sochalski, & Aiken, 1999; McClure & Hinshaw, 2002). Quality of care studies have indicated that patients experienced, lower mortality rates (Aiken, Smith, & Lake, 1994; Aiken, Sloane, Lake, Sochalski, & Weber, 1999; Aiken, Havens, & Sloane, 2000), fewer complications (Kovner & Mezey, 1999), fewer falls during routine care (Sovie & Jawad,

2001), shorter lengths of stay (Aiken, 2001), reduced number of patient and family complaints (Havens, 2001), and increased patient satisfaction (Aiken, Sloane, & Lake, 1996; Aiken, Sloane, Lake, et al., 1999; Aiken, Havens, & Sloane, 2000, Sovie & Jawad, 2001) in magnet facilities. Nurses have experienced increased job satisfaction (Kramer & Hafner, 1989; Kramer, Schmalenberg, & Hafner, 1989; Kramer& Schmalenberg, 1991; Upenieks, 2000), increased perceptions of productivity and quality of care provided (Kramer & Hafner, 1989), lower burnout rates (Aiken, Lake, Sochalski, & Sloane, 1997), and fewer work-related injuries (Clarke, Sloane & Aiken, 2002; Aiken, Sloane & Klocinski, 1997) in magnet settings. Magnet hospitals have experienced higher Joint Communication on the Accreditation of Healthcare Organizations (JCAHO) ratings, increased ability to attract nurses, increased ability to recruit new nurses, lower turnover, lower vacancy rates, and increased retention of existing staff (McClure & Hinshaw, 2002). Magnet hospitals have not been found to be any more costly than conventional hospitals due to reductions in length of stay, reduced intensive care unit usage, and lower average ancillary costs per day (Aiken, 2001) in conjunction with lower costs of nursing turnover. In addition, other research findings have indicated that magnet practices tend to be durable even when magnet hospitals faced significant internal reorganization (e.g., downsizing) and external reconfiguration (e.g., merger) (Buchan, 1999). Overall, the magnet concept can legitimately be classified as an administrative innovation that represents a significant departure from the state-of-the-art with profound consequences for the delivery of health services (Zinn, Weech & Brannon, 1998).

In 1993, a formal program for attaining recognition as a magnet hospital was established by the ANCC, an affiliate of the American Nurse's Association (ANCC,

2002). This recognition program was intended to assist in communicating to both the public and to prospective RN applicants a hospital's commitment to professional nursing as the basis of high-quality patient care and thereby facilitate attraction of both RNs and patients (Moore & Sharkey, 2001). The number of designated magnet hospitals has increased dramatically, from approximately five in 1997, to 25 in 2000, to 50 in April 2002, to approximately 130 in March 2005 , and to at least 170 by December 2005 (Costello, 2002; ANCC, 2005).

Magnet hospital results have been widely recognized by influential organizations related to the health care industry. The American Hospital Association (AHA, 2002), JCAHO (JCAHO, 2002), and the Voluntary Hospitals of America (Gelinas & Bohlen, 2002) have all recognized the magnet concept and recommended it as an institutional strategy for addressing workforce shortages. In addition, national workforce legislation, the Nurse Reinvestment Act of 2002, has endorsed institutional approaches drawn from magnet principles and authorized funding to assist qualifying hospitals in pursuit of this strategy (Nurse Reinvestment Act, 2003).

The impressive results of the magnet concept to date and the recognition it has been accorded emphasize the need to explore this organizational phenomenon in more detail in order to understand how it might better serve to address the problem of nursing workforce shortages. Examining environmental and organizational factors that influence adoption of the magnet concept facilitated answering the research questions posed for this study and thereby provide findings that will benefit future adoption of this administrative innovation.

Components of the Literature

There are a number of components of the literature that are important to understanding the adoption of administrative innovations. First, literature related to general systems theory (GST), strategic adaptation, strategic choice, strategic management, and selected organizational theories are reviewed for theoretical perspective. Second, foundational literature related to innovation adoption and diffusion is examined. Third, the linkage of adaptation and innovation is explored along with relevant findings from health services research literature specifically addressing this relationship. Fourth, literature addressing type of innovation is considered. Fifth, literature on factors influencing innovation adoption is reviewed with particular consideration of selected environmental and organizational factors and relevant health services literature. Finally, literature related to innovation adoption is reviewed along with related health services literature.

General Systems Theory

General systems theory (GST) as applied to organizations provides the overarching framework for this research. General systems theory is composed of a set of principles concerning the organization and operation of all systems regardless of individual elements or particular context (von Bertalanffy, 1968). A system can be defined as, "an organized, unitary whole composed of two or more interdependent parts, components, or subsystems and delineated by identifiable boundaries from its environmental suprasystem" (Kast & Rosenzweig, 1985: 103). The biologist Ludwig von Bertalanffy first proposed this theory when he observed the increasing complexity of

natural systems. He noted that the aggregation and coordination of multiple interlocking hierarchies of subsystems in nature accumulated into larger more complex systems that were themselves part of even larger more complex systems.

General systems theory has been used to great advantage across a number of different disciplines as a unifying theoretical framework (Baker, 1973; Morgan, 2006). Von Bertalanffy applied GST to both the biological and physical sciences (von Bertalanffy, 1968). Kenneth Boulding applied GST to economics and social sciences (Boulding, 1956) and this work was subsequently extended by other scholars to particular types of social systems, such as government, organizations, and businesses (Thompson, 1967; Katz & Kahn, 1978; Kast & Rosenzweig, 1985). Morgan (2006) used GST as a metaphor for understanding organizations as goal-seeking adaptive social systems.

A key conceptual premise of GST is that open systems are in dynamic interaction with other systems in their environment (Kast & Rosezweig, 1985). A system's environment provides resource inputs that the system (e.g., organization) transforms into outputs desired/demanded by its environment. Resource inputs (e.g., physical materials, money/financing, human effort, and/or information) are obtained from the environment by the organization (Kast & Rosenzweig., 1985). The organizational system then has its own internal subsystems, or operating core (Thompson, 1967) that transforms these resource inputs into outputs (e.g., products, services, satisfactions, social benefits) that are then exchanged with its environment for more inputs as anticipated by resource dependence theory (Pfeffer & Salanick, 1978). A feedback loop running from system outputs back to the organization and system inputs provides information that can be used to identify the need for adjustments to inputs, transformation processes, and/or outputs to

meet environmental requirements (Kast & Rosenzweig., 1985). The environment has certain expectations concerning the outputs that will be produced by the organization, along with the efficiency with which this will occur. Control ultimately involves comparing information about the system's actual transformation of inputs into outputs to expectations and then intervening as necessary to assure expectations are met (Rakich, Longest & Darr, 1992). Organizations as open systems achieve adaptation to their environment via feedback and control process in an iterative cycle of dynamic adjustment that takes place on an ongoing basis (Kast & Rosenzweig, 1985).

Strategic Adaptation and Strategic Management

Strategic adaptation is the process by which an organization aligns itself to its external environment (Child, 1997). The strategic behavior of organizations is shaped by the dual influences of the organization's environment and the organization's own internal capabilities (Ansoff, 1987). Organizations exhibit willful, adaptive behaviors in using their capabilities responding to environmental demands (Oliver, 1991). Thus, environmental determinism and strategic choice are foundational to understanding and explaining organizational adaptation to change (Hrebniak & Joyce, 1985; Oliver, 1991).

Population ecology theory is particularly informative in understanding the influence of environmental determinism on organizations (Hannan & Freeman, 1977). Population ecology is an organization theory which argues that the environment plays a deterministic role in organizational survival and that organizations have limited adaptive capacity to influence their survival (Hurley & Kaluzny, 1987). Population ecology theory draws many analogies to the biological model of natural selection whereby the

environment selects those species that best fit its demands and deselects to the point of extinction those species that are poor fits (Hannan & Freeman, 1977). Those organizational species whose form and functions best match the environment's demands at a given time are rewarded with survival and those that do not are deselected, unless able to quickly adapt and achieve renewed environmental alignment in a favored niche. However, achieving such adaptation is usually very difficult for organizations due the difficulty of learning and implementing new skill sets, processes, and behavioral routines and re-deploying material and financial resources to support such changes (Hannan & Freeman, 1984). The limited capacity of organizations to change in the face of environmentally induced selection pressures is referred to as structural inertia (Hurley & Kaluzny, 1987). The concept of structural inertia is one of the most influential concepts in population ecology theory as it provides a rationale as to why organizations are unable to successfully adopt and/or implement adaptive strategies and are consequently selected or deselected for survival (Kaluzny, 1987). Thus, organizational characteristics are viewed as salient in influencing an organization's potential to respond advantageously to influential environmental demands.

Strategic choice theory (Childs, 1972; 1997) has been offered to explain how organizations achieve alignment with their environment. Strategic choice has been defined as the process whereby power elites in organizations make strategic decisions about courses of action for the organization (Child, 1997). This theory focuses on the ability of an organization to make strategic decisions about how it will position itself relative to its environment or seek to change its environment in order to accomplish its goals given its internal capabilities, competencies, and resources (Shortell & Kaluzny,

1994). The strategic choice perspective has a number of significant similarities to resource dependence theory (Pfeffer & Salanick, 1978) that addresses an organization's resource transactions with its environment and primarily focuses on those volunteeristic actions that organizations take to achieve such transactions (Miles, 1980; Astley & Van de Ven, 1983). Defining these actions requires that an organization have the capacity to understand its external environment in terms relevant to the organization and the cognitive ability to convert this external reality into internal reality (Barnard, 1938; Weick, 1979; Miles, 1980).

With assessment of external threats and opportunities and knowledge of internal strengths and weaknesses, specific strategies can be formulated to achieve objectives that are supportive of the organization's goals (Ginter, Swayne & Duncan, 2002). The strategic choices organizations make lead to adjustment and evolution of organizational structures and processes in response to perceived environmental factors (Child, 1972; 1997). Organizational changes arising from strategic choices represent innovations adopted by organizations since innovations are defined as changes that are perceived as new to a social system (Rogers, 2003), such as an organization. Damanpour (1991) noted that innovation is a means of bringing about change in organizations whether in response to changes in its internal or external environment. Thus, adoption of innovations by organizations is a mechanism for achieving strategic adaptation.

Strategic management is an organizational process for achieving adaptation. Strategic management has been described as a systematic process for positioning an organization within its environment so that continued success is assured and it is able to deal with surprise (Ansoff, 1987). Strategic management theory argues that an

organization engages in both intentional and unintentional formation of strategies that are synthesized into the actual strategy enacted by the organization as it seeks to reconcile internal capabilities with its environmental possibilities (Mintzberg & Waters, 1985). Organizations develop strategies to attain competitive advantage in their relationship to their environment relative to their competitors. The source of competitive advantage is an area of debate in the strategic management literature. Two streams of intellectual thought tend to dominate (Luke, Walston, & Plummer, 2003).

One steam of literature, sometimes referred to as the market structure view (MSV), focuses on external advantages primarily attained via favorable market positioning that increases the market power of an organization relative to its competitors (Luke, Walston, & Plummer, 2003). Drawing on work in industrial and organizational economics, the MSV focuses on industry structures and the conduct of competitors. Market structures refer to the features of markets that influence strategies of competitors, whereas conduct refers to actions or strategies organizations take in response to environmental and market forces (Shortell & Kaluzny, 2006). Porter (1980) described these forces in terms of buyer power, barriers to entry, seller power, and availability of substitutes that collectively determine the level of competitive rivalry in a market. This rivalry consequently defines generic strategies open to organizations such as cost leadership, differentiation of offerings, focus on a niche in the market, or some amalgam that represents a middle road among these strategies (Porter, 1980). Thus, market structure, "is often a major determinant of strategic choice" (Shortell & Kaluzny, 2006: 464).

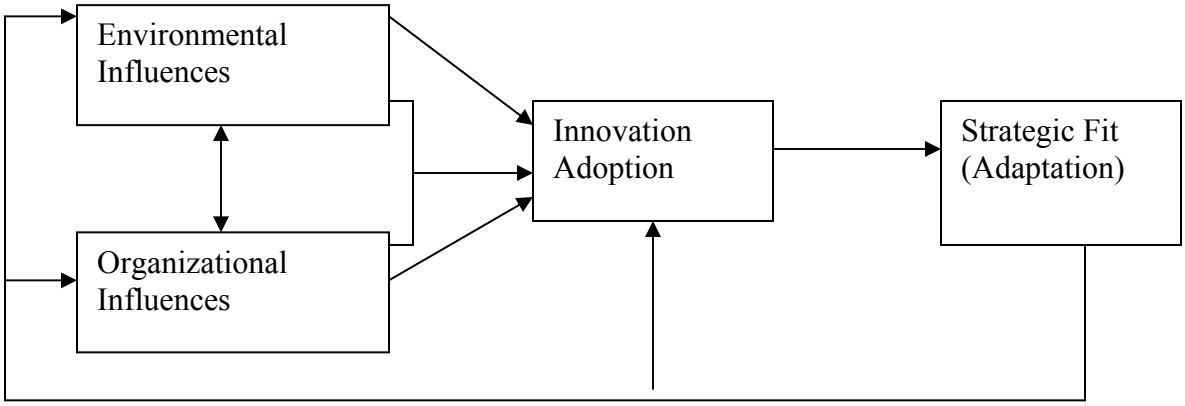
The second strategic management stream, sometimes referred to as the resource based view (RBV), focuses internally on all of the assets, capabilities, organizational processes, information, knowledge, and so forth controlled by a firm that enables it in developing and implementing effective strategies (Barney, 1991). Barney (1991) went on to describe organizations as bundles of physical, human, and administrative capabilities that can create sustained competitive advantage to the degree they are valuable, rare, inimitable, and non-substitutable. Barney (1991; 2001) suggests that intangible resources like organizational culture are a primary source of advantage since they are very difficult to imitate, whereas Hamel and Prahalad (1984) suggest that dynamic capabilities resulting from strategic learning are another primary source of inimitable competitive advantage. Indeed, Porter (1985) argued that competitive advantage flows from improving coordination of internal activities that constitute an organization's "value chain" for producing its outputs.

The strategic management process, popularized by the design school of management theorists (Mintzberg, Ahlstrand & Lampel, 1998), argues that organizations should analyze their external environment for threats and opportunities and examine their internal capabilities for strengths and weaknesses as a basis for formulating deliberate strategies for mitigating weaknesses and threats while capitalizing on organizational strengths to exploit opportunities (Learned, Christensen, Andrews, & Guth, 1965; Ginter, Swayne, & Duncan, 2002). Clearly the MSV informs analysis of external environmental threats and opportunities and the RBV informs analysis of internal strengths and weaknesses for strategy development. Thus, these steams converge to facilitate the ultimate goal of strategic adaptation of achieving alignment or fit between internal

organizational capabilities and external environmental possibilities (Mintzberg, Ahlstrand & Lampel, 1998) while realizing that both of these sources of influence are highly interdependent (Luke, Walston, & Plummer, 2003).

In summary, both organization theory and strategic management theory suggest that environmental and organizational factors are salient in the adaptation process as depicted in Figure 2. The adaptation process primarily involves organizational actions that seek alignment of the organization with environmental demands (Shortell, Morrison, & Friedman, 1990). Strategic choice is the process by which organizational power-holders decide upon courses of action and undertake initiatives within their network of internal and external organizational relationships to implement these choices (Child, 1997: 45-46). Initiatives chosen by organizational power-holders may be novel new actions and/or mimicry of actions taken by other organizations. Since an innovation is a change to a social system that involves introduction of new ideas, technologies, processes, or other alterations that are perceived as new to the social system (Rogers, 2003; Damanpour, 1991), adoption of innovations by organizations represents an important adaptive mechanism for exercising strategic choice in reconciling an organization and its environment to achieve strategic fit.

FIGURE 2
Relationship of Environmental and Organizational Influences to Innovation Adoption and Strategic Adaptation



The Adoption and Diffusion of Innovation

Because of the importance and pervasiveness of innovations to organizations, their adoption and diffusion has been one of the most widely researched and best documented of social phenomena, encompassing literally thousands of articles, books and other publications (Rogers, 2003). Scholars in nearly two dozen academic disciplines including business, geography, education, political science, economics, and other areas have contributed to this literature (Mahajan & Peterson, 1985). This scholarship draws on a core literature of foundational concepts.

In the early twentieth century a French sociologist was the first researcher to plot the "S – shaped" curve that represents the cumulative adoption time path or pattern of diffusion of an innovation over time (Rogers, 2003). The S-curve is an important concept in innovation adoption and diffusion research and has been repeatedly verified in

subsequent studies (Mahajan & Peterson, 1985). This curve results from initial adoption of an innovation by only a few members of a social system, followed in subsequent time periods by acceleration of adoption until slowing as saturation is approached due to adoption by virtually all potential adopters to the point that diffusion is completed (Rogers, 2003). Numerous explanations have been offered to explain the underlying dynamics leading to this distinctive curve, including investment requirements, economic advantages produced, degree of associated uncertainty, supply and demand factors, organizational learning, information transfer dynamics, technological substitution effects, and communications patterns (Mahajan & Peterson, 1985).

The S-curve is the dominant model used to explain the rate of adoption and diffusion of innovations (Mahajan & Peterson, 1985). It is important to note that there can be a number of different S-curves that vary in their slopes. The slope of an S-curve depicts the rate of diffusion of an innovation. Innovations that diffuse rapidly, and thus have high rates of adoption, have steeply sloped S-curves and those with slower rates of adoption have a flatter slope. This curve assumes that there is a fixed ceiling on the number of adopters that remains constant, that there is only one adoption by an adopter, that the adopter either accepts or rejects the innovation, that the innovation is independent of all other innovations, and that all relevant information about the adoption is captured in the model (Mahajan & Peterson, 1985). These assumptions are important, as they are foundational to most studies that have investigated determinants of adoption behavior.

Modern innovation research can be traced to the early 1940s and the work of two sociologists, Ryan and Gross, who studied the diffusion of hybrid corn seed among Iowa farmers (Rogers, 2003). These researchers verified that the rate of adoption of the new

hybrid seed followed the S-curve model. When classified according to the amount of time it took different farmers to adopt the new seed, Ryan and Gross identified fives categories of adopters: innovators, early adopters, early majority, later majority, and laggards (Ryan & Gross, 1943). Each of these categories related to a different segment of the S-curve reflecting the adoption behavior of a particular group of adopters. This early research demonstrated that different diffusion rates existed and that these differing rates accounted for the S-curve and had different determinants related to the context and characteristics of the potential adopters of the innovation. These findings energized research in adoption and diffusion of innovations, sparking interest by scholars in a wide variety of scientific fields in the following decades (Rogers, 2003).

By the 1960's a new generation of innovation research led communication researcher Everett Rogers to capture advances over forty years in various editions of his widely cited book, *The Diffusion of Innovations* (2003). Drawing on studies from a number of academic fields, Rogers contributed a more detailed explanation of the adoption and diffusion of innovations in accord with the S-curve model. Rogers explained that this particular functional form results from a relatively small group of early adopters who conclude that incremental advantages of an innovation exceed disadvantages to yield improvement over what is replaced (Roger, 2003). Since there is uncertainty in adopting an innovation, the risk adversity of potential adopters influences how quickly innovations are adopted. Potential adopters can be classified based on how quickly they adopt an innovation (i.e., innovators, early adopters, early majority, late majority, laggards) which reflects their risk profile. Diversity in risk profiles of potential adopters makes diffusion possible (Rogers, 2003).

If an innovation is successful, it will generally have an adoption pattern over time that assumes the "S-shape" curve (Rogers, 2003). This phenomena is driven by relatively few early adopters that follow the innovators and become the opinion leaders that then influence the early majority group of the utility of adoption until critical mass (Rogers, 2003) or a "tipping point" (Gladwell, 2000) is reached. Once this point is reached, contextual pressures push late majority and laggards toward adoption or face isolation from the social system (Greve, 1998). Indeed, a substantial literature exist on conformity pressures that lead organizations to mimicry in pursuit of fads and fashions in innovations, particularly administrative innovations in these latter stages of the diffusion process (Abrahamson, 1991; Abrahamson & Rosenkopf, 1993; Abrahamson & Rosenkopf 1997).

Knowledge of innovations can come from mass media or from organizational or personal network relationships, with the latter being most influential, particularly if proximal to opinion leaders (Rogers, 2003). Opinion leaders and innovation champions were found to be critical to adoption and diffusion. Likewise, the reception that an innovation receives depends on the social system into which it is introduced. Some social systems tend toward maintaining system norms and thus resist changes (i.e., homophilous systems), while others tend to accept changes to system norms (i.e., heterophilious systems) and are correspondingly more receptive to adoption of innovations (Rogers, 2003).

This sketch of the classic innovation paradigm highlights a number of factors important to studying adoption and diffusion of innovations. First, understanding the risk/uncertainty profile of potential adopters is important to predicting adoption and

diffusion as risk adversity propels the adoption/diffusion process. Second, utility analysis, as reflected by relative advantage trade-off, is integral to early adopter decisions. Third, communication network linkages, both with regard to mass media and interpersonal networks (e.g., proximity to opinion leaders), are important in conveying information about innovations and their acceptance by opinion leaders (e.g., early adopters) that influence other potential adopters. Fourth, inter-organizational embeddedness is important to understanding conformity pressures to adopt innovations. Fifth, the environmental context of adoption is important in terms of social system factors that are critical in understanding receptiveness to adoption and in terms of market factors that influence decisions. Finally, organizational capacity to assimilate an innovation is important to understanding its stage in the adoption process relative to the "tipping point" in adoption and diffusion of an innovation. Assessing the potential for evaluating an innovation on each of these factors is important to using this classic model to understand and predict adoption and diffusion of a particular innovation by adopting units such as organizations.

The Innovation-Adaptation Linkage in Health Care Organizations

Organizations adopt administrative innovations continuously over time to adapt to environmental change (Damanpour, 1991). It has generally been assumed that innovations are adopted to improve the performance or effectiveness of the adopting organizations, although anticipated improvements may not always be realized (Wilson, Ramamurthy, & Nystrom, 1999). Indeed, innovation has been touted as playing a crucial role in securing sustained competitive advantage (Porter, 1980; Cooper, 1998). Because

competitors simultaneously seek to innovate to likewise achieve competitive advantage, organizations must continuously innovate to sustain competitive advantage once it has been attained. Development of the organizational ability to continuously innovate to attain and maintain competitive advantage is viewed as a strategic core competency that is difficult for competitors to imitate and thereby can be a source of sustainable advantage (Hamel & Prahalad, 1993).

The health services research literature empirically supports adoption of innovations as a means of adaptation by health care organizations to achieve advantage. For example, a number of studies support the adoption of different strategies under different environmental conditions. California hospitals adopted different strategies when faced with a doctor's strike in 1975 (Meyer, 1982). Zajac and Shortell (1989) demonstrated that hospitals changed strategies after implementation of the Prospective Payment System (PPS) of reimbursement by Medicare in 1983. In a landmark book-length treatment of their multi-year study of eight hospital systems, Shortell, Morrison, and Friedman (1990) verified how these systems adapted to significant changes in the health care industry. Some hospitals restructured, merged, sold, or closed while making significant shifts in strategic orientations (i.e., prospectors, defenders, analyzers, and reactors) in response to the environmental jolt resulting from implementation of PPS. Ginn and Young (1992) demonstrated that organizational characteristics (i.e., size, system membership, type of ownership, and case-mix severity) were more salient in influencing the business strategy of hospitals than environmental characteristics (i.e., general economic factors, unemployment rate, percent of population over 65, ratio of physicians to population) and that size (i.e., small) and type (i.e., independent, non-

system affiliated) were less likely to follow a proactive strategic orientation. Alexander, D'Aunno, and Succi (1996) found that rural hospitals adaptively responded to avoid closures by converting from acute care to delivery of other health services (e.g., long term care, rehabilitation, primary care, emergency care) in response to environmental factors (i.e., competition of near or distant hospitals providing similar services, small size of community) and organizational characteristics (i.e., poor financial performance, fewer beds, devoting more of their care to areas other than acute patient care, membership in a multi-hospital systems, and non-government ownership). Wheeler, Burkhardt, Alexander, and Magnus (1999) found that diversification into subacute care by hospitals was influenced by resource availability related to environmental factors (i.e., higher per capital income, availability of insurance coverage for subacute services, increased supply of nurses, declines in acute care market) and organization factors (i.e., low occupancy, higher volumes of outpatient care, multi-hospital system membership, small medical staff size, for-profit ownership). Adoption of provider-based rural health clinics by rural hospitals were found to be particularly influenced by bandwagon pressures to imitate other providers because of uncertainty and limited resources for evaluating alternatives versus more proactive adaptive responses (Krein, 1999). Florida hospitals were shown to have adopted more defensive strategies in response to competitive and reimbursement changes (Marlin, Lamont, & Hoffman, 1994).

Organizations adapt to environmental influences by adopting administrative innovations particularly via imitation of other organizations. Adoption of organizational boundary-spanning practices was found to be influenced by institutional pressures from other organizations (Fennell & Alexander, 1987). In a study of adoption of cost

accounting systems by hospitals (Counte & Glandon, 1988), these systems were cited as only one of a number of innovative managerial technologies being adopted by hospital managers to adapt to the challenges of a rapidly changing environment, including actions by other adopters. Other innovations cited by Counte and Glandon (1988: 383) included, "productivity enhancement strategies (e.g., quality circles and other types of participative management programs), comprehensive and integrated patient care information systems, and portfolio investment strategies." A finding of institutional and network conformity pressures influencing adoption of Total Quality Management (TQM) programs by hospitals was demonstrated in a study by Westphal, Gulati, & Shortell (1997). Adoption and abandonment of matrix management organizational structures was found to be influenced by organizational characteristics and imitation of other members of inter-organizational networks (Burns & Wholey, 1993). Arndt (1995) found that Massachusetts' hospitals engaged in restructuring by adopting corporate structures in response to environmental pressures transmitted through their inter-organizational role set. The adoption and extensiveness of reengineering in hospitals was found to be influenced by both institutional and economic pressures from the hospital's environment (Walston, Kimberly & Burns, 2001). These studies all represent examples of adoption of purely administrative innovations in response to environmental demands including institutional influences.

The health services research literature also provides findings supportive of adaptive responses in adoption of clinical innovations that indirectly spawn administrative innovations. Organizational discretion representing strategic choice in adoption of cesarean sections for births was found in California hospitals (Goodrick &

Salancik, 1996). Also, institutionally induced conformity pressures were found to influence decisions to adopt HIV treatment practices in substance abuse treatment centers (D'Aunno, Vaughn, & McElroy, 1999). Hirth, Chernew, and Orzol (2000) found that environmental resource munificence influenced adaptation by dialysis centers. Decreases in payments due to managed care and capitation, led to numerous internal adjustments related to cost reductions, cost-increasing acquisition of new quality-enhancing technologies, and patient amenities. Ownership, chain membership, size, market competition, and regulatory constraints were found salient in influencing use of new technologies.

In summary, strategic adaptation to environmental demands via strategic choice informs understanding of why organizations undertake innovation. This theory is grounded in the presumption that an organization can proactively undertake actions to achieve a desired resource dependence relationship with its environment (Child, 1972, 1997; Pfeffer & Salanick, 1978). However, accomplishing this goal requires a process that systematically analyzes the organization's current positioning relative to demand and that then leads to strategies to make required adjustments primarily through adoption of changes that are new to the organization as a social system. Damanpour (1991: 556) noted that, "Innovation is a means of changing an organization, whether as a response to changes in its internal or external environment or as a preemptive action taken to influence the environment." Thus, adoption of innovations is a major vehicle for strategic adaptation by organizations, including health care organizations.

Type of Innovation

Type of innovation has been suggested as a moderator in the adoption literature (Damanpour, 1991). Different types of innovations have been classified according to several dichotomies: administrative/organizational versus technical, product versus process, and radical versus incremental (Demanpour, 1991). Administrative or organizational innovations typically involve changes in organizational structure and administrative processes versus technical innovations that are related to basic work activities producing products or services, and related technology and systems inherent in the organization's operating core (Damanpour & Evan, 1984; Wilson, Ramamurthy, & Nystrom, 1999). Product innovations involve development of new product or service offerings, or modification to existing ones, to a market that create value versus process innovations that represent internal changes in the transformation of resource inputs into outputs (Utterback & Abernathy, 1975). The degree of change in existing organizational systems, routines, or practices that an innovation demands of an organization can be classified as radical or incremental and thereby influence how readily or reluctantly an innovation is adopted (Dewar & Dutton, 1986). It has been noted that this wide variety of types of innovations do not share the same attributes, are not influenced by the same organizational factors, and that the process of initiation and implementation of these types of innovations differ in significant ways (Wilson, Ramamurthy, & Nystrom, 1999).

General system theory (Kast & Rosenzweig, 1985) is useful in distinguishing different types of innovations based on whether an innovation primarily affects the operating core or the outputs of an organization. Certain innovations, such as administrative/organizational innovations, have their impacts within the organization and

as such usually have an indirect impact on market outputs. Product and/or service innovations primarily relate directly to market outputs, but may have implications for internal organizational processes. Process and technological innovations directly affect the operating core and directly impact market outputs. Thus, proximity to an organization's operating core and market outputs are primary distinguishing characteristics between types of innovations.

The propensity of an organization to adopt an innovation is not constant across all types of innovations (Cooper, 1998). For example, in a study in the banking industry, Subramanian and Nilakanta (1996) found that administrative innovations led to improvements in organizational efficiency, while technological innovations led to improvements in both organizational efficiency and organizational effectiveness. Strategic intent has been suggested to influence which types of innovations are adopted, with a low cost business strategy related to process innovations and a differentiation strategy related to product/service innovations (Porter, 1980). Indeed, structural characteristics (e.g., centralization, size) of an organization have been associated with adoption of process and product innovation (Daft, 1978; Damanpour, 1991). Daft (1978) proposed a dual-core model of innovation which suggested that technological innovation is advantaged in organizations with more organic organizational structures (e.g., low formalization, centralization, specialization) and that more mechanistic structures (e.g., bureaucratic) promote adoption of administrative innovations.

While much research has been done on the correlates influencing adoption of the different types of innovations, Cooper (1998) observed that this research has been largely inconclusive leading to the question of whether the different types of innovations should

be treated as different phenomena or as dimensions of a more complex construct. Indeed some theorists have argued that innovation type is not essential to the construct as organizations ultimately adopt both administrative and technical, product and process, and radical and incremental innovations (Van de Ven, 1986) – frequently at the same time. It has been suggested that congruency between innovation types may be more important than each type alone (Damanpour & Evan, 1984). Damanpour (1991: 583) concluded from examination of a number of studies that type of innovation might not be a primary contingency variable from an organizational effectiveness perspective.

Confusion in the innovation construct has been noted and linked to difficulties in accurately identifying different types of innovations. For example, Cooper (1998) argues that a single innovation can be viewed as technological due to its influence on core output, process due to new techniques deployed within the core, and radical due to the degree to which it departs from existing organizational and industry practices. Cooper (1998) concluded that unidimensional innovation constructs are insufficient to capture the complexity of such innovations and the dynamics of their adoption. This author suggested that a multidimensional definition of innovations that specifies them in terms of attribute combinations from three dichotomies (i.e., administrative versus technological, incremental versus radical, process versus product) may facilitate description of relationships between organizational variables and the adoption of innovation and allow for more cross study comparisons (Cooper, 1998).

Use of Cooper's (1998) multidimensional approach to conceptualizing innovation type is useful to consider differences in the innovation adoption process for administrative/organizational innovations versus product/service innovations. Cooper's

framework emphasizes that all innovation type dimensions are interrelated. To varying degrees, product innovations can influence and/or spur administrative innovations and vice versa. Thus, specifying innovation types unidimensionally is of limited utility. More fine-grained multidimensional specifications are needed. Until these are available, focusing on coarse-grained unidimensional specifications of innovation types is problematical. This finding is important to consideration of innovation type in adoption research.

Factors Influencing Innovation Adoption

This section reviews literature related to factors influencing innovation adoption. Two categories of influences representing environmental and organizational factors are reviewed in depth. Several specific factors in each influence category are discussed because of their theoretical interest as examples of how these factors can be usefully employed to investigate innovation adoption. In addition, moderator and mediator factors and control variables are discussed.

A number of factors can influence adoption of administrative innovations. These factors are typically classified into two groups, determinants and moderators (Damanpour, 1991). In addition, mediators can also be considered as a group of influential factors (Frambach & Schillewaert, 2002). Determinants are factors that are believed to influence the adoption of an innovation and would thus typically serve as independent variables in research models (Trochim, 2001). Moderators affect the direction and/or strength of the relationship between independent and dependent variables while mediators intervene in this relationship (Baron & Kenny, 1986). This review

focuses on what have been viewed as determinant factors with moderator and mediator factors addressed briefly in the concluding part of this section.

A number of direct antecedents of the adoption of administrative innovations have been explored in the literature. A meta-analysis by Damanpour (1991) identified a group of the most frequently studied factors at the organizational level. These factors were: specialization, functional differentiation, professionalism, complexity, formalization, centralization, managerial attitudes toward change, managerial tenure, technical knowledge resources, administrative intensity, slack resources, external communication, internal communication, and vertical differentiation. Damanpour (1991) provided a description of each factor, operational measures, and findings from various studies indicating whether the factor was positively or negatively related to innovation adoption and the strength of these relationships.

Additional influential factors have been identified as influencing adoption of other types of innovations in the literature. For example, it has been suggested that various marketing efforts such as targeting potential early adopters, intensive marketing communications, and adopter risk reduction tactics might be considered as determinants (Frambach, Barkema, Nooteboom, & Wedel, 1998). Social network building tactics to grow inter-connectedness between adopters and potential adopters to increase the degree of information sharing has also been suggested in the literature (Lind & Zmud, 1991). Network externalities relating to the number of adopters in place and the resultant relationship to critical mass or tipping point has been emphasized as important to adoption (Kraut, Rice, Cool, & Fish, 1998). The importance of competitive pressures in fueling innovation adoption has been cited due to its importance in maintaining market

position or risk competitive disadvantage and consequent loss of market standing (Gatignon & Robertson, 1989; Robertson & Gatignon, 1986). In addition, resource munificence in the community or market has been investigated (Trinh & O'Connor, 2000). Strategic orientation of an organization has also been studied where it was found that organizations with aggressive growth strategies were more likely to adopt radical innovations (Wilson, Ramamurthy, & Nystrom, 1999). Kimberly and Evanisko (1981) found that as much as 60% of the variation in adoption of innovation in their study of hospitals was explained by organizational structural factors. In summary, a large number of potential influential factors have been addressed in the literature.

Given the number of potential influential factors, some method of classifying these factors into organizationally relevant categories is needed. Kimberly and Evanisko (1981) used a three category classification scheme (i.e., contextual, organizational, individual) in a study of administrative innovation. The contextual or environmental category was defined as characteristics of the context out of which the organization emerged and/or within which it operated, such as competition, environmental complexity, and age of the organization (Kimberly & Evanisko, 1981). The organizational category was composed of characteristics of the adopting organization and included many of the factors subsequently incorporated in the Damanpour (1991) meta-analysis discussed above. The individual category was defined as characteristics of organizational members in authority positions who were influential in the adoption decision such as job tenure, external relationships, education, policy/job level, attitude toward change. Few studies until the Kimberly and Evanisko (1981) included factors at multiple levels. Environmental and organizational categories of influential factors are discussed in more

detail since individual level factors can be subsumed within the organizational category and since organizational – environmental alignment is the primary focus of this review in accord with the theoretical framework.

Environmental Influence Factors

As noted, environmental or contextual influence factors represent a category of characteristics resulting from the context out of which the organization emerged and/or within which it operated (Kimberly & Evanisko, 1981). Environmental complexity and competition were identified by Kimberly & Evanisko (1981) as key contextual factors. Network externalities relating to the number of adopters in place and the resultant relationship to critical mass or tipping point has been emphasized as important to innovation adoption also (Kraut, Rice, Cool, & Fish, 1998). Environmental munificence as represented by the availability of community resources has also been recognized as an important factor (Trinh & O'Connor, 2000). These factors are reviewed in more detail to demonstrate their utility as a basis for influencing the likelihood of adoption of administrative innovations.

Environmental complexity. This factor deals with the operating environment of the organization that influences and defines its activities (Kimberly & Evanisko, 1981). These authors went on to note that, the importance of an organization's environmental context for innovation has been acknowledged conceptually, but rarely examined empirically. Environmental complexity is similar to the concept of environmental dynamism in organizational contingency theory (Mintzberg, 1979). Environmental

dynamism refers to the rate of change, absence of pattern and unpredictability of the environment (Dess & Beard, 1984). The greater the degree of environmental dynamism, the less effective are bureaucratic organization models and the greater the need for more flexible and adaptive organizational forms (Dressler, 1980; Katz & Kahn, 1978). Thus, on theoretical grounds organizations facing dynamic environments would be expected to be more likely to adopt administrative innovations that facilitate flexibility and adaptation.

There have been a number of empirical studies that have considered environmental complexity surrogates**.** Kimberly and Evanisko (1981) posited environmental complexity as a function of the size of the city in which an organization was located as this would capture a broad representation of the organization's contextual milieu. Empirically, these authors found that size of city was a significant positive predictor of technological innovations adopted by hospitals, but was not significantly predictive of adoption of administrative innovations. In a study examining the relationship between hospital governing board composition (i.e., innovation of adding management and physician insiders to board) and financial performance, Molinari, Morlock, Alexander, and Lyles (1993) used binary indicators for rural (0) and urban (1) location and found urban location to be a significant predictor of financial performance when insiders were on the board. In a study of hospital referrals to home health agencies and vertical integration into home health care services, Dansky, Milliron, and Gamm (1996) measured environmental complexity based on whether a hospital was located in an urban (MSA) or rural (non-MSA) location (dichotomously coded) and found that there was no difference in influence on referrals, but urban location was a significant positive

predictor of vertical integration (i.e., the innovation) into home care by a hospital. In a study of adoption of provider-based rural health clinics, Krein (1999) measured population density in the rural areas and found that it was a significant negative predictor as would be expected in this study due to the nature of this innovation being associated with less environmental complexity. In a study of diversification into subacute care, Wheeler and colleagues (1999) examined the impact of location in rural versus non-rural areas, which was binary coded based on AHA survey designation, and found that it was not a significant predictor, although the sign was positive. In summary, environmental complexity has been measured as location in a number of empirical studies with somewhat mixed, but generally supportive results favoring adoption of innovation in more complex environments.

Competition. Competition is an environmental factor that is widely utilized in health economics and health services research studies (Bernstein & Gauthier, 1998). Competition is viewed as the number of organizations within a market area that vie for acquisition of resource inputs and for disposition of outputs (Feldstein, 1999). Greater competition gives rise to hospitals adopting strategies to achieve competitive advantage (Ginter, Swayne, and Duncan, 2002.) The importance of competitive pressures in fueling innovation adoption has been cited due to its importance in maintaining market position or risking competitive disadvantage and consequent loss of market standing (Robertson & Gatignon, 1986; Gatignon & Robertson, 1989). As a result, on theoretical grounds, greater competition would be expected to lead to greater likelihood to embrace an innovation.

Empirical research is at best mixed on the role of competition in spurring innovation adoption. Kimberly and Evanisko (1981) found competition, as measured by the presence of other hospitals in the area, was significantly associated in a positive direction with hospital adoption of both administrative and technological innovations. In a study of adoption of proactive business strategy by hospitals, Ginn and Young (1992) found that whether competition was measured using the Herfindahl index or each hospital's market share, neither was a significant predictor of proactive strategy adoption. In a study of the determinants of conversion of rural hospitals to non-acute care services, Alexander, D'Aunno, and Succi (1996) used distance to the nearest competing hospital as a measure of competition and found this to be a significant predictor with a negative sign. (These authors noted that extreme distance and low density of competitors for rural hospitals precluded using more traditional measures of competition such as the Herfindahl index and number of other hospitals in the market.) A study of the adoption of TQM programs by nursing homes in Pennsylvania found that a perceptual measure of competition (i.e., 10 point rating scale) was a significant predictor of adoption and that objective measures (i.e., Herfindahl index, excess capacity – unoccupied beds in market) were not significant (Zinn, Weech, & Brannon, 1998). Local market competition was found to be associated with adoption of revenue enhancement strategies by rural hospitals (Trinh & Begun, 1999). In a study of adoption of provider-based rural health clinics, Krein (1999) used a number of measures of competition (i.e., distance to two nearest competitors, hospital market share, HMO penetration, number of rural health clinics) and found none of these to be a significant predictor. In a study of diversification into subacute care, Wheeler and colleagues (1999) found that competition, as measured by the

number of hospitals in the market area, was not a significant predictor of adoption. Overall, competition has been widely used as a factor in investigating adoption of innovation in health services research with mixed results.

Network externalities. Network externalities refer to the number of adopters in place and the resultant relationship to critical mass or tipping point in innovation adoption (Kraut, Rice, Cool, & Fish, 1998). This phenomena is driven by relatively few early adopters that follow the innovators and become the opinion leaders that then influence the early majority group of the utility of adoption until critical mass (Rogers, 2003) or a "tipping point" (Gladwell, 2000) is reached. Once this point is achieved, contextual pressures push late majority and laggards toward either adoption or isolation from the social system (Greve, 1998). Conformity pressures by other relevant organizations can lead a potential adopter to mimicry in pursuit of fads and fashions in administrative innovations in these latter stages of the diffusion process (Abrahamson, 1991; Abrahamson & Rosenkopf, 1993; Abrahamson & Rosenkopf 1997).

Models of diffusion of innovation rely on external linkages. Inter-organizational relationships are foundational to influencing adoption and diffusion of innovations (Mick, 1990). Knowledge of competitor's actions influences an organization to undertake initiatives that lead to changes in structure and processes to the degree necessary to conform to changing practices. The more competitors that have adopted an innovation, the greater the pressure on non-adopters of the innovation to conform. Thus, on theoretical grounds, it would be expected that the more competitors that have adopted an innovation, the greater the likelihood of adoption by non-adopters.

Empirical research appears to be very limited concerning network externalities and adoption of innovations by health care organizations. In a study of adoption of provider-based rural health clinics, Krein (1999) sought to measure institutional conformity pressures and used the percentage of other rural hospitals in the state with provider-based rural clinics as a measure that was found to be a significant predictor with a positive sign. While other studies have posited conformity pressures, they have usually been operationalized in terms of external linkages, which are discussed below. While limited empirical research is available, the one study identified is supportive of the utility of network externalities as an influence on adoption of innovation. More research is needed on this factor.

Community resources. The resource dependence school of organization theory focuses on an organization's ability to secure needed resources from its environment in order to survive (Pfeffer & Salancik, 1978). Resource acquisition needs create dependency on an organization's environment while the organization simultaneously seeks to remain independent resulting in a dependence-independence tension that influences an organization's form and functions (Shortell & Kaluzny, 1994). This perspective assumes that an organization can influence its ability to procure resources and/or reduce dependence and thereby increase the organization's chances of survival (Alexander & Morrisey, 1989).

In order to enhance their capacity for survival, organizations want to protect their operating core (Thompson, 1967) from disruption and avoid increased transaction costs (Williamson, 1981). Dependence – independence tension provides the impetus for

organizations to seek strategies that can advantage them in gaining preferential access to key resources in their environment and/or decreasing their dependence to protect their operating core. Adoption of an innovation provides a potential means of achieving a resource dependence position that will enhance survivability and implies that an organization will take such action as necessary to adjust its structure and processes in order to achieve this positioning. On theoretical grounds, the need for key resources can be expected to increase the likelihood of adoption of an innovation. When operating in a resource munificent environment, an organization might not have to change to improve its chances of survival versus operating in an environment of resource scarcity (Mick, Morlock, Salkever, de Lissovoy, Malitz, Wise, & Jones; 1993).

Environmental resource availability or munificence has been widely examined in empirical studies in the health services research literature. Medicare payer mix was used as a measure of community resources in a study of adoption of hospital cost accounting systems and was not found to be significant (Glandon & Counte, 1995). In a study of adoption of proactive business strategy by hospitals, Ginn and Young (1992) used average family income, percentage of the population over 65, unemployment rate, and physician supply (i.e., physicians/total population) to measure community resources and found that none were significant predictors. In a study of the determinants of conversion of rural hospitals to non-acute care services, Alexander, D'Aunno, and Succi (1996) used market resources (i.e., per capita income in county, number of active physicians in county, total county population, and percent of county population over 65) and found that only county population was significant in a positive direction. Zinn, Weech, and Brannon (1998) found that community resources as measured by Medicare market share,

was a significant predictor of adoption of TQM in nursing homes. Community resources as measured by Medicare reimbursement were found to be associated with adoption of cost containment strategies and other measures of community resource munificence were not found to be associated with adoption of revenue enhancement strategies by rural hospitals (Trinh & Begun, 1999). In a study of adoption of provider-based rural health clinics, Krein (1999) used number of physicians/1000 county population as a measure of community resources and found that it was not a significant predictor of adoption, along with similar findings for per capita county income and percentage of families below the poverty level. In a study of diversification into subacute care, Wheeler and colleagues (1999) measured per capita income in the county and found that it was not a significant predictor of adoption, as was population over 65. Overall, community resources have been examined in a number of empirical studies using a variety of measures. Findings have been somewhat mixed, but community resources have not been salient in many cases. This factor is in need of further investigation.

In summary, further research is needed on the salience of environmental factors influence on innovation adoption. A scarcity of research on network externalities was found, but with the lone study that was identified supportive of adoption. Extensive research on competition was found to yield very mixed results. While results were mixed on environmental complexity, studies tended toward supporting adoption as expected on theoretical grounds. However, while results were also mixed, study results tended toward a negative relationship with adoption for community resources, in accord with theoretical expectations. Clearly, additional empirical research is needed examining these environmental factors.

Organizational Influence Factors

The organizational factors category used by Kimberly and Evanisko (1981) was defined as characteristics of the organization that influenced the likelihood of adoption of an innovation. All of the factors in the Damanpour (1991) meta-analysis discussed above can be classified in this category. Organizational complexity, slack resources, external communications network, and control of domain are suggested on theoretical grounds as key organizational determinants. These factors are reviewed in more detail.

Organizational complexity. This factor can be viewed as either, a distinct concept that seeks to capture the overall scope of an organization's operations or as a composite that combines the concepts of specialization (i.e., diversity of skill sets employed in an organization), functional differentiation (i.e., degree to which an organization is divided into subunits), and professionalism (i.e., use of professional knowledge in different organizational units) (Damanpour, 1991). The population ecology school of organization theory (Hannan & Freeman, 1977) suggests that achieving environmental adaptation is usually very difficult for organizations due the difficulty of learning and implementing new skill sets, processes, and behavioral routines, and re-deploying material and financial resources to support such changes (Hannan & Freeman, 1984). The limited capacity of organizations to change in the face of environmental pressures is conceptualized as structural inertia (Hurley & Kaluzny, 1987). Structural inertia provides a rationale as to why organizations are unable to successfully adopt and/or implement adaptive strategies as their scope increases and they become more complex (Kaluzny, 1987). The difficulty

of changing organizational routines, stakeholder expectations, and existing asset deployments all serve as powerful anchors, to perpetuate the status quo with increased organizational complexity. Organizational complexity can therefore be expected to inhibit or reduce the likelihood of adopting an administrative innovation on theoretical grounds.

Organizational complexity has been examined in a number of empirical studies of innovation adoption in health care organizations. Damanpour's 1991 meta-analysis examined the correlation of measures of organizational complexity with adoption of administrative innovations and found that all three factors (i.e., specialization, functional differentiation, and professionalism) captured in the organizational complexity construct were positively and significantly associated with adoption. In a study of adoption of proactive business strategy by hospitals, Ginn and Young (1992) used case-mix index as a measure reflecting a hospital's capabilities and sophistication and found that it was a significant predictor with a positive sign. (These authors also argued that size was associated with availability of alternative services and thus sophistication of a hospital and found that it was also a significant positive predictor.) Glandon and Counte (1995) found that organizational complexity of a hospital, operationalized as teaching status, was significantly associated in a positive direction with the administrative innovation of adoption of hospital cost accounting systems. In a study of the determinants of conversion of rural hospitals to non-acute care services, Alexander, D'Aunno, and Succi (1996) examined organizational complexity via a hospital's level of specialization (i.e., mean percent of nonacute care beds and non-acute inpatient days) prior to conversion and found that it was a significant predictor of conversion with a positive sign. In a study of

adoption of provider-based rural health clinics, Krein (1999) measured scope of services as availability of innovative services (i.e., home health, hospice, skilled nursing services, and having an organized hospital outpatient department) and found that the availability of any of these services was not a significant predictor of adoption. Overall, organizational complexity has primarily been positively associated with adoption of innovations in empirical health services research, contrary to theoretical expectations.

Slack resources. This factor seeks to capture the resources an organization has available beyond what is required to maintain ongoing operations (Damanpour, 1991). In accord with the contingency school of organization theory, resource munificence can influence organizational form and function (Dressler, 1980). Slack resources enhance an organization's ability to adopt an innovation in two ways. First, surplus resources provide the means to fund implementation. Second, slack resources reduce the risk of adopting an innovation by providing a financial buffer in the event of failure in implementation or failure to realize the anticipated benefits of the innovation (Kimberly & Evanisko, 1981). The availability of slack resources can be expected to increase the likelihood of adoption of an administrative innovation.

Slack resources have been widely studied as a factor influencing innovation adoption in health care organizations. Provan (1987) found that slack resources, measured by occupancy rate, was significantly and positively predictive of adoption of hospital cost containment policies. In a meta-analysis of multiple studies, Damanpour (1991) found a significant positive adjusted correlation between slack resources and adoption of administrative innovations. In a study of adoption of proactive business

strategy by hospitals, Ginn and Young (1992), in a curious operationalization, used hospital size (i.e., number of beds), ownership (for-profit, non-profit), and multi-hospital system membership as measures for slack resources where they found all three measures were significant positive predictors of adoption of proactive strategy. Hospital occupancy was used as a measure of slack resources in a study of adoption of hospital cost accounting systems and was found to be a significant predictor of adoption (Glandon & Counte, 1995). In a study of the determinants of conversion of rural hospitals to non-acute care services, Alexander, D'Aunno, and Succi (1996) used organizational performance (i.e., cash flow, adjusted admissions) to measure slack and found that both were significant predictors with a negative sign. Organizational resources, as measured by Medicare census, were found to be a significant predictor of adoption of TQM programs by nursing homes (Zinn, Weech, & Brannon, 1998). Staffed beds were found to influence adoption of rural hospital strategy with regard to revenue enhancement or cost containment (Trinh & Begun, 1999). In a study of adoption of provider-based rural health clinics, Krein (1999) used a number of potential measures of slack resources (i.e., hospital occupancy, operating margin, and percentage of revenue from Medicare) which were not found to be significant predictors of adoption, but receipt of a rural health transition grant to assist with funding of clinic development was found to be a significant positive predictor. In a study of diversification into subacute care, Wheeler and colleagues (1999) used cash flow as a measure of slack resources and found that it was not a significant predictor of adoption, but expenses and growth in beds were significant predictors with a positive sign and outpatient revenue and occupancy were significant with negative signs. (Interestingly, an interaction term of ownership and cash flow was a

significant positive predictor.) Overall, empirical studies are generally supportive of slack resources as a factor positively influencing adoption of innovations in health care organizations.

External communications network. The institutional school of organization theory posits a linkage between an organization and a portion of the larger social system that serves as the organization's environment (Dimaggio & Powell, 1983). According to institutional theory, the rules, norms and expectations of the larger system influence patterning of the structure and processes of an organization in order for it to be recognized as legitimate and worthy of support from this larger social system (DiMaggio & Powell, 1983; Meyer & Rowan, 1977). Rather than focusing inward on maximizing technical efficiency or focusing outward to optimize exchange transactions with its environment, the organization seeks recognition and support from relevant external entities (Kraatz & Zajac, 1996). An example of patterning in order to conform to the "rules, beliefs, and norms" of external entities is illustrated by conformance to "professional standards, laws, licensure and accreditation requirements" (Shortell & Kaluzny, 1994: 24). Similarity in conformance by organizations to social system demands is referred to as isomorphism (DiMaggio & Powell, 1983). Isomorphism explains why organizations that are confronted with similar environmental forces tend to resemble each other in form and function. Over time conformance leads organizations to become embedded in their institutional environments that convey legitimacy and protect them from uncertainty and other threats to their survival (Baum & Oliver, 1992).

Institutional organization theory is particularly useful in understanding how dynamics other than technical efficiency explain and anticipate an organization's adoption of innovations. An organization's interaction with other actors in its environment leads to transmission of norms, standards, and expectations that the organization seeks to meet in order to attain legitimization and support from these entities. The organization adjusts its internal structure and processes to conform to these external expectations (i.e., isomorphism) either by developing unique responses (i.e., invention) or mimicking (i.e., imitation) the other organization's responses that appear to have been successful. Institutional theory suggests that organizations that have extensive linkages with their external role set will be more likely to adopt an innovation.

A number of empirical studies have examined organizational linkages and network relationships relative to adoption of innovations by health care organizations. Sharing of clinical and administrative services was used as a measure of external relationships, along with a dichotomous measure of external orientation by Provan (1987) in a study of adoption of cost containment policies by hospitals. This researcher found that both measures were significant predictors with positive signs. In a meta-analysis of multiple studies, Damanpour (1991) found a significant positive adjusted correlation between external communications (i.e., environmental scanning, professional activities, information exchange relationships) and adoption of administrative innovations. As previously noted, in a study of adoption of proactive business strategy by hospitals, Ginn and Young (1992) found that multi-hospital system membership was a significant positive predictor. Membership in a multi-hospital system was found to have a significant positive relationship with adoption of hospital cost accounting systems

(Glandon & Counte, 1995). In a study of the determinants of conversion of rural hospitals to non-acute care services, Alexander, D'Aunno, and Succi (1996) found multi-hospital system membership to be a positive predictor. Multi-hospital system membership was found to be associated with strategy adoption of both revenue enhancement and cost containment by rural hospitals (Trinh & Begun, 1999). In a study of adoption of provider-based rural health clinics, Krein (1999) found that neither being part of an investor owned hospital system nor being contract managed was associated with adoption. In a study of diversification into subacute care, Wheeler and colleagues (1999) found that multi-hospital system membership was a significant positive predictor of adoption. Overall, empirical studies support network linkages as a factor positively influencing adoption of innovation by health care organizations.

*Control of domain***.** Control of domain refers to the means and extent power is exercised by professional participants in an organization to secure and protect an arena of professional decision-making and activity and to promote fidelity to professional standards (Flood & Scott, 1978; Flood & Scott, 1987). Professionals in organizations tend to develop special control arrangements that provide significant autonomy to the professionals and that rely on collegial control processes depending on the power exercised by the professionals in the organization (Flood & Scott, 1987). The ability of a professional group to define and defend an area of professional practice depends on the group's power to affect the outcomes of organizational decisions and thus the greater the control of its domain (Flood & Scott, 1987). The greater the control of domain of a professional group in an organization the greater the impetus they have to exert control

that is in their professional interests and the greater influence they exert over outcomes relevant to their professional arena. Thus, in organizations where professionals have greater control of their professional domain it would be in their interests to initiate and support actions that would strengthen and extend their power and control. This suggests that greater control of domain would be related to greater likelihood of adoption.

Control of domain is derived from the sociology of organizations and professions literature and has particularly salient application in health care organizations. Hospitals have been described as having both bureaucratic and professional structures that influence the performance of their complex tasks (Flood & Scott, 1987). Bureaucratic structures achieve coordination and control through externally imposed rules and hierarchies, whereas professional organizations "operate to support the efforts of self-regulating individual practitioners who exercise a large amount of discretion in independently carrying out their work" (Aiken, 2002: 62). Nurses in hospitals can be seen as agents of both bureaucratic and professional structures. It has been noted that hospital organizations that "nurses create and maintain serve to varying degrees to balance the competing demands of bureaucratic and professional responsibilities" (Aiken, 2002: 62).

Control domain has been examined in the literature for both physicians and nurses. Flood and Scott (1987) found that within domain control by surgeons had no significant impact on surgical outcomes for patients, but that within domain influence by nursing had a significant negative impact on quality of surgical care. Increased power of the surgical staff over its own members was found to relate to higher quality of surgical care (Flood & Scott, 1987).

Control over nursing practice (i.e., practice autonomy) has been particularly well researched in the nursing literature. Increased status, respect, and recognition were found to be outcomes associated with increased control over practice (Kramer & Schmalenberg, 2002). It was also found that control over nursing practice elevated the status of nursing in the organization, promoted communication, and recognized its contribution to organizational performance (Perley & Raab, 1994). Control over nursing practice was also found to increase the formal authority and power of nursing within an organization (Jones & Sparki, 1989). Practice autonomy was found to distinguish magnet from non-magnet hospitals (Kramer & Schmalenberg, 1991) and to be highly instrumental in staff nurse job satisfaction, productivity, retention, and as a component of a culture of excellence (Kramer & Schmalenberg, 1988, 1991, 1993).

In the literature reviewed, capturing the impact of professionals on innovation adoption was primarily accomplished by examining the extent of their presence in organizations. In a meta-analysis, Damanpour (1991) found a significant positive adjusted correlation between the technical knowledge resources (i.e., technology professionals most often) of an organization and adoption of administrative innovations. In studies testing a model of traits of hospitals that are essential to excellent patient care and retention of nursing workforce, Aiken used RN to patient ratio and skill mix to capture professional influence on nurse and patient outcomes and found a significant positive relationship in general (Aiken, 2002). In a study of the determinants of conversion of rural hospitals to non-acute care services, Alexander, D'Aunno, and Succi (1996) used total physicians per bed, total nurses per bed, and total number of administrators per full time equivalent employee and found that none of these measures

were significant predictors. In a study of adoption of provider-based rural health clinics, Krein (1999) found that having previously employed key professionals for staffing rural clinics (i.e., nurse practitioners or physician's assistants) was a significant positive predictor of adoption. In a study of diversification into subacute care, Wheeler and colleagues (1999) measured professional resources necessary for adoption as both availability of physicians (i.e., physicians on staff/acute bed) and nurses (RNs and LPNs/acute bed) and found both to be significant predictors, but with physician having a negative sign and nurses having a positive sign. Overall empirical results are mixed on the influence of extent of professional resources on innovation adoption in health care organizations.

In summary, additional research is needed on the influence of organizational factors on innovation adoption. Control of domain via availability of professional resources has received some examination, with mixed results, and needs additional study. While organizational complexity, slack resources, and external communications network have received much more study, results are still somewhat mixed, but generally support adoption. Overall empirical findings tend to support theoretical expectations, except for organizational complexity, but further study is needed.

Moderator Factors

Moderators are factors that affect the nature of the relationship between independent causal factors and dependent outcomes (Baron & Kenny, 1986). Damanpour's meta-analysis (1991) identified several potential moderators (i.e., type of

organization, type of innovation, and scope of innovation) that were considered to influence the relationship between determinants and innovation adoption.

Type of organization. The type of organization has been suggested as a moderator and a determinant (Damanpour, 1991). This factor focuses on how innovation adoption can be influenced by differences in industry, legal organization, or other distinctive characteristics of the firm (Van de Ven, 1986). Firms have been classified into types based on factors such as whether they are manufacturing or service, for-profit or not for-profit, type of technology, organizational structure, and degree of managerial control (Damanpour, 1991).

In the health services literature, type of organization is frequently used and most commonly addressed in terms of control, ownership, or status indicators. In a study of adoption of proactive business strategy by hospitals, Ginn and Young (1992) found that for-profit hospital ownership was a significant predictor with a positive sign. Molinari and colleagues (1993) found that placing hospital insiders (i.e., CEO, physicians) on the board had a significant positive relationship to financial performance in for-profit chain hospitals compared to not-for-profits. Glandon and Counte (1995) found mixed results with respect to type of hospital and adoption of hospitals cost accounting systems, but only different types of nonprofit hospitals were examined. In a study of the determinants of conversion of rural hospitals to non-acute care services, Alexander, D'Aunno, and Succi (1996) coded hospital ownership/control by a series of dummy variables for for-profit, private not-for-profit, and governmental hospitals and found only not for-profit control to be a significant positive predictor. Type of hospital (i.e., non-governmental

control) was found to be salient in rural hospitals adoption of strategic alternatives (i.e., revenue enhancement, cost containment) (Trinh & Begun, 1999). In a study of adoption of provider-based rural health clinics, Krein (1999) found that for-profit ownership was a significant predictor of adoption versus public ownership. In a study of diversification into subacute care, Wheeler and colleagues (1999) found that type of hospital, binary coded as investor owned (1) or tax-exempt (0), was significant with a positive sign. In summary, type of hospital has been used widely in innovation adoption studies in health care organizations and has usually been found to be a significant influence on adoption. While empirical studies are mixed, findings slightly tend toward for-profit status favoring innovation adoption.

Type of innovation. The type of innovation has also been suggested as moderator (Damanpour, 1991). Different types of innovations have been classified according to three dichotomies: administrative versus technical, product versus process, and radical versus incremental. Issues related to this factor were discussed earlier in the literature review where findings indicated that type of innovation is a problematical construct due to its multidimensionality and the preponderance of literature treating it as unidimensional. Pending development of more fine-grained measures, type of innovation can be expected to remain problematical (Cooper, 1998) and, as such, is not considered salient for purposes of the proposed research.

Scope of innovation. The scope of an innovation, defined as the extent of the impact of an innovation on an organization, has been suggested as moderator also

(Damanpour, 1991). Impact is usually defined in terms of the pervasiveness of the impact of an innovation on different parts or units of an organization. In this regard, it is similar to the incremental versus radical distinction discussed relative to type of innovation and is similarly problematical as a construct. Organizational units are affected differently and have varying abilities to assimilate different innovations (Zmud, 1984). As with type of innovation, scope is not considered salient for purposes of the proposed research.

Organization size. Size is a particularly important factor that has been used as both a determinant and as a control variable in a number of studies. Contingency theory of organizations supplements and modifies classical bureaucratic theory by recognizing that there are important factors that influence how organizations differentiate and coordinate activities that determine structure and processes (Dressler, 1980). An organization's size has been viewed as a contingency variable influencing the structural flexibility of an organization in adopting new forms to achieve adaptation to environmental demands (Dressler, 1980; Katz & Kahn, 1978). However, the role of size as a contingency variable is complex. Larger organizations tend to be more hierarchical and, thus, more bureaucratic in structure which serves as an impediment to change via structural inertia (Mintzberg, 1979; Hannan & Freeman, 1984). However, larger organizations tend to have more slack resources which provide them with the material means to experiment with more innovative strategies (Zinn, Weech & Brannon, 1998). It has been suggested that the relationship between size and innovation adoption might be curvilinear (Kimberly & Evansiko, 1981).

Size has been widely used in adoption research in health care organizations. Kimberly and Evanisko (1981) found that size as measured by number of beds was significantly associated in a positive direction with hospitals adoption of both administrative and technological innovations. [It should also be noted that Kimberly and Evanisko (1981: 700) examined four measures of size (i.e., beds, total assets, total employees, and full-time equivalents) and found that they were highly inter-correlated (r = .85) and concluded that use of any of the four measures could be justified on empirical grounds.] Provan (1987) found size, as measure by beds in operation, to be positively related to adoption of hospital cost containment policies. In a study of adoption of proactive business strategy by hospitals, Ginn and Young (1992) found hospital size was a significant positive predictor. Size of hospital as measured by number of beds set up and staffed had a significant positive relationship to adoption of hospital cost accounting systems (Glandon & Counte, 1995). In a study of the determinants of conversion of rural hospitals to non-acute care services, Alexander, D'Aunno, and Succi (1996) measured size using staffed beds and found it to be a significant predictor with a negative sign as would be expected on theoretical grounds in this particular case. Size was not found to be significantly associated with adoption of TQM programs by nursing homes (Zinn, Weech, Brannon, 1998). In a study of adoption of provider-based rural health clinics, Krein (1999) found that size (i.e., number of hospital beds) was not a significant predictor. In a study of diversification into subacute care, Wheeler and colleagues (1999) found that size as measured by number of beds was a significant predictor with a positive sign. Size was not found to be a significant predictor of organizational innovativeness in a sample of nonprofit human service agencies in Alabama (Jaskyte & Dressler, 2003).

Overall, size has been widely used in innovation adoption studies in health services research and, while some results are mixed, generally has been found to positively influence adoption.

Moderators can be addressed in several ways in studies. For example, a common type and scope of innovation can be used in a study. Likewise, a common type of organization can be used. Control variables might also be employed. In the proposed research, type and size of organization are treated as control variables and a common type and scope of innovation are used to address these potential moderators.

Mediator Factors

Mediators represent a type of factor through which causal factors (i.e., independent variables) operate to sway outcomes (i.e., dependent variable) (Baron & Kenny, 1986). A series of factors that Rogers (2003) described as perceived innovation characteristics have been suggested as potential mediators (Frambach & Schillewaert, 2002). These characteristics have been interpreted as beliefs or cognitive attitudes held by an organizational decision-making unit toward an innovation that mediates the impact of the determinants in forming behavioral intentions toward adoption (Frambach & Schillewaert, 2002).

Rogers (2003) described five perceived characteristics of an innovation that influences its rate of adoption: relative advantage, compatibility, complexity, trialability, and observability. Relative advantage is the extent to which potential adopters perceive that an innovation is superior to alternative products, services or concepts. Compatibility is the degree to which an innovation conforms to a potential adopter's existing values,

previous experiences, and needs. Complexity is the extent to which an innovation is perceived as difficult to understand and use considering various dimensions, such as the extent to which an innovation can be implemented on a limited basis, the difficulty associated with understanding the innovation, and the extent of newness of the innovation (Gopalakrishnan & Damanpour, 1994). Trialability is the degree to which an innovation can be tried on a limited scale before an adoption decision is made. Observability is the extent to which the results of an innovation are visible to others. Although not included in Rogers' set of characteristics, uncertainty has also been suggested as an important characteristic that can influence adoption of an innovation (Frambach & Schillewaert, 2002). Uncertainty in this context is viewed as the extent of perceived unpredictability related to an innovation's reliability and functionality, financial impact, and social acceptance by others relevant to the adopter (Nooteboom, 1989).

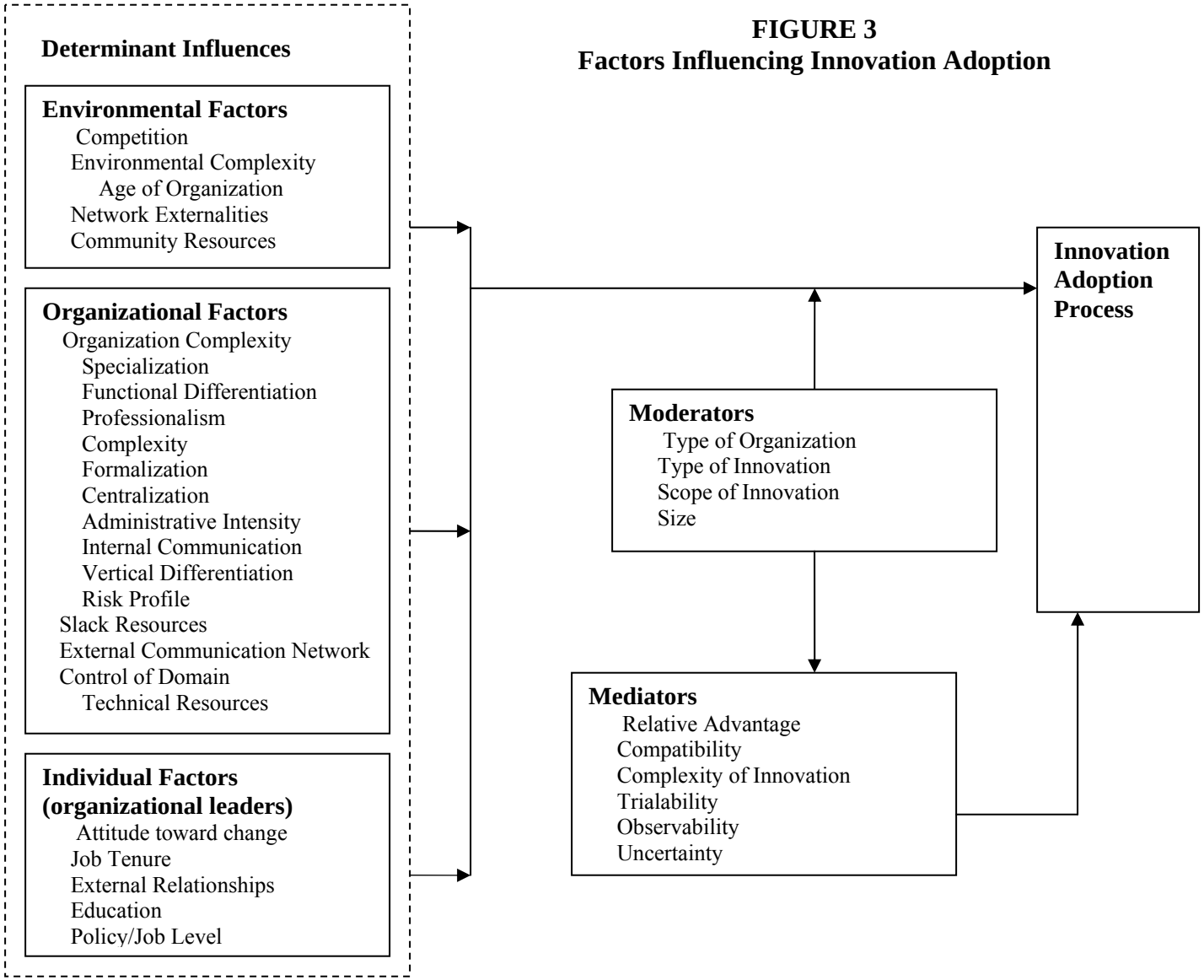
Most of the mediators operate at the individual level of influential factors. These factors are not directly included in the scope of this study given its focus on organizational and environmental level factors in accord with a strategic adaptation framework. However, many of these mediators are considerations by individuals or groups in the persuasion (i.e., feasibility) and decision stages of the adoption process that precede the implementation stage that is used as the dependent variable in this study.

In summary, other factors that might influence innovation adoption, such as moderators and mediators, have not received substantial empirical investigation, but are of interest from a theoretical standpoint in research design. As regards moderators, type and scope of innovation are problematical constructs and are probably best addressed by a design that focuses on homogeneity of these factors to the degree possible. Mediators

tend to focus at the individual level of the organization and be considered at the persuasion (i.e., feasibility) or decision stages of the adoption process. Both type of organization and size of organization have been treated as moderators and determinants in health services research with multiple operational definitions and usually have been found to be salient in positively influencing adoption.

Figure 3 summarizes findings from review of the literature related to influential factors categorized as determinants, moderators, and mediators. Overall, these three categories of factors are depicted as influencing the adoption process. In accord with the strategic adaptation theoretical framework, selected environmental factors (i.e., environmental complexity, competition, network externalities, and community resources) and organizational factors (i.e., organizational complexity, slack resources, external communications, control of domain) are suggested as salient in influencing innovation adoption on theoretical and empirical grounds. As regards moderators, these factors are problematical on theoretical and empirical grounds and thus may contribute more confusion than enlightenment to future research until finer-grained measures are available. Mediators primarily operate at the individual level where they are factored into decision-making by organizational elites in specific stages of the adoption process. Process focused research methods might be most fruitful in examining these particular factors in future research. Organizational type and size are suggested as control variables in future research.

FIGURE 3
Factors Influencing Innovation Adoption



Innovation Adoption

This section reviews literature related to the innovation adoption process of organizations. First, a dichotomy in the literature is examined concerning whether innovation adoption should be viewed as an event or a process. Next, process literature is reviewed with particular attention to Rogers' five stage process (Rogers, 2003) which was used for this research. Finally, health services literature related to adoption is reviewed.

Innovation scholarship of particular interest to this study can be divided into two streams of research differing on whether innovation adoption should be regarded as a process or a discrete event (Cooper, 1998). Advocates of innovation as a discrete event view innovation as occurring when resources are committed and risk is assumed, which is usually the discrete event of implementation. Studies in this line of research tend to focus on predictors of implementation such as organizational characteristics (e.g., firm size, age, type) and contextual characteristics (e.g., market concentration, industry maturity) (Cooper, 1998). However, event advocates do not necessarily ignore the process involved in innovation adoption as much as they focus on only one stage in the process, usually implementation. Indeed, it has been noted that organizations which successfully innovate follow a similar pattern of steps or phases, those that imitators that fail to follow these phases will run the risk of a failed implementation of their innovation (Burgelman & Sayles, 1986).

Another stream in innovation adoption literature is the process of innovation perspective, which argues that innovation adoption occurs in identifiable stages (Wilson, Ramamurthy, & Nystrom, 1999). Different scholars have identified different numbers of

stages in this process, ranging from as few at two to as many as twenty-one and have noted differences in the sequence of stages and iteration between stages in some cases (Zaltman, Duncan & Holbek, 1973; Meyer & Goes, 1988; Rogers, 2003). However, it has been noted that while models may differ on the number of stages, there is general agreement that innovations go through similar stages (Wilson, Ramamurthy, & Nystrom, 1999).

Rogers (2003) indicated that adoption of an innovation is a process of identifiable stages and provided a widely adopted schema of these stages. Rogers defined adoption as, "the process through which an individual or other decision-making unit passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and confirmation of this decision" (Rogers, 2003: 168). Thus, an innovation adoption decision involve a series of choices over time that cumulatively lead to embracing and assimilating an innovation or abandoning further consideration at one step in the process. Rogers (2003) suggested that the five stages of knowledge, persuasion, decision, implementation, and confirmation capture the innovation adoption process. Each stage provides inputs to the next stage and also serves as a potential rejection point for an innovation. Thus, each of these stages represents a potential outcome in the adoption of an innovation.

Knowledge stage. The knowledge stage begins when an innovation decision-making unit (i.e., an organization in this discussion) learns of an innovation's existence and gains some knowledge of how it functions (Rogers, 2003). Information about the existence and function of an innovation can be gained passively or actively usually

depending on whether there is a perceived need for the innovation. There is debate in the literature regarding whether the need for an innovation precedes knowledge by making the decision-maker more attuned to recognizing the potential benefits of an innovation or whether knowledge of an innovation creates need or desire for the innovation (Rogers, 2003). There is also discussion about the importance of different types of knowledge about an innovation ranging from existence, to how it works, to fundamental understanding of the principles underlying the innovation.

Knowledge of an innovation is fundamentally an information acquisition and processing task that supports comparison of the benefits and risks inherent in the changes driven by new ideas (Rogers, 2003). Organizations that have more communication linkages are better positioned to acquire potentially useful information about an innovation. Also, organizations that have a better understanding of needs should be more sensitive to information acquired and the consequent potential of an innovation. Organizations with this knowledge are better positioned to move to the next stage of the adoption process.

Persuasion stage. The persuasion stage in the adoption process begins with knowledge of a potentially useful innovation and concludes with either a favorable or unfavorable attitude toward adoption based on some form of assessment of the innovation (Rogers, 2003). The potential adopter actively seeks information in order to evaluate the innovation in terms of criteria such as: a) relative advantage compared to the current or anticipated situation; b) compatibility with existing beliefs and practices; c) complexity in terms of understanding the innovation and its implementation; d) ability to trial the

innovation before full adoption; and e) observability of the impact of the innovation's success or failure. Ultimately, persuasion requires that uncertainty about an innovation's benefits and feasibility is addressed. Reinforcement by peers who have had experience with the innovation and the occurrence or potential occurrence of some unwanted event related to the innovation are particularly salient in a potential adopter's attitudes (Rogers, 2003).

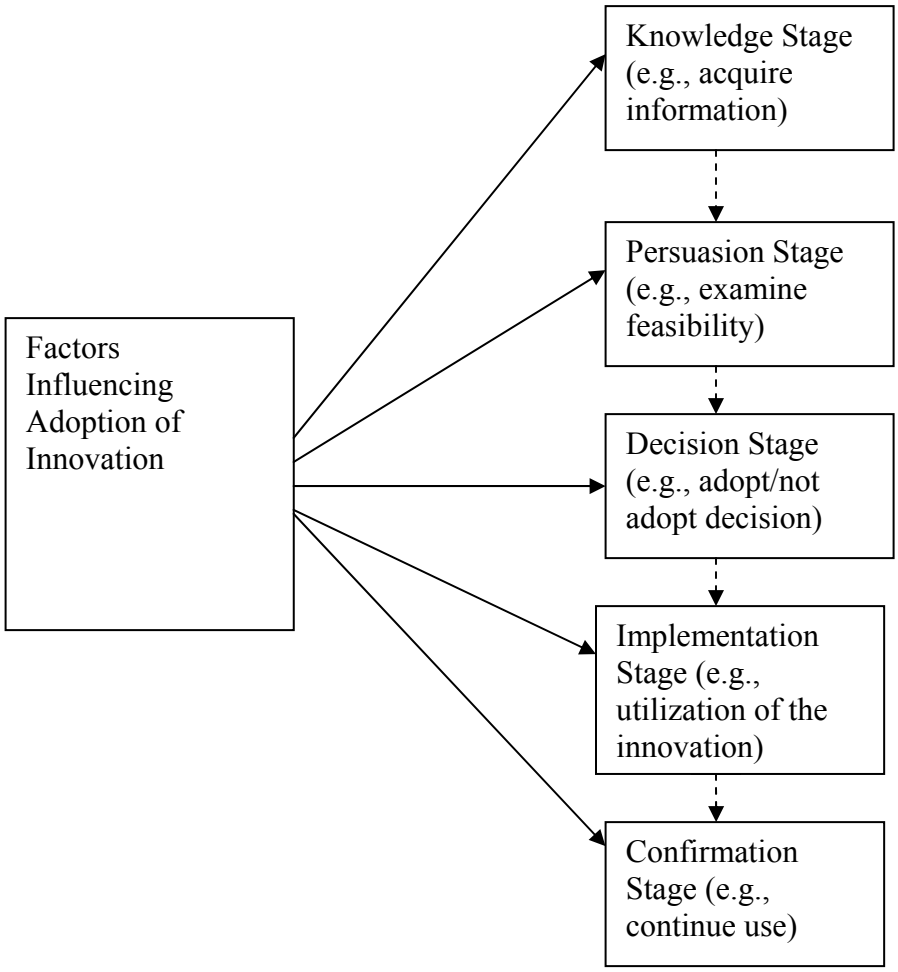
Decision stage. The decision stage takes place with the decision-making unit making a choice to accept or reject an innovation (Rogers, 2003). The ability to conduct a small scale trial or to examine results of a peer trial are particularly salient in reducing uncertainty concerning relative advantage. Arrangements that facilitate trials (i.e., samples, site visits, demonstrations, change agent support) speed the rate of adoption (Rogers, 2003). Rejection can also result via a proactive decision to reject an innovation or a more passive failure to ever seriously consider adoption. Also, it is not unusual that an innovation will be accepted with minor to major re-invention in order to make the innovation more compatible with the organization.

Implementation stage. The implementation stage occurs when an adopter puts an innovation into practice and continues until the innovation becomes a routine part of the organization's ongoing operations and loses its distinctive quality (Rogers, 2003). During implementation, reinvention of the innovation frequently occurs whereby the adopter changes or modifies the innovation to adapt and enhance compatibility with situational factors and thereby speeds adoption and sustainability in use of the innovation

(Rogers, 2003). While there may continue to be some uncertainty about the consequences of the innovation, problems related to use of the innovation are resolved including organizational resistance to change. Indeed, organizational resistance ranging from passive compliance to active opposition may be encountered based on structural and situational factors (e.g., structural inertia) and become more pronounced with the size and complexity of the organization.

Confirmation stage. Confirmation is the final stage in the adoption process as adopters can subsequently decide to discontinue an innovation even after substantial investments in implementation. Adopters seek reinforcement of their adoption decision after implementation and may reverse the adoption decision if such confirmation is not received (Rogers, 2003). A lack of confirmation indicates that an innovation was not incorporated into the ongoing operation of an organization. Failure to receive confirmation can lead to a state of dissonance that motivates an adopter to take action to resolve this tension. The rate of discontinuance can be as important as the rate of adoption in determining the overall level of adoption at any given time. Discontinuance can result from replacement of an innovation by adopting another innovation that is subsequently considered superior or disenchantment due to failure to realize anticipated performance relative to decision criteria (e.g., relative advantage, compatibility, complexity, trialability, observability) (Rogers, 2003). Figure 4 depicts this multi-stage framework of the adoption process.

FIGURE 4
Five Stages of the Innovation Adoption Process



Given these stages, innovation adoption is more than just an adoption or non-adoption decision by an organization to undertake implementation of an innovation. An innovation can be rejected before an adoption decision is made or discontinued after an adoption decision (Rogers, 2003). As a consequence, anyone of the five stages is a potential outcome of the adoption process or, in research terminology, a potential dependent variable. Likewise the overall process can be considered (Meyer & Goes, 1988).

Some scholars have more parsimoniously subdivided the innovation adoption process into two broad phases of initiation and implementation (Zaltman, Duncan & Holbek, 1973). However, this schema reconciles with Rogers' (2003) five stage process. The initiation stage consists of the organization becoming aware of the innovation, forming an attitude toward it, and evaluating it. The implementation stage consists of actually implementing the innovation and continuing its use until it is fully assimilated into ongoing operations. The actual adoption decision takes place between these two broad phases. Similarly, Meyer and Goes (1988) used a nine stage process for adoption of technological innovations in health care organizations which can be mapped back to Rogers' five stages. However, it should be noted that actual adoption is not fully complete in any process schema until there has been adoption at the individual level by end-users and other relevant organizational stakeholders (Frambach & Schillewaert, 2002). Of particular importance are differential organizational skills in initiation versus implementation that can influence adoption success (Zmud, 1984).

This review indicates that adoption of an innovation is a process that involves a series of decisions, not a single decision. However, studies of adoption of administrative innovations generally have not considered the entire adoption process (Frambach & Schillewaert, 2002) perhaps because of the complexity inherent in delineating each and all of the stages in the process (Wilson, Ramamurthy, & Nystrom, 1999). Most studies have focused on a single stage as the outcome variable, so that research considering the different steps or stages in the adoption process are limited (Kimberly & Evanisko, 1981; Olshavsky & Spreng, 1996; Wilson, Ramamurthy, & Nystrom, 1999) even though it has

been noted that determinants of the innovation process may differ at each stage (Wilson, Ramamurthy, & Nystrom, 1999).

A number of examples are available in the health services literature that illustrate research focused on a single stage in the adoption process. Kimberly and Evanisko (1981) measured innovation adoption as self reports of implementation from a checklist in a survey instrument of potential technological and administrative innovations that could have been adopted, resulting in count data for the dependent variable in their regression analysis (OLS). In a study of hospital adoption of cost containment policies, Provan (1987) used survey self-reports of the number of different cost containment policies hospitals claimed to have adopted and these responses were used to construct an adoption index that served as the dependent variable for regression analysis (OLS). (It was not clear from this study as to whether adoption was at the decision or implementation stages.) Damanpour's (1991) meta-analysis of determinants and moderators required use of rate of adoption of innovations or organizational innovativeness as the dependent variable for inclusion in the study, and adoption in these studies was deemed to imply implementation of the innovations. Glandon and Counte (1995) measured adoption of hospital cost accounting systems as self-reported dichotomous (i.e., adopt/ nonadopt) responses as the dependent variable in their logistic regression analysis. In a study of adoption of TQM programs by nursing homes Zinn, Weech, and Brannon (1998) used a dichotomous (i.e., TQM adoption/non-adoption) dependent variable for logistic regression where adoption was at the implementation stage based on five criteria used for classification by the authors based on survey data. In a study of adoption of provider-based rural health clinics, Krein (1999) used a

dichotomous dependent variable to measure implementation based on objective verification (i.e., HCFA reimbursement status) and used discrete-time survival (or event history) logit methods to predict the event of adoption. In a study of diversification into subacute care, Wheeler and colleagues (1999) used a two-stage model wherein a binary dependent variable (i.e., presence/absence of subacute beds) was estimated using Probit analysis and then adopters were analyzed in a second adjusted regression model to predict level of adoption (i.e., number of subacute beds). In a study of adoption of proactive business strategy by hospitals, Ginn and Young (1992) used Miles and Snow's (1978) typology (i.e., defender, prospector, analyzer, and reactor) to create a continuous scale measuring the degree of proactivity of a hospital's strategy which could then be used as the dependent variable in a regression model (OLS) with various environmental and organizational variables used as independent predictors. In a study of the determinants of conversion of rural hospitals to non-acute care services, Alexander, D'Aunno, and Succi (1996) used discrete-time logistic regression to predict conversion versus non-conversion based on actual implementation. The only study that was found that examined multiple stages of adoption as the dependent variable was by Meyer and Goes (1988) concerning the extent of adoption of various technological innovations by hospitals. This study use a nine point scale constructed by the authors and participant rating of the extent of adoption.

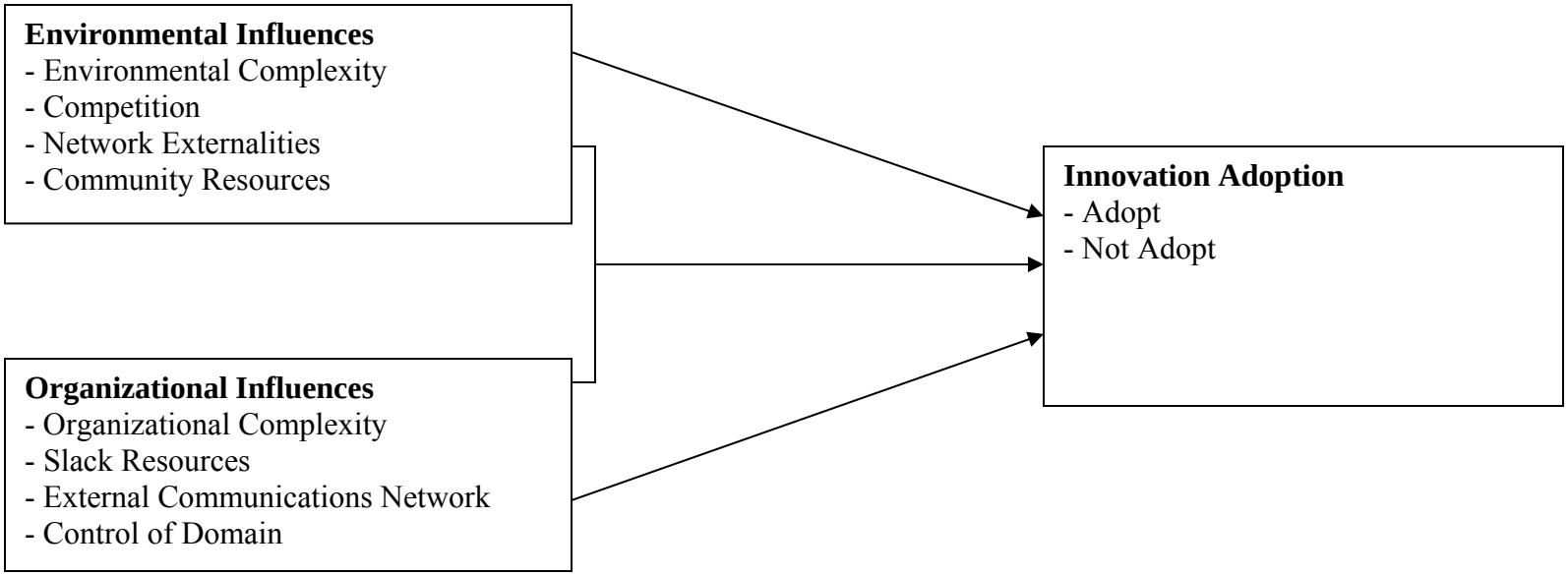
In many of these studies exactly what was meant by adoption was unclear. Either intent-to-adopt (i.e., decision stage) or implementation (i.e., implementation stage) could be plausible in several cases and both stages could easily be captured given the wide use of self reports versus objective measures. It is clear that studies exclusively focused on

either the decision (i.e., intent to adopt) or implementation stages in Rogers' (2003) schema of the adoption process. Only one study was found that considered factors potentially influencing adoption relative to multiple stages in the adoption process and it involved extent of adoption of technological innovations. No studies were found that examined multiple stages of the adoption process or the impact of determinants on these stages individually and/or comparatively for administrative innovations.

Summary of What is Known and Unknown

This literature review identified a need in the innovation adoption literature, a theoretical framework and model for investigating this need, and a particular administrative innovation to be used for this investigation. There is a need in the literature to examine multiple factors simultaneously influencing stages in the adoption process of administrative innovations. This need is essentially a disjunction between an event based literature stream focusing on influential factors in innovation adoption and a process stream of literature focusing on stages in the adoption process. Overwhelmingly, studies of adoption focus on the decision or implementation stage in the adoption process. Findings concerning the influence of specific factors have frequently been mixed or contradictory. Also, there are a number of factors that might be salient that have not been studied. Thus, there is a need to further investigate factors with mixed findings and emergent factors. Figure 5 summarizes the literature by presenting a model for examining relationships between factors drawing on the event stream and the implementation stage in the innovation adoption process drawing on the process stream.

FIGURE 5
Environmental and Organizational Influences on Innovation Adoption



Influential factors are classified at the environmental and organizational levels as independent variables in accord with strategic adaptation theory. Testing of this model was done using adoption of the magnet hospital concept as the administrative innovation. Investigation of the influential factors at the implementation stage of the adoption process facilitates comparison of results with the literature.

While a substantial number of determinant factors were identified in the literature review, the four factors of environmental complexity, competition, network externalities, and community resources were examined in detail to capture the construct of environmental influences. It was found that increased environmental complexity is theoretically expected to be positively associated with innovation adoption. Empirical results, while mixed, generally supported theoretical expectations. The review also indicated that increased levels of competition might be expected to be positively associated with increased adoption. However, numerous empirical studies have examined this factor, using a variety of operationalizations, with very mixed findings. It was suggested in the review that network externalities are theoretically expected to be positively associated with adoption. Only one empirical study was found in the review, but it supported theoretical expectations; however, much more extensive research is needed on this factor. Increased community resources are expected to be negatively associated with adoption on theoretical grounds. A number of operational definitions have been used in empirical studies with findings somewhat mixed, but generally not significant.

Specific factors examined in the literature related to organizational factors influencing innovation adoption were organizational complexity, slack resources,

external communications, and control of domain. It was found that increased levels of organizational complexity are theoretically expected to be negatively associated with innovation adoption. However, empirical results were generally contrary to theoretical expectations. Increased levels of slack resources were theoretically expected to be positively associated with adoption. Empirical results, while mixed, were generally supportive. A more extensive external communications network is theoretically expected to be positively associated with adoption. Overall, empirical findings were supportive of theoretical expectations. Theoretical considerations suggested a salient positive direction in the relationship of control of domain and adoption, but empirical findings were mixed. More extensive research is needed on this factor. It was found that size and type of organization have been used as both determinants and moderators. However, both theoretical and empirical findings were ambiguous on these factors in the literature review. Size and type are probably best addressed as control variables.

The literature review found that there are a number of different schemas, with varying numbers of stages, which can be used for capturing the innovation adoption process**.** Rogers' five stage schema of knowledge, persuasion, decision, implementation, and confirmation is widely accepted. Each of these stages can serve as a potential outcome in innovation adoption with each successive stage representing a greater degree of adoption and thereby collectively capturing the extent of adoption of a particular innovation. However, innovation adoption has overwhelmingly been studied at the decision or implementation stage.

Finally, it was found that nursing workforce shortages have been a persistent problem for U.S. hospitals since World War II and are projected to continue and intensify

until at least 2020. Serious quality, operational, and human resource problems arising from these shortages have been salient in leading hospitals to seek innovative solutions. The magnet hospital concept was identified as a viable administrative innovation for research purposes. This study is the first research examining factors influencing adoption of the magnet hospital concept.

Contribution of This Study to the Literature

On the basis of this review, this research can make both substantive and methodological contributions. Substantively, mixed results on the role of certain factors (e.g., environmental complexity, competition, community resources, community resources, and organizational complexity) from the literature review and the need for more studies on understudied factors (e.g., network externalities and control of domain) are needed areas of inquiry. In addition, comparative operationalizations of determinants can be useful to ascertain those that are most useful in capturing constructs of interest. In this regard, investigation of a consistent type and scope of innovation in one stage of the adoption process might be beneficial in consideration of the need for finer-grained approaches (Cooper, 1998). There is a need for studies to consider multiple categories of factors (i.e., environmental, organizational) simultaneously as this has been an under-researched area. Also, administrative innovations are in need of additional study as these innovations have been researched less than technological and product innovations. No studies were found investigating factors influencing adoption of the magnet hospital concept as an administrative innovation.

Methodological improvements are also needed in future studies. Methodological problems that have been identified in other reviews of this literature include the following (Wilson, Ramamurthy, & Nystrom, 1999: 311): poor conceptualization and operationalization of dependent variables; lack of distinction between types of innovations; failure to recognize the locus of adoption (e.g., organization, individual) and consequent influences on decision-making; methods bias in obtaining both antecedent and dependent variable information from the same individuals; and use of unreliable and non-quantitative research methods that lack statistical power.

This study advances understanding of the influence of specific organizational and environmental factors on adoption of administrative innovations. In particular, this study specifically tests whether these factors are operable related to health care organizations and, if so, the nature of their influence. Significantly, this study is the first empirical contribution to the literature on factors influencing adoption of the magnet hospital concept as an administrative innovation. From a scholarly standpoint, this study addresses a significant need in the research literature on innovation adoption. From the standpoint of managerial practice, this study contributes to guiding successful adoption of beneficial administrative innovations in the future.

Summary

This chapter reviewed literature relevant to the research study. Background information on adoption and diffusion of innovations was first presented to provide a foundation in classic innovation theory and a broad theoretical perspective. Also, background information on the U.S. nursing shortage and the magnet hospital concept

were reviewed for contextual purposes. General systems, strategic adaptation, strategic choice, strategic management, and selected organizational theories were then reviewed and linkages to innovation theory were examined to support development of a theoretical framework for the proposed study. Relevant findings from the health services research literature were examined on the relationship between strategic adaptation and innovation. Literature on factors influencing innovation adoption was reviewed with detailed consideration accorded a group of selected environmental and organizational factors. The innovation adoption process was next reviewed along with relevant health services related literature. Overall, this review concluded that there is a need to examine ambiguous finding concerning some factors that have been studied and to investigate emergent factors that have received little attention to date.

Throughout the literature review a research model was developed to facilitate a study to address the identified needs. The theoretical models summarizing the literature presented in this chapter are the source of the research model that provides the basis for this study. The research study will contribute to better understanding of administrative innovation adoption and thereby contribute to a better understanding of the process of strategic adaptation by organizations through adoption of these innovations. In addition, this research should aid practicing managers in facilitating more successful adoption of administrative innovations.

CHAPTER 3

METHODOLOGY

Introduction

This chapter reviews the research methodology used to empirically test the model formulated to answer the research questions that were proposed for this study. First, the purpose of the research and the research questions are reviewed. Hypotheses are then presented drawing on findings from the literature review. The measures used for the independent variables are then explained along with measures for the control variables and the dependent variable. Next, the research design is described, including the sampling frame, method, and size. Specific data collection procedures are then detailed. Data sources for each measure, measurement and instrumentation issues, and reliability and validity considerations are discussed. Finally, data analysis methods that address specific statistical procedures are explained.

Research Objectives

The purpose of this study was to investigate the influence of environmental and organizational factors on the adoption of administrative innovations in order to better understand strategic adaptation by organizations. This study tested a research model that related a set of selected environmental and organizational factors to adoption of an administrative innovation. The administrative innovation that was used for this study was

the adoption of the magnet hospital concept for enhancing recruitment and retention of RNs by U.S. hospitals.

In accord with the purpose of this study, the following research questions were posed:

1. What, if any, influence do environmental factors have on innovation adoption? If environmental factors are influential, which environmental factors significantly influence innovation adoption and what is the direction of this influence?
2. What, if any, influence do organizational factors have on innovation adoption? If organizational factors are influential, which organizational factors significantly influence innovation adoption and what is the direction of this influence?
3. If environmental and organizational factors both influence innovation adoption, is one set of factors more influential than the other? If one set is more influential, which set is more influential?
4. What, if any, influence do environmental and organizational factors, acting jointly, have on innovation adoption? If environmental and organizational factors jointly are influential, which of the environmental and organizational factors significantly influence innovation adoption and what is the direction of this influence?

To answer these questions, hypotheses are described in the following subsections of this chapter based on findings in the literature review in accord with the research model. Hypotheses related to environmental factors are first presented, followed by hypotheses related to organizational factors. Next, hypotheses are presented related to the relative influence of each set of factors and, finally to the joint influence of these factors on innovation adoption. Control variables are also discussed.

Environmental Influences

Environmental influences are factors that are characteristics of an organization's external environment that are believed to influence an organization's likelihood of adoption of an innovation (Kimberly & Evanisko, 1981). Since these factors are environmental characteristics, organizations generally have little to limited control over them. Based on the literature review related to strategic adaptation, it was expected that environmental factors would have a significant positive influence overall on innovation adoption. In accord with this expectation, the following hypotheses were stated:

> *Hypothesis 1. There is a positive correlation between environmental influences (i.e., level of environment complexity, competition, network externalities, community resources as a group) and innovation adoption.*
>
> *Hypothesis 1_0. There is no correlation or a negative correlation between environmental influences (i.e., level of environment complexity, competition, network externalities, community resources as a group) and innovation adoption.*

If there was a significant association between the environmental factors and innovation adoption, then the secondary research questions asked which environmental factors significantly influenced adoption and, if significant, what was the direction of this relationship, positive or negative? Based on the literature review, the four environmental factors of environmental complexity, competition, network externalities, and community resources were investigated in this study.

Environmental complexity. Environmental complexity seeks to capture a composite of the environmental forces acting on an organization (Dansky, Milliron, & Gamm, 1996; Kimberly & Evanisko, 1981). Typically these forces are viewed as

creating an environmental context that ranges on a continuum from stable to dynamic depending on the intensity and interplay of these forces (Mintzberg, 1979; Lawrence & Lorsch, 1986). The greater the degree of environmental dynamism, the less effective are bureaucratic organization models and the greater the need for more flexible and adaptive organizational forms (Dressler, 1980; Katz & Kahn, 1978; Mintzberg, 1979). Organizations facing dynamic environments can reasonably be expected to be more likely to adopt administrative innovations that facilitate adaptation. Thus, theoretically it was expected that more complex environments would be positively associated with innovation adoption. Empirical findings from the literature, while mixed, generally supported theoretical expectations. In accord with these expectations, the following hypotheses were proposed:

Hypothesis 1.1. There is a positive correlation between environmental complexity and innovation adoption.

Hypothesis 1.1$_0$. There is no correlation or a negative correlation between environmental complexity and innovation adoption.

Competition. Competition seeks to capture the contention between organizations for acquisition of resource inputs and disposition of production outputs within markets (Bernstein and Gauthier, 1998; Feldstein, 1999). The literature review indicated that competition gives rise to organizations adopting strategies to achieve competitive advantage (Porter, 1980; Ginter, Swayne, and Duncan, 2002). The significance of competitive pressures in fueling innovation adoption has been cited due to their importance in maintaining market position or risking competitive disadvantage and consequent loss of market standing (Robertson & Gatignon, 1986; Gatignon & Robertson, 1989). It has been suggested that increased competitiveness leads hospitals to

be more strategically proactive as an uncertainty reduction strategy in competitive markets (Bigelow & Mahon, 1989). However, empirical findings in the literature review were very mixed, leading to reliance on theoretical reasoning for purposes of this hypothesis. Since organizations compete to hire workers from their market, it was anticipated that more competition would lead to a greater likelihood to embrace an innovation that would provide advantage in hiring. In accord with this expectation, the following hypotheses were proposed:

Hypothesis 1.2. There is a positive correlation between competition and innovation adoption.

Hypothesis 1.2$_0$. There is no correlation or a negative correlation between competition and innovation adoption.

Network externalities. Network externalities refers to the number of adopters in place and the resultant relationship to critical mass or tipping point and has been emphasized as important to innovation adoption (Kraut, Rice, Cool, & Fish, 1998). Once this point is achieved, contextual pressures push late majority and laggards toward either adoption or isolation from the social system (Greve, 1998). Based on theoretical expectations and very limited empirical findings in the literature review, it was expected that knowledge of competitor's actions would influence an organization's decision to adopt an innovation. In accord with this expectation, the following hypotheses were proposed:

Hypothesis 1.3. There is a positive correlation between network externalities and innovation adoption.

Hypothesis 1.3$_0$. There is no correlation or a negative correlation between network externalities and innovation adoption.

Community resources. Community resources seeks to capture the availability of critical resources in an organization's environment that influence adoption (Kimberly & Evanisko, 1981). Organizations are dependent on their environment to procure the resources needed for survival (Pfeffer & Salancik, 1978). Organization's act to procure resources and/or reduce dependence and thereby increase their chances of survival (Alexander & Morrisey, 1989). When operating in a resource rich (or munificent) environment, an organization may not have to change to improve its chances of survival versus when operating in an environment of resource scarcity (Mick, Morlock, Salkever, de Lissovoy, Malitz, Wise, & Jones, 1993). Empirical findings in the literature review were very mixed on this factor, thus primarily on theoretical grounds it was expected that there would be a negative relationship between availability of community resources and innovation adoption. In accord with this expectation, the following hypotheses were stated:

Hypothesis 1.4. There is a negative correlation between community resources and innovation adoption.

Hypothesis 1.4$_0$. There is no correlation or a positive correlation between community resources and innovation adoption.

Organizational Influences

Organizational influences are factors that are characteristics of a particular organization that are believed to be significant in the likelihood of adoption of an innovation (Kimberly & Evanisko, 1981). These influences are characteristics of the organization that are presumed to be under its control. Based on the literature review related to strategic adaptation, it was expected that organizational factors would have a

significant positive influence overall on innovation adoption. In accord with this expectation, the following hypotheses were proposed:

Hypothesis 2. There is a positive correlation between organizational influences (i.e., level of organizational complexity, slack resources, external communications, control of domain as a group) and innovation adoption.

Hypothesis 2_0. There is no correlation or a negative correlation between organizational influences (i.e., level of organizational complexity, slack resources, external communications, control of domain as a group) and innovation adoption.

If there was a significant association between organizational influences and innovation adoption, then the secondary research questions asked which organizational factors significantly influenced adoption and, if significant, what was the direction of this relationship, positive or negative? Based on the literature review, the four organizational factors of organizational complexity, slack resources, external communications, and control of domain were examined in this study.

Organizational complexity. Organizational complexity seeks to capture the overall scope of an organization's operations in terms of its degree of specialization, functional differentiation, and degree of professionalism (Damanpour, 1991). Because of the difficulty organizations encounter bringing about change in the face of environmental pressure as their scope and complexity increase (i.e., structural inertia) (Hannan & Freeman, 1984; Hurley & Kaluzny, 1987), theory suggests organizational complexity will inhibit or reduce the likelihood of innovation adoption. However, empirical results from the literature review were mixed, but generally contrary to theoretical expectations. It might be inferred that the difficulty of changing organizational routines, stakeholder expectations, and existing asset deployments all served as powerful anchors to perpetuate

the status quo with increased organizational complexity such that this would inhibit innovation adoption. In accord with this expectation, the following hypotheses were proposed:

Hypothesis 2.1. There is a negative correlation between organizational complexity and innovation adoption.

Hypothesis 2.1_0. There is no correlation or a positive correlation between organizational complexity and innovation adoption.

Slack resources. Slack resources seeks to capture the resources an organization has available beyond what is required to maintain ongoing operations (Damanpour, 1991). Slack resources provide the means to fund implementation of an innovation and reduce the risk of adoption (Kimberly and Evanisko, 1981). Slack resources have been noted as a critical factor in analyzing strategic options open to organizations (Bigelow & Mahon, 1989). Thus, it was expected that greater slack resources would enhance adoption. Empirical results, while mixed, were generally supportive. On the basis of theoretical and empirical findings in the literature review, the following hypotheses were proposed:

Hypothesis 2.2. There is a positive correlation between slack resources and innovation adoption.

Hypothesis 2.2_0. There is no correlation or a negative correlation between slack resources and innovation adoption.

External communications network. External communications network seeks to capture the degree of interaction and embeddedness of an organization with other relevant entities in its environment and thereby capture the degree of consequent conformity pressures (Damanpour, 1991). Institutional theory suggests that organizations

seek to conform to norms, standards, and expectations of other organizations in their role set and suggests that organizations with extensive linkages will be more likely to adopt innovations (DiMaggio & Powell, 1983; Meyer & Rown, 1977). It was expected that the more embedded an organization was with its larger social system, the greater the likelihood it would conform to external expectations via adoption of innovations. Overall, empirical findings were supportive of theoretical expectations. Based on theoretical and empirical findings in the literature review, it was expected that there would be a positive relationship between external communications and innovation adoption. In accord with this expectation, the following hypotheses were stated:

Hypothesis 2.3. There is a positive correlation between external communications network and innovation adoption.

Hypothesis 2.3$_0$. There is no correlation or a negative correlation between external communications network and innovation adoption.

Control of domain. Control of domain refers to the means and extent power is exercised by professional participants in an organization to secure and protect an arena of professional decision-making and activity and to promote fidelity to professional standards (Flood & Scott, 1978; Flood & Scott, 1987). The greater the control of domain of a professional group, such as nursing, the greater the influence they exert over outcomes relevant to their professional arena, such as adoption of the magnet hospital concept. This factor has not been studied extensively with the limited empirical findings primarily drawing on Flood & Scott (1978, 1987) and Aiken (2002) and other studies primarily related to the general influence of the presence of professionals in organizations on innovation adoption. Considering the theoretical reasoning and the empirical results, it was expected that there would be a positive relationship between control of domain and

innovation adoption if the innovation was professionally desirable. In accord with this expectation, the following hypotheses were stated:

Hypothesis 2.4. There is a positive correlation between control of domain and innovation adoption.

Hypothesis 2.4$_0$. There is no correlation or a negative correlation between control and innovation adoption.

It should be noted that there is some ambiguity related to theoretical reasoning on this factor relative to adoption of the magnet hospital concept. First, the relationship is subject to professional evaluation of the desirability of an innovation in terms of compatibility with professional decision-making, activity, and desires. Thus, there is a presumption that the magnet hospital concept is deemed desirable by hospital professional elites. Secondly, consideration of this factor relative to adoption of the magnet hospital concept suggests that hospitals with more nurses have more power and expertise available for implementing magnet practices and conversely, fewer nurses might impair their ability to adopt. However hospitals with nursing shortages have greater need for nurse recruitment and retention interventions like the magnet hospital concept, which suggest greater impetus toward adoption. Also, fewer nurses might facilitate implementation of magnet practices by potentially reducing structural inertia and implementation logistics. Since, plausible arguments can be made for hypothesizing this relationship in different directions on some theoretical grounds, the stated hypothesis should be viewed as exploratory.

Environmental and Organizational Influences

The next research question asked whether one set of factors was more influential than the other, if both sets were found to significantly influence innovation adoption. The literature review found that strategic adaptation is the process by which an organization aligns itself to its external environment (Child, 1997). It was noted that the strategic behavior of organizations is shaped by the dual influences of the organization's environment and the organization's own internal capabilities (Ansoff, 1987). Organizations exhibit willful, adaptive behaviors in using their capabilities responding to environmental demands (Oliver, 1991). Thus, environmental determinism and strategic choice are foundational to understanding and explaining organizational adaptation to change (Hrebniak & Joyce, 1985; Oliver, 1991). Given the theoretical argument that organizations exercise strategic choice, such as adoption of innovations, in order to adapt to their environment, it was expected that environmental factors exerted dominant influence on innovation adoption and thus there should be a salient difference between environmental and organizational factors influence on adoption. In accord with this expectation, the following hypotheses were proposed:

Hypothesis 3. There is a significant difference between environmental influences and organizational influences correlations with innovation adoption.

Hypothesis 3_0. There is no significant difference between environmental influences and organizational influences correlations with innovation adoption.

The final research question asked, what is the influence of environmental and organizational influences, acting jointly, on innovation adoption? As has been noted earlier in this section, strategic adaptation literature indicates that both environmental determinism and strategic choice jointly influence an organization's actions that represent

its adaptive response, such as adoption of innovations. Given this rationale, it was expected that environmental and organizational factors, acting jointly, would be particularly salient in influencing innovation adoption. In accord with this expectation, the following hypotheses were proposed:

Hypothesis 4. There is a positive correlation between environmental and organizational influences, acting jointly, and innovation adoption.

Hypothesis 4_0. There is no correlation or a negative correlation between environmental and organizational influences, acting jointly, and innovation adoption.

If environmental and organizational influences, acting jointly, were significant, then it was of interest to examine which of these individual factors significantly influenced the innovation adoption process and what was the direction of this influence. Hypotheses similar to 1.1 – 1.4 and 2.1-2.4 were used to examine the significance and direction of the relationship between the joint influence factors and innovation adoption.

Operationalization of Variables

This section explains operationalization of the variables that were used in testing of the hypotheses. First, operationalization of the independent variables of organizational complexity, competition, network externalities, and community resources are explained in order to capture environmental influences on innovation adoption. Operationalization of the independent variables of organizational complexity, slack resources, external communications network, and control of domain are then explained to capture organizational influences on innovation adoption. Next, the dependent variable of innovation adoption is operationalized. Finally, operationalization of type of hospital and size of hospital as control variables are addressed.

Environmental complexity. Hospitals located in urban areas have been viewed as operating in more complex environments than hospitals in rural areas (Kimberly & Evanisko, 1981). Location of hospitals in urban versus rural areas is a widely used variable in health services research (Alexander, D'Aunno, & Succi, 1996; Dansky, Milliron, & Gamm, 1996;Krein, 1999; Molinari, Alexander, Morlock, & Lyles, 1995). For purposes of this research, it was anticipated that environmental complexity would be operationally defined as location and measured by whether a hospital was located in an urban (i.e., MSA) or rural (i.e., non-MSA) area. However, preliminary analysis of data for the magnet hospital adopters indicated that none were located in rural areas (i.e., non-MSA areas). Thus, for purposes of this research hospitals were classified as to whether they were located in more urban or metropolitan areas (i.e., core population at least 50,000 or higher) or less urban or micropolitan areas (i.e., core population at least 10,000 up to 49,999) using 2003 Office of Management and Budget classifications (Census, 2006) based on AHA annual survey data for the year of adoption or readoption between 1999-2004 for magnet hospitals and in 2004 for non-adopters.

Competition. Numerous empirical studies have examined competition using various operationalizations. While a number of measures of competition are used in health services research, the Herfindahl Index is a very widely adopted measure (Lynk & Morrisey, 1987; Ginn & Young, 1992; Tami, 1999; Trinh & O'Connor, 2000) of market concentration that is used to gauge competition. It has been found that markets that are less concentrated tend to be more competitive (Ginn & Young, 1992). Thus, the lower the Herfindahl index, the more competitive a hospital's market. The Herfindahl index can

be calculated as the sum of the squared shares of admissions for all acute care hospitals in a city (or other geographic unit) where a hospital is located and where market share is calculated by dividing each hospital's admissions by the total number of admissions for the city (or other geographic unit) (Ginn & Young, 1992). As such, a hospital market's Herfindahl index can range from 0 to 1, moving from a large number of competitors to a single provider. In this study, competition is operationally defined as a hospital's Herfindahl index within its market (i.e., county). (It should be noted that the higher the Herfindahl Index, the more concentrated the market, so lower values of the index reflect higher degrees of competition. Thus, the direction of the relationship between measures of the index and innovation adoption will be negative in order to be consistent with the hypothesis of a positive relationship). The Herfindahl Index was calculated for each county using hospital admission data from the AHA annual survey for the year of adoption or readoption between 1999-2004 for magnet hospitals and in 2004 for non-adopters.

Network externalities. The one study found with this factor used the percentage of adopting competitors to measure network externalities (Krein, 1999). For purposes of this study, network externalities was operationally defined as the presence of other adopters in a hospital's market area and measured as the percentage of competitors in the market (i.e., county) that had already adopted the magnet hospital concept. The percentage of adopters in place was calculated by county for the year prior to adoption for all magnet hospitals. Likewise the percentage of adopters in place in 2004 was calculated for all non-adopter hospitals by county. A list of designated magnet hospitals

was obtained from the ANCC to identify all adopters and readopters during the study period, designation years 2000-2005 (ANCC, 2006) which corresponds to AHA data years 1999-2004.

Community resources. A number of operational definitions have been used in empirical studies in the health services research literature for availability of community resources. Physician supply per thousand population has frequently been used in the health services literature to measure workforce availability as a community resource (Alexander, D'Aunno, & Succi, 1996; Bigelow & Mahon, 1989; Krein, 1999; Zajac & Shortell, 1989). Given the focus of this study, community resources availability might best be operationalized as nursing supply within a hospital's market (i.e., county) as measured by the number of RNs per thousand of population. Research to date has demonstrated the ability of magnet hospital's to attract and facilitate recruitment of new nurses, lower turnover and vacancy rates, and increase retention (McClure & Hinshaw, 2002). Adoption of the magnet concept provides a means for hospitals to achieve a favorable resource dependence position by attracting nurses available as a community resource. However, data on the number of RNs by county was not uniformly available for any years during the study period. Thus, an alternative measure of health care workforce availability was used in this research. The number of Healthcare Practitioner Professionals per thousand of population was uniformly available by county from the year 2000 census as a measure of the relative availability of health care workers as a community resource from ARF (Bureau of Health Professions, 2005). Healthcare Practitioner Professionals (HPPs) are defined by the U.S. Census Bureau as practitioners

in the following occupation codes: Chiropractors, Dentist, Dietitians and Nutritionists, Optometrists, Pharmacists, Physicians and Surgeons, Physicians and Surgeons, Physician Assistants, Podiatrists, Registered Nurses, Audiologists, Occupational Therapists, Physical Therapists, Radiation Therapists, Recreational Therapists, Respiratory Therapists, Speech-Language Pathologists, Therapists-All Other, Veterinarians, and Health Diagnosing and Treating Practitioners-All Other (Bureau of Health Professions, 2005). Thus, HHPs per thousand of population in each hospital's county for the year 2000 was used as a relative measure of community resources in this research.

Organizational complexity. While a number of different operationalizations were found in the literature, the complexity of hospital organizations has been frequently measured in terms their scope of services (Gautam & Goodstein, 1996). For purposes of this study, organizational complexity was measured as the number of services offered by a hospital. This measure was computed from AHA annual survey data that reports services available by hospital. This measure was computed for the year of adoption or readoption between 1999-2004 for magnet hospitals and in 2004 for non-adopters.

Slack resources. Slack resources provides a measure of resource availability for implementing innovations and mitigating related risks. Slack resources have been operationalized using a number of measures. Superior financial performance can lead to greater availability of resources and accumulation of slack resources. While financial measures are frequently used, the most common approach found in the literature review used a measure of hospital occupancy or census for this factor (Provan, 1987; Glandon &

Counte, 1995; Zinn, Weech, & Brannon, 1998; Krein, 1999). In this research, slack resources were measured by percentage of hospital occupancy. Hospital occupancy was calculated from AHA annual survey utilization data as follows: Hospital Patient Days for Year divided by the product of the Number of Beds Available multiplied by 365 days (Bureau of Health Professions, 2005). Hospital occupancy was calculated for the year of adoption or readoption for magnet hospitals between 1999-2004 and in 2004 for non-adopters.

External communications network. Whether a hospital is a member of a formal system of hospitals is frequently used in health services research to capture network linkages (Krein, 1999; Wheeler, Brukhardt, Alexander, & Magnus, 1999). Hospital system membership was used to operationalize external communications network in this study. The AHA annual survey provides a categorical indicator or whether a hospital is a member of a multi-hospital system or not. This measure was obtained for the year of adoption or readoption for magnet hospitals between 1999-2004 and for 2004 for non-adopters.

Control of domain. This influence factor seeks to capture the power of a professional group in an organization over decisions, activities, and outcomes important to their professional interests. The greater the control of domain of a professional group, such as nursing, the greater the influence they exert over outcomes relevant to their professional arena, such as adoption of the magnet hospital concept. The more nurses that a hospital has relative to its capacity, the greater potential RNs have to exert control

over their domain and the greater expertise there is available to implement the innovation. Control of domain was defined as a hospital's nursing supply in this study and was measured by the number of RNs per bed in operation at a hospital similar to the way strength of professional presence has been captured in other studies (Alexander, D'Aunno, & Succi, 1996; Wheeler et al., 1999). The number of RNs and the number of beds were obtained for each hospital from the AHA annual survey and the ratio was calculated as of the year of adoption or readoption for magnet hospitals between 1999 and 2004, or as of 2004 for non-adopters.

Innovation adoption. The literature review indicated that adoption of an innovation is a process that involves a series of decisions, not a single decision. However, most studies of adoption of innovations generally have not considered the entire adoption process (Frambach & Schillewaert, 2002) probably because of the complexity inherent in delineating and measuring each and all of the stages in the process (Wilson, Ramamurthy, & Nystrom, 1999). Most studies have focused on a single stage as the outcome variable (Kimberly & Evanisko, 1981; Olshavsky & Spreng, 1996; Wilson, Ramamurthy, & Nystrom, 1999), usually the implementation stage using Rogers' (2003) schema. The implementation stage occurs when an organization actually puts an innovation into use. The literature review indicated that implementation of an innovation is a widely used measure of adoption (Glandon & Counte, 1995; Alexander, D'Aunno & Succi, 1996; Zinn, Weech, and Brannon, 1998; Krein, 1999; Wheeler et al., 1999). In this study, adoption at the implementation stage was measured by whether a hospital was formally designated as a magnet hospital by the ANCC or not during the study period,

ANCC designation years 2000-2005 which corresponds to AHA data years 1999-2004. (This measure was dichotmously coded as adoption = 1 and non-adoption = 0.) A listing of designated magnet hospitals with key identifying information and designation and/or redesignation dates was obtained from the ANCC (ANCC, 2006).

Type of hospital. Type of hospital was used as a control variable. It has been noted that for-profit hospitals focus on financial performance versus not-for-profit hospitals that also focus on broader qualitative and social performance objectives (Feldstein, 1999; Marsteller, Bovbjerg, & Nichols, 1998; Jones, DuVal, & Lesparre, 1987). Hospital ownership can be dichotomously coded as not-for-profit or for-profit (Alexander, D'Aunno, & Succi, 1996; Trinch & O'Connor, 2000; Wheeler et al., 1999; Zajac & Shortell, 1989). For purposes of this research type of hospital was operationalized as for-profit or not-for-profit ownership. These designations were obtained from AHA annual survey data for the year of designation or redesignation for magnet hospitals from 1999-2004 and for 2004 for non-adopters.

Hospital size. In the original magnet research, it was noted that the ingredients of magnetism that emerged in the study were similar regardless of size, where hospitals ranged from 99 to 1,050 beds (McClure et al., 1983). Various beds sizes are represented by ANCC designated magnet hospitals (ANCC, 2006). However, the literature review indicated that size has a positive influence if it is significant, but empirical results have been mixed on its significance (Kimberly & Evanisko, 1981). While hospital size can be captured by a number of measures, number of operating beds has been a frequently used

metric (Alexander, D'Aunno, & Succi, 1996; Gautam & Goodstein, 1996; Trinh & O'Connor, 2000; Wheeler et al., 1999) and was used to operationalize hospital size in this study. Total number of hospital beds in operation was obtained from AHA annual survey data for the year of designation or redesignation for magnet hospitals between 1999 and 2004 and for 2004 for non-adopters.

Research Design

This section describes the research design used for this study. The sampling frame and method are first discussed followed by data collection procedures. Measurement and instrumentation, reliability and validity considerations, and data analysis methods are then reviewed.

Sampling Frame and Method

The initial sampling frame for this study consisted of U.S. hospitals registered with the AHA during the study period. Data for ANCC designated or redesignated magnet hospitals as of December 2005 were obtained from the AHA annual survey datasets for the year prior to designation or redesignation as a magnet hospital (i.e., lagged to correspond to the year implementation was actually achieved) during the study period if the hospital reported data to the AHA. Data for non-adopters (i.e., non-magnet hospitals) were obtained from AHA annual survey data for the last year of the study period if the hospital reported data for that year to the AHA, since this was the last opportunity the non-adopters had to make a decision to adopt the magnet hospital concept as an administrative innovation.

The timeframe for this study was the period 2000 through 2005 based on those hospitals that were designated or redesignated by the ANCC during this period. This timeframe corresponds to AHA annual surveys with publication dates of 2001 through 2006. However, data in AHA surveys lags publication date by 12 to 24 months. Thus, the actual timeframe for the data in the AHA surveys is for hospital fiscal years 1999 through 2004. To avoid confusion, the study timeframe has been referred to as AHA data years 1999-2004. This was the most recently available data at the time of the study. All ANCC designated or redesignated hospitals as of December 2005 that reported data on the AHA annual surveys during the study period were included in this study. Hospitals designated after December 2005 were not included due to lack of AHA survey data.

The AHA data year 2004 was used as the sampling frame for obtaining a random sample of non-adopter hospitals since this was the last year these hospitals could have made the decision to adopt. A number of hospitals were dropped from the overall sampling frame for various reasons prior to sampling. First, hospitals that did not employ RNs were dropped since the magnet hospital concept is a strategy for recruiting and retaining RNs. Second, hospitals that were not located in one of the 50 U.S. states were dropped since no magnet hospitals had been designated in these other areas (i.e., primarily U.S territories and possessions). Third, federal government hospitals operated by the Department of Defense, Department of Justice, Bureau of Indian Affairs, and U.S. Public Health Service were dropped since these hospitals do not routinely recruit in traditional labor markets and no magnet hospitals of these types had been designated. However, hospitals operated by the Department of Veterans Affairs were retained in the sampling frame since several of these hospitals had attained magnet designation. Next,

hospitals that did not report data to the AHA were dropped. (While the AHA does estimate data for most non-reporting hospitals, the basis of these estimates and their reliability could not be ascertained.) Finally, rural hospitals were dropped from the sampling frame since no magnet hospitals were located in OMB designated rural areas during the study period.

In summary, all ANCC designated magnet hospitals for which AHA data were available were included in this study along with a random sample of non-adopters from the adjusted sampling frame described above. The size of the sample was guided by recommended ratios of the number of non-adopters to adopters and the ratio of the total number of cases (i.e., adopters plus non-adopters) to the number of independent variables for use of logistic regression as a statistical technique. King and Zeng (2001a; 2001b) recommend that the ratio of non-adopters (i.e., 0's) to adopters (i.e., 1's) approximate the range of two to five non-adopters per adopter. Aldrich and Nelson (1984) recommend that the total number of cases (i.e., N) approximate at least fifty per independent variable. The random sample of non-adopters used for this research and the total number of cases per independent variable conforms to these guidelines.

Data Collection Procedures

The data used in this study were drawn from three secondary sources. The ANCC web site (ANCC, 2006) was consulted on May 15, 2006 to obtain the names, identifiers, and related information on hospitals that met designation or redesignation criteria as magnet hospitals up through 2005. The AHA annual survey datasets for the study period (i.e., 1999-2004 data years) were used to obtain data for both the adopters and a random

sample of non-adopters. The ARF (Bureau of Health Professions, 2005) was used to obtain environmental and demographic data related to each adopter and non-adopter. Data were extracted from the secondary data sources and cleaned and coded as necessary and new measures calculated as needed and ultimately merged into a new dataset for statistical analysis.

Measurement and Instrumentation

Measures of independent and control variables for each hospital in the study were obtained from the secondary data sources described above. These data were obtained from survey instruments used by each data collection sponsor in accord with definitions and procedures established by the sponser. Table 1 provides survey source definitions for measures, formulas for calculated measures, and survey data sources. These measures were examined for each survey year to assure that definitions had not changed between surveys and for overall consistency of measures between years.

TABLE 1
Operationalization of Variables

Influence Categories	Variable	Measure	Definition	Data Source
Environmental Influences	Environmental Complexity	Location	Coded as Urban (Metro MSA) = 1 Suburban (Micro MSA) =0	AHA Annual Survey & Area Resource file
	Competition	Herfindahl Index	Calculated as the sum of the squared ratios of each hospital's admissions to the market total. The lower the index the less concentrated the market (i.e., the more competitive). Market is defined as county.	AHA Annual Survey
	Network Externalities	Cumulative Adopters in Market	Calculated as percentage of competitors adopting magnet hospital concept in market. Market is defined as county.	AHA Annual Survey & ANCC data
	Community Resources	Health Workforce Supply in market	Health Practitioner Professionals/1000 population market. Market defined as county.	Area Resource File
Organizational Influences	Organizational Complexity	Number of Services	Number of hospital services reported.	AHA Annual Survey
	Slack Resources	Percentage of hospital occupancy	Hospital occupancy reported. Calculated as Patient Days/(average beds available* 365).	AHA Annual Survey
	External Communications Network	System Membership	Coded as Member = 1 and Non-Member = 0	AHA Annual Survey
	Control of Domain	RN Staffing	Calculated as number of FTE RNs/bed in operation	AHA Annual Survey
Controls	Size	Number Beds	Number of acute care beds in operation	AHA Annual Survey
	Type of Hospital	Ownership	Not-For-Profit = 1; For-Profit = 0	AHA Annual Survey
Innovation Adoption	Adoption of Magnet Hospital Concept	ANCC Designation as Magnet Hospital	Designated = Adopter = 1 Not Designated = Non-Adopter = 0	ANCC Data

Changes occurred over the study period that significantly affected two measures. First, the definition of Metropolitan Statistical Areas (MSAs) changed in 2003 from six categories based on varying population sizes to four categories (i.e., rural, micropolitan, metropolitan, metropolitan division) to better reflect social and economic integration patterns (Bureau of Health Professions, 2005). It was possible to map these different categorical designations to each other for purposes of capturing the environmentalcomplexity variable consistently in this research. Second, organizational complexity was captured using number of hospital services as the measure. However, the number of service categories tended to grow each year during the study period due to expansion of existing services or additions of new service categories. If the new service categories were expansions of a prior category (e.g., transplant services in 1999 grew to five categories for specific types of transplants by 2004), then the new categories were mapped back to the 1999 category. If the new category was unique compared to the 1999 categories, such that it could not be mapped back (e.g., gamma knife procedures), then it was excluded. This approach assured that a consistent scope of services relative to 1999 was used for each year in the study given the cross-sectional approach of this research.

Measures of the dependent variable were obtained from the ANCC web site (ANCC, 2006). These data consisted of hospital name, address, and other identifiers along with year of initial designation and all redesignation years. It should be noted that year of designation and year of adoption of the magnet hospital concept typically are not the same. The year of adoption is estimated to be the year in which a hospital made the decision to apply for ANCC designation since this would be the point at which the hospital had attained a sufficient level of confidence in implementation of the magnet

principles to proceed with an application for formal recognition. According to the ANCC, it typically takes at least a year for application preparation, review, and designation action (ANCC, 2006). Thus, ideally data would be collected for the year before designation in order to approximate the adoption/implementation date. Since the AHA data are inherently lagged 12 to 24 months from publication date, this lag period serves to approximate adoption/implementation date.

Reliability and Validity

Reliability is a function of the properties of the instruments and procedures used by the survey sponsors to collect the data in their respective surveys from year to year. Both the AHA annual survey and ARF data are commonly used in scholarly research, particularly in the health economics and health services research literatures. Calculated measures all use survey data and common formulas from the literature. Data collected from ANCC records were verified against web site information for each of the designated hospitals to ensure accuracy. As discussed above, all measures were compared from year to year for the study period and adjustments were made (e.g., MSA designation, service categories) to assure consistency.

While it was not possible to assess the reliability of the data collection instruments, the stability and reliability of overall results were examined. Three sampling frames and five samples within each frame were used for modeling to assess the stability of results. The first sampling frame consisted of all hospitals participating in the AHA annual survey during the study period, except for hospitals not located in the 50 U.S. states and certain federal hospitals. The second sampling frame consisted of only those

hospitals from the first frame that actually reported data on the AHA survey, thus excluding those with estimated data. The final sampling frame consisted of only hospitals in non-rural areas from the second frame. Aside from all hospitals in each sampling frame, models were examined for five, ten, fifteen, and twenty percent samples to compare results.

Several approaches to establishing validity were considered. Face validity deals with whether a measure or procedure appears to capture what it purports to measure (Trochim, 2001). All of the measures used in this study intuitively seemed valid as evidenced by their use for similar research purposes in the cited literature. Content validity is the extent to which a measurement reflects the intended domain of content (Trochim, 2001). All of the variable measures used in this study were drawn from the health economics and health service research literatures where they were used for similar purposes, which indicates their broad acceptance as suitable measures for their respective domains. Construct validity is viewed as agreement between a theoretical concept and a specific measuring device or procedure (Trochim, 1986). All of the variables used in this study for operationalizing constructs are drawn from cited literature where they were used for a similar purpose. Criterion related validity is used to demonstrate the accuracy of a measure or procedure in capturing a construct by comparing it with another measure or procedure that has been demonstrated as valid (Trochim, 1986). This type of validity is a property of the data collection instruments. Overall, widespread use of data from the AHA and ARF surveys in scholarly research was accepted as reasonable evidence of their validity for purposes of this study.

In addition to relying on the literature review for guidance in addressing validity, empirical methods were also employed. Both principle components analysis and factor analysis were used to examine the association of the metric variables (i.e., measures for competition, network externalities, community resources, organizational complexity, slack resources, control of domain, and size) with the categories of environmental and organizational influences. While these two methods often yield similar results (Stevens, 1992), particularly with large samples, both methods were used to cross-validate results. Analyses were performed using correlation matrices for the variables. To determine factorability of the data, the size of the determinant was assessed and the Kaiser-Meyer-Oklin test of sampling adequacy was used along with Bartlett's test of sphericity. To determine the number of components or factors suggested by the variables, the Kaiser criterion (i.e., eigenvalues greater than one) and Scree plots were used. Both orthogonal (i.e., varimax) and oblique (i.e., promax) rotations were employed to clarify the loading of specific variables on the components or factors. The criterion for assessing loading was a minimum loading factor of |0.3| with loadings of |0.4| or higher desired for practical significance, although a loading as small as |0.2| would be statistically significant for a sample of 725 cases and $p = 0.01$ (Stevens, 1992).

Data Analysis Methods

Logistic regression was the primary statistical method used to analyze these data. Logistic regression is appropriate for use when the dependent variable (i.e., adoption/non-adoption of the magnet hospital concept) is dichotomous and the independent variables (i.e., environmental factors, organizational factors, and control variables) are measured

either categorically or on a continuous scale (Der & Everitt, 2002). In this study the dependent variable was categorical with adoption of the magnet hospital concept = 1 and non-adoption = 0. All independent and control variable measures were either continuous or categorical. For Hypothesis 1.0, reduction in logistic model deviance (e.g., -2LL) was used to statistically test the relationship between environmental factors as a group and innovation adoption, and Wald statistics were used to test Hypotheses 1.1 – 1.4 concerning the significance of each factor individually. The same approach was used for the organizational factors as a group (Hypothesis 2.0) and for each of these factors individually (Hypotheses 2.1 – 2.4). Likewise, this same approach was used to examine the joint influence of both sets of influence factors on adoption (Hypothesis 4.0) and the significance of each of theses factors individually (Hypotheses 4.1-4.8). The relative influence of the environmental factors as a group and organizational factors as a group on innovation adoption (Hypothesis 3.0) was statistically tested using the difference in the reduction of deviance (i.e., change in -2LL) for their respective logistic regression models. In all of the models, the control variables were entered first, in a separate step, before the experimental variables were entered so that their respective impact on reduction in deviance could be examined. Descriptive statistics were analyzed, including frequencies for categorical variables and means, medians, standard deviations, ranges, and correlations for continuously measured variables. In addition, test of differences between measures of central tendency were used as an exploratory tool to examine differences between quantitative measures of independent variables by dependent variable categories. The SPSS/PC Version 14.0 software package was used for data analysis.

Summary

The methodology used for this study was explained in this chapter. First, the purpose of the study and related research questions were reviewed. Hypotheses to address each of the research questions were then presented. The research model was operationalized using common variables and measures from the organizational, health economics, and health services research literatures. Secondary data sources were identified for each independent and control variable drawing on widely utilized health services surveys and data collection procedures were described for the dependent variable. Validity and reliability issues were addressed by drawing on the widespread adoption and usage of the survey data sources and employing empirical methods to the degree possible. Logistic regression was identified as the primary statistical method used to examine the nature and significance of the hypothesized relationships.

CHAPTER 4

ANALYSIS AND PRESENTATION OF FINDINGS

Introduction

The purpose of this chapter is to provide an analysis of the data used to investigate the study hypotheses and present the findings from this analysis. A description of the sampling frames and samples investigated in this study is first reviewed. This description includes descriptive statistics on the study sample selected for analysis and addresses reliability and validity issues. Next, results and findings related to each hypothesis are presented. The chapter closes with a summary of the findings.

Description of the Sample

This section describes the sampling frame and sample along with addressing issues of reliability and validity. In addition, assumptions for statistical tests are discussed.

Sampling Frame

The sampling frame for the study sample consisted of all 3773 non-rural U.S. hospitals that reported institutional information on AHA annual surveys for data years 1999-2004. This sampling frame was developed by successively refining the pool of hospitals in the AHA annual survey database through a series of steps to better approximate characteristics of the population of magnet hospitals in the U.S.

There were 197 ANCC designated organizations as of May 2006. Some 23 of these organizations were excluded from the study because they were corporate offices of hospital systems, or were not registered with AHA, or otherwise had no data in the AHA annual survey, or were designated in 2006 outside of the study period. Of the 174 magnet hospitals with AHA data for the study period, some 18 had data in the annual survey reports that were estimated by AHA rather than reported by the hospitals. These hospitals were excluded from the study since neither the basis of these estimates nor their reliability could be ascertained. These exclusions left 156 adopters or readopters of the magnet hospital concept during the study period for inclusion in the study.

As regards non-adopters, the initial sampling frame consisted of all 5901 hospitals (i.e., 6057 hospitals less 156 adopters) registered with the AHA for its annual survey. This is a census of virtually all hospitals in the U.S. (AHA, 2006). This population was reduced by: (a) hospitals not located in the 50 U.S. states, since no magnet hospitals have been designated in U.S. territories or possessions and these locations might have substantially different labor markets and nursing credentials; (b) hospitals or health facilities that did not employ RNs; (c) hospitals with less than one year of operating results; and (d) federal government hospitals operated by the Defense Department, Department of Justice, Bureau of Indian Affairs, and Public Health Service, since these hospitals have limited impact on typical labor markets and no magnet hospitals have been designated in such facilities. However, Department of Veterans Affairs hospitals were included since these hospitals recruit in local labor markets and have been designated as magnet hospitals. These reductions yielded a sampling frame of 5702 non-adopters, labeled as “All Hospitals” in Appendix C.

Since only about 83% of registered hospitals actually report data each year in the AHA annual survey (AHA, 2006), the "All Hospitals" sampling frame was reduced by 1065 non-adopter hospitals that did not report actual data to the AHA during the study period. While the AHA estimates data for non-reporting hospitals, neither the basis of these estimates nor their reliability could be verified. These reductions yielded a sampling frame of 4637 non-adopter hospitals, labeled as "Reporting Hospitals" in Appendix C.

A preliminary analysis of the designated magnet hospitals indicated that none were located in rural areas using the Census Bureau/OMB (Census, 2006) designations captured by the AHA survey. Thus, the "Reporting Hospitals" sampling frame was reduced by 1020 non-adopter hospitals located in rural areas. These reductions yielded a sampling frame of 3617 non-adopter hospitals, labeled as "Reporting Non-Rural Hospitals" in Appendix C. This is the final sampling frame that was used for the study.

Sample

In the "Reporting Non-Rural Hospitals" sampling frame there were 156 adopters of the magnet hospital concept and 3617 non-adopter hospitals. Given a substantial disproportion of "1's" (i.e., adopters) and "0's" (i.e., non-adopters) in a population (i.e., sampling frame), a potential problem can arise in statistical analysis due to the phenomenon of interest (i.e., adoption of the magnet hospital concept) being a rare event (King & Zeng, 2001a; 2001b; Allision, 1999). To facilitate analysis, it is recommended by King and Zeng (2001a; 2001b) that random sampling take place on the non-rare event (i.e., non-adoption) in a ratio of two to five non-rare events (i.e., 0's) to each rare event

(i.e., 1's). Since there were 156 adopters available for study, then some 312 to 780 non-adopters were needed. A 15 percent random sample of the 3617 non-adopter in the sampling frame yields 569 non-adopter hospitals that when added to the 156 adopters, yielded a total sample of 725 hospitals or a ratio of 3.6 non-adopters per adopter, well within the sampling guidelines. Furthermore, it is recommended by Aldridge and Nelson (1984) that there should be at least 50 total cases for each independent variable for statistical analysis using logistic regression methods. For the ten independent variables (i.e., eight experimental and two control variables) in this study, a total sample size of at least 500 cases was needed. Thus, a fifteen percent random sample of non-adopters plus the adopters provided a sample size (i.e., N = 725) that fell well within these guidelines. (For comparative purposes, Appendix C provides five, ten, and twenty percent samples for each of the three sampling frames.)

Descriptive Statistics

The study sample consisted of 725 non-rural U.S. hospitals drawn from the "Reporting Non-Rural Hospitals" sampling frame. Table 2 presents descriptive statistics for the metric and categorical variables used in this study. Frequencies are provided for categorical variables along with means, standard deviations, medians, and ranges for metric variables. Plots and tests of normality were questionable for measures of the competition, network externalities, and total beds metric variables. These findings suggested that nonparametric statistical methods might be appropriate for certain subsequent analyses.

TABLE 2
Descriptive Statistics for Study Variables

Variable	Measure	Frequency	Mean	Standard Deviation	Median	Range
Environmental Influences						
Environmental Complexity	Location	Metro = 593 Micro = 132				
Competition	Herfindahl Index		0.39	0.31	0.30	0.98
Network Externalities	% of prior adopters		0.02	0.05	0.00	0.43
Community Resources	HPP/1000		15.48	4.55	15.02	34.11
Organizational Influences						
Organizational Complexity	Number Services		56.12	34.43	53.00	247.00
Slack Resources	Occupancy		0.66	0.18	0.68	0.97
External Communications Network	System Member	Yes = 427 No = 298				
Control of Domain	RNs/Bed		1.28	0.69	1.24	4.72
Control Variables						
Hospital Size	Total Beds		246.10	237.50	172.00	2010.00
Hospital Type	Control	NFP = 593 FP = 132				
Adoption		Yes = 156 No = 569				

Table 3 provides descriptive statistics for the study variables for each category of the dependent variable. There were 156 magnet hospitals in the adopter category and 569 hospitals in the non-adopter category. Frequencies are provided for categorical variables along with means, standard deviations, medians, and ranges for metric variables by adopter and non-adopter categories. The significance of differences between means and between medians for adopters and non-adopters were tested for the metric variables. Differences on all metric variables were significant whether a parametric t-test (i.e., independent samples, without assuming equal variances) for means or a nonparametric Mann-Whitney-Wilcoxon test for medians was used. Contingency table analysis was performed for the categorical variables using the chi-square test for independence (Gibbons, 1976). The categorical measures for location and hospital type differ for the adopter and non-adopter categories, unlike the measure for external communications network, which was not significant. These results indicate that when each of these variables, except external communications network, are considered independently from each other, they significantly differ between adopters and non-adopters, indicating potential salience in distinguishing between groups.

TABLE 3
Descriptive Statistics for Study Variables by Adoption Status

Variable	Measure	Adopters					Non-Adopters					Significant Difference
		Freq	Mean	Std. Dev.	Median	Range	Freq	Mean	Std. Dev.	Median	Range	
Environmental Influences												
Environmental Complexity	Location	Metro = 151 Micro = 5					Metro =454 Micro =115					χ^2 p = 0.000
Competition	Herfindahl Index		0.29	0.25	0.21	0.98		0.42	0.32	0.35	0.98	U p = 0.000 t p = 0.000
Network Externalities	% of prior adopters		0.03	0.08	0.00	0.40		0.02	0.04	0.00	0.43	U p = 0.007 t p = 0.003
Community Resources	HPP/1000		17.26	4.69	16.52	32.08		14.98	4.39	14.51	27.22	U p = 0.000 t p = 0.000
Organizational Influences												
Organizational Complexity	Number Services		79.93	37.96	69.00	215.00		49.59	30.32	47.00	247.00	U p = 0.000 t p = 0.000
Slack Resources	Occupancy		0.73	0.11	0.73	0.58		0.64	0.19	0.67	0.97	U p = 0.000 t p = 0.000
External Communications Network	System Member	Yes = 88 No = 68					Yes = 339 No = 230					χ^2 p = 0.477
Control of Domain	RNs/Bed		1.70	0.59	1.63	3.74		1.17	0.66	1.15	4.72	U p = 0.000 t p = 0.000

TABLE 3
Continued

Variable	Measure	Adopters					Non-Adopters					Significant Difference
		Freq	Mean	Std. Dev.	Median	Range	Freq	Mean	Std. Dev.	Median	Range	
Control Variables												
Hospital Size	Total Beds		436.40	247.39	383.00	1330.0		193.96	206.20	129.00	2010.0	U p = 0.000 t p = 0.000
Hospital Type	Control	NFP = 153 FP = 3					NFP = 440 FP = 129					χ^2 p = 0.000
Adoption		Yes = 156					No = 569					

U p < .05 is significance based on Mann-Whitney-Wilcoxon test of difference between medians for metric variables. t p < .05 is significance based on t-test for independent samples without assumption of homogeneity of variance for metric variables. χ^2 p < .05 is significance of relationship based on chi-square test of independence for categorical variables.

Correlations between the metric variables are presented in Tables 4a through 4c. These tables present correlations and significance test using both parametric (i.e., Pearson) and nonparametic (i.e., Kendall, Spearman) methods. While magnitudes of the correlation coefficients vary between methods due to differences in analytical techniques, the patterns of the magnitudes and the significance of the correlations were found to be remarkably similar. The two highest correlations were between total beds and number of service (R = 0.474, Tau = 0.457, Rho = 0.629) and RNs/bed and number of services (R = 0.324, Tau = 0.308, Rho = 0.442). Another notable correlation using nonparametic coefficients was for percent of prior adopters and Herfindahl index (R = -0.244, Tau = -0.389, Rho = -0.531). Collinearity or high correlations between independent variables can create convergence problems for maximum likelihood estimation in logistic regression (Cohen, Cohen, West, & Aiken, 2003). No such problems were encountered in the analyses for this study.

TABLE 4a
Pearson's R Correlations of Metric Variables

	Competition	*Network Externalities*	*Community Resources*	*Org. Complexity*	*Slack Resources*	*Control Domain*	*Size*
Measures	**Herfindal Index**	**% of Prior Adopters**	**HPP/1000**	**Number of Services**	**Occupancy**	**RNs/Bed**	**Total Beds**
Herfindal Index	1.00						
% of Prior Adopters	*-0.244*	1.00					
HPP/1000	*-0.188*	*0.117*	1.00				
Number Service	*-0.175*	*0.133*	*0.182*	1.00			
Occupancy	***-0.303***	*0.126*	*0.202*	*0.187*	1.00		
RNs/Bed	*-0.137*	0.052	*0.169*	***0.324***	*0.143*	1.00	
Total Beds	*-0.276*	*0.150*	*0.170*	***0.474***	*0.316*	*0.198*	1.00

Italics indicate correlation is significant at the 0.01 level (2-tailed).

TABLE 4b
Kendall's Tau Correlations of Metric Variables

	Competition	*Network Externalities*	*Community Resources*	*Org. Complexity*	*Slack Resources*	*Control Domain*	*Size*
Measures	**Herfindal Index**	**% of Prior Adopters**	**HPP/1000**	**Number of Services**	**Occupancy**	**RNs/Bed**	**Total Beds**
Herfindal Index	1.00						
% of Prior Adopters	***-0.389***	1.00					
HPP/1000	*-0.061*	0.003	1.00				
Number Service	*-0.117*	0.055	*0.165*	1.00			
Occupancy	*-0.119*	*0.137*	*0.127*	*0.130*	1.00		
RNs/Bed	*-0.070*	0.012	*0.123*	***0.308***	*0.107*	1.00	
Total Beds	*-0.237*	*0.156*	*0.145*	***0.457***	*0.239*	*0.195*	1.00

Italics indicate correlation is significant at the 0.01 level (2-tailed).

TABLE 4c
Spearman's Rho Correlations of Metric Variables

	Competition	*Network Externalities*	*Community Resources*	*Org. Complexity*	*Slack Resources*	*Control Domain*	*Size*
Measures	**Herfindal Index**	**% of Prior Adopters**	**HPP/1000**	**Number of Services**	**Occupancy**	**RNs/Bed**	**Total Beds**
Herfindal Index	1.00						
% of Prior Adopters	***-0.531***	1.00					
HPP/1000	*-0.096*	-0.001	1.00				
Number Service	*-0.170*	0.070	*0.240*	1.00			
Occupancy	*-0.289*	*0.178*	*0.186*	*0.172*	1.00		
RNs/Bed	*-0.103*	0.016	*0.181*	***0.442***	*0.136*	1.00	
Total Beds	*-0.353*	*0.201*	*0.214*	***0.629***	*0.341*	*0.283*	1.00

Italics indicate correlation is significant at the 0.01 level (2-tailed).

Validity, Reliability, and Analytical Assumptions

Key bases for establishing reliability were reviewed in Chapter 3. Beyond these precautions, statistical analyses were repeated across a number of different sampling frames and sample sizes to examine the stability of study results. Appendix C provides the findings of these supplemental analyses. A remarkably uniform pattern of results was found across the "All Hospitals", "Reporting Hospitals", and "Reporting Non-Rural Hospitals" sampling frames for sample sizes of five, ten, fifteen, and twenty percent, in addition to analyses for all hospitals in each sampling frame. In general, all of these supplemental analyses supported reliability of results from the fifteen percent sample of "Reporting Non-Rural Hospitals" that were used as the basis of the findings presented in this chapter.

Validity was addressed empirically using both principle components analysis and factor analysis to examine the association of the metric variables (i.e., measures for competition, network externalities, community resources, organizational complexity, slack resources, control of domain, and size) with the categories of environmental and organizational influences. Appendix B presents results of the principle components and the factor analyses. For principle components and the factor analysis, the determinant test (i.e., determinant > 0.000001), the KMO criterion (i.e., KMO > 0.6), and the Bartlett test of sphericity ($p < 0.000$) supported sampling adequacy and factorability of the variables. The Kaiser criterion (i.e., eigenvalues > 1.0) and Scree plots both supported a two component or factor solution. The cumulative variance explained by the two components or factors was at least 47.7 percent. The measures for organizational complexity, control of domain, and size loaded (i.e., loadings > |0.3|) on a component or

factor that could be reasonably designated as organizational influences. The measures for competition, network externalities, and community resources loaded on a component or factor that could be reasonably designated as environmental influences. The measure for slack resources (i.e., percentage of hospital occupancy) loaded on the environmental influences component and factor rather than the organizational component or factor as expected. These findings were similar for both principle components and factor analysis and for orthogonal (i.e., varimax) and oblique (i.e., promax) rotations. Although the measure for the slack resources variable did not load on the organizational influences component or factor as expected, it was included with these influences in the analyses in the following sections in accord with theoretical rationale and to be consistent with usage in the health services research literature. It should be noted that whether slack resources was included as an environmental or organizational influence factor did not affect analytical results sufficiently to change the conclusions on any of the hypotheses presented in the following sections. Explanation of the unexpected loading of this factor is addressed in the discussion section of the following chapter.

The statistical technique primarily used for data analysis in this study is logistic regression. Logistic regression does not require assumptions of linearity, homosecdasticity, and normality or multivariate normality (Polit, 1996; Harlow, 2005). However, this technique does require that outcome categories be exclusive and exhaustive (i.e., statistically independent) so that each participant (i.e., hospital) is classified into one, and only one, of these categories. In addition, logistic regression requires large samples to ensure stability of estimates and limited collinearity between

independent variables for estimation convergence (Aldridge & Nelson, 1984; Kinnear & Gray, 2004). These assumptions were met in this study.

Results and Findings

This research investigated four primary hypotheses and sixteen secondary hypotheses to answer the research questions. Each of the following subsections presents results and findings for each primary hypothesis and its associated secondary hypotheses.

Hypothesis 1.0: Environmental Factors and Innovation Adoption.

The first primary hypothesis proposed that there was a positive correlation between environmental factors (i.e., environmental complexity, competition, network externalities, and community resources) as a group and innovation adoption (i.e., designation as a magnet hospital). Table 5 presents logistic regression results for this hypothesis for the fifteen percent sample (N = 725 hospitals) used for the study. This regression was done in two stages with the control variables (i.e., Size of Hospital, Type of Hospital) entered first, in a separate step, and then the four experimental variables entered in the next step as a group. (This procedure was followed so the respective impact on reduction in deviance of the control and experimental variables could be examined.) Null model deviance (-2LL) of 755.0 was significantly reduced to 612.9 with the addition of the control variables (χ^2 =142.1, 2 degrees of freedom, p = 0.000 or 1.391E-31). This deviance was further reduced from 612.9 to 587.4 when the experimental variables were added indicating a significant unique contribution by these variables (χ^2 = 25.5, 4 degrees of freedom, p = 3.991E-5). The Chi Square statistic for

the full model (i.e., control and experimental variables) was very significant (χ^2 =167.7, 6 degrees of freedom) with p = 0.000 (or 1.383E-33 exactly). This finding was supported by a non-significant Hosmer-Lemeshow statistic of 0.212 that indicates a good fit of the model to the data. The overall Classification Ratio improved from 78.5 percent for the null model to 81.2 percent for the full model. Notably the percentage of correctly classified adopters improved from zero in the null model to 30.1 percent in the full model. The pseudo-R^2 indices ranged from 20.7 percent (Cox-Snell) to 31.9 percent (NagelKerte) of the deviance explained by the full model, which corresponds to Cohen's guidelines of a medium to large effect size (Cohen, Cohen, West, & Aiken, 2003). (Cohn's guidelines for effect size in power analysis are: small = 0.01, medium = .09, and large = .25 in term of proportion of variance explained. Since the pseudo-R^2 in logistic regression is in terms of deviance explained, these guidelines should be used with caution.) These results support rejection of the null hypothesis in favor of the alternative hypothesis that the environmental factors as a group are significantly related to innovation adoption. With this finding, the secondary hypotheses are useful in examining which environmental factors are individually related to adoption.

TABLE 5
Tests of Primary Hypotheses for Groups of Factors Singularly and Jointly

Hypotheses	Deviance -2LL			Chi Square Test			Overall Classification Ratio %			% Correctly Classified Adopters			R-Square		
	Null	Control	Control and Exper.	Model χ^2	DF	Significance p-value	Null	Control	Control and Exper.	Null	Control	Control and Exper.	Cox-Snell	Nagel-Kerte	Hosmer Leme-show
Hypothesis 1.0 Positive correlation environmental influences and adoption.	755	612.9	587.4	167.7	6	0.000	78.5	80.0	81.2	0.0	24.4	30.1	0.207	0.319	0.212
Hypothesis 2.0 Positive correlation organizational influences and adoption	755	612.9	551.8	203.2	6	0.000	78.5	80.1	82.3	0.0	24.4	40.4	0.244	0.378	0.112
Hypothesis 4.0 Positive correlation environmental and organizational influences jointly and adoption	755	612.9	537.3	217.8	10	0.000	78.5	80.0	82.6	0.0	24.4	41.0	0.259	0.401	0.317

*Hypothesis 1.1: environmental complexity***.** The first hypothesis for an environmental factor states that there is a positive correlation between environmental complexity (i.e., measured categorically as location in a less versus more urbanized area) and innovation adoption (i.e., designation as a magnet hospital). Table 6 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a positive 1.089 with a standard error of 0.510 resulting in a Wald statistic of 4.564 that is statistically significant with $p = 0.033$ for one degree of freedom. In interpreting this factor, it is important to remember that the coding of these data are such that a positive beta coefficient indicates an increase in environmental complexity (i.e., increasing urbanization) is associated with greater likelihood of adoption. The exponentiated beta indicates that there is a 296.7 percent increase in the odds ratio, or odds of adoption, due to location in a more urbanized area versus a less urbanized area. These findings lead to rejection of the null hypothesis and support the alternative hypothesis of a significant positive relationship between environmental complexity and innovation adoption.

TABLE 6
Tests of Secondary Hypotheses for Environmental Factors

Hypotheses	β	S.E.	Wald	DF	p-value	Exp(β)	Lower CI	Upper CI
1.1 There is a positive correlation between environmental complexity and innovation adoption.	1.089	0.510	4.564	1	0.033	2.967	1.094	8.065
1.1 There is a positive correlation between competition and innovation adoption.	-0.329	0.424	0.603	1	0.437	0.719	0.313	1.652
1.1 There is a positive correlation between network externalities and innovation adoption.	2.518	1.647	2.339	1	0.126	12.409	0.492	312.82
1.1 There is a negative correlation between community resources and innovation adoption.	0.069	0.023	9.085	1	0.003	1.071	1.024	1.120
Control 1 - Size = Number of Beds in use	0.003	0.000	46.9	1	0.000	1.003	1.002	1.004
Control 2 - Type of Hospital = Not For-Profit or For-Profit	2.145	0.602	12.68	1	0.000	8.538	2.623	27.795
Constant = B_0 (for Full Model)	-5.152	0.702	53.82	1	0.000	0.006		

Hypothesis 1.2: competition. The second hypothesis for an environmental factor states that there is a positive correlation between competition (i.e., inverse of Herfindahl Index) and innovation adoption (i.e., designation as a magnet hospital). Table 6 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a negative (-) 0.329 with a standard error of 0.424 resulting in a Wald statistic of 0.603 that is not statistically significant with p = 0.437 for one degree of freedom. In interpreting this factor, it is important to remember that a negative beta coefficient indicates a decreasing likelihood of adoption with increasing market concentration (i.e., equivalent to decreasing market competition), which is consistent with the hypothesis (i.e., increasing likelihood of adoption with increasing competition). While the direction of the relationship is consistent with the hypothesis, the beta parameter is not statistically significant so the null hypothesis cannot be rejected. Thus, these findings do not support the hypothesis of a significant relationship between competition and innovation adoption.

Hypothesis 1.3: network externalities. The third hypothesis for an environmental factor states that there is a positive correlation between network externalities (i.e., percentage of other adopters in the county) and innovation adoption (i.e., designation as a magnet hospital). Table 6 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a positive 2.518 with a standard error of 1.647 resulting in a Wald statistic of 2.339 that is not statistically significant with p = 0.126 for one degree of freedom. In interpreting this

factor, it is important to remember that a positive beta coefficient indicates an increasing likelihood of adoption with the presence of more adopters in a hospital's market, defined as county in this research. While the direction of the sign is consistent with the hypothesis, the beta parameter is not statistically significant so the null hypothesis cannot be rejected. Thus, these findings do not support the hypothesis of a significant relationship between network externalities and innovation adoption.

*Hypothesis 1.4: community resources***.** The fourth hypothesis for an environmental factor states that there is a negative correlation between community resources (i.e., number of HPPs per thousand population in a hospital's county) and innovation adoption (i.e., designation as a magnet hospital). Table 6 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a positive 0.069 with a standard error of 0.023 resulting in a Wald statistic of 9.085 that is statistically significant with $p = 0.003$ for one degree of freedom. In interpreting this factor, it is important to remember that a positive beta coefficient indicates increasing community resources (i.e., increasing number of HPPs within county) are associated with an increasing likelihood of adoption. The positive beta coefficient in these results is contrary to the expected negative relationship proposed by the hypothesis. However, the exponentiated beta indicates that there is a 7.1 percent increase in the odds ratio, or odds of adoption, for each unit increase in this factor. Since the direction of the relationship is not consistent with the hypothesis, the hypothesis is not supported even though there is a statistically significant relationship between community resources and innovation adoption, but in the opposite direction.

Control variables. Both of the control variables used in this research were statistically significant with a positive sign as shown in Table 6. Size of hospital (i.e., number of total beds) had a positive beta parameter of .003 for the study sample (N = 725 hospitals) with a standard error of 0.000 resulting in a Wald statistic of 46.9 for one degree of freedom and a significance of p = 0.000 (or 7.455E-12 exactly). The exponentiated beta indicates an increase in the odds ratio of adoption of 0.3 percent per unit increase in size. The type of hospital (i.e., measured categorically as for-profit or not for-profit) control variable had a positive beta parameter of 2.145 with a standard error of 0.602 for a Wald statistic of 12.68 with one degree of freedom and a significance of p = 0.000 (or 3.694E-4 exactly). The exponentiated beta indicates an increase in the odds ratio of adoption of 8.5 times (or 854 percent) when hospital type is not for-profit versus being for-profit.

*Environmental factors summary***.** These results indicate that the environmental factors as a group were significantly related to innovation adoption. Environmental complexity was significantly related to innovation adoption and the direction of the relationship was positive as hypothesized. Community resources were significantly related to innovation adoption, but the direction of the relationship was positive rather than negative as hypothesized. Neither competition nor network externalities were significantly related to innovation adoption however both were in the hypothesized positive direction. Both of the control variables were significant and positively associated with innovation adoption.

Hypothesis 2.0: Organizational Factors and Innovation Adoption

The second primary hypothesis proposed that there was a positive correlation between organizational factors (i.e., organizational complexity, slack resources, external communications, and control of domain) as a group and innovation adoption (i.e., designation as a magnet hospital). Table 5 presents logistic regression results for this hypothesis for the fifteen percent sample (N = 725 hospitals) used for the study. Again, this regression was done in two stages with the control variables (i.e., Size of Hospital, Type of Hospital) entered first and then the four experimental variables entered in the next stage as a group so the impact on reduction in deviance of the control and experimental variables could be examined. Null model deviance (-2LL) of 755.0 was significantly reduced to 612.9 with the addition of the control variables (χ^2 =142.1, 2 degrees of freedom, p = 1.391E-31). This deviance was further reduced from 612.9 to 551.8 when the experimental variables were added indicating a significant unique contribution by these variables (χ^2 = 61.1, 4 degrees of freedom, p = 1.703E-12). The Chi Square statistic for the full model (i.e., control and experimental variables) was very significant. This finding was supported by a non-significant Hosmer-Lemeshow statistic of 0.112 that indicates a good fit of the model to the data. The overall Classification Ratio improved from 78.5 percent for the null model to 82.3 percent for the full model. Notably the percentage of correctly classified adopters improved from zero in the null model to 40.4 percent in the full model. The pseudo-R^2 indices ranged from 24.4 percent (Cox-Snell) to 37.8 percent (NagelKerte) of the deviance explained by the full model, which corresponds to Cohen's guidelines of a large effect size (Cohen, et al., 2003).

These results support rejection of the null hypothesis in favor of the alternative hypothesis that the organizational factors as a group are significantly related to innovation adoption. With this finding, the secondary hypotheses are useful in examining which organizational factors are individually related to adoption.

*Hypothesis 2.1: organizational complexity***.** The first hypothesis for an organizational factor states that there is a negative correlation between organizational complexity (i.e., number of hospital services) and innovation adoption (i.e., designation as a magnet hospital). Table 7 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression, contrary to the hypothesis, is a positive 0.014 with a standard error of 0.004 resulting in a Wald statistic of 14.605 that is statistically significant with p = 0.000 (or 1.326E-4 exactly) for one degree of freedom. In interpreting this factor, it is important to remember that the coding of these data are such that a positive beta coefficient indicates an increase in organizational complexity (i.e., increasing number of services) and is associated with greater likelihood of adoption. The exponentiated beta indicates that there is a 1.4 percent increase in the odds ratio, or odds of adoption, due to a unit increase in this factor. Since the direction of the relationship is not consistent with the hypothesis, the hypothesis is not supported even though there is a statistically significant relationship between organizational complexity and innovation adoption, but in the opposite direction.

TABLE 7
Tests of Secondary Hypotheses for Organizational Factors

Hypotheses	β	S.E.	Wald	DF	p value	Exp(β)	Lower CI	Upper CI
2.1 There is a negative correlation between organizational complexity and innovation adoption.	0.014	0.004	14.605	1	0.000	1.014	1.007	1.021
2.2 There is a positive correlation between slack resources and innovation adoption.	0.547	0.796	0.472	1	0.492	1.728	0.363	8.225
2.3 There is a positive correlation between external communications network and innovation adoption.	0.397	0.229	3.003	1	0.083	1.487	0.949	2.328
2.4 There is a positive correlation between control of domain and innovation adoption.	0.931	0.168	30.800	1	0.000	2.536	1.826	3.524
Control 1 - Size = Number of Beds in use	0.003	0.001	34.290	1	0.000	1.003	1.002	1.004
Control 2 - Type of Hospital = Not For-Profit or For-Profit	1.679	0.620	7.333	1	0.007	5.361	1.590	18.075
Constant = B_0 (for Full Model)	-6.471	0.804	64.792	1	0.000	0.002		

Hypothesis 2.2: slack resources. The second hypothesis for an organizational factor states that there is a positive correlation between slack resources (i.e., hospital occupancy) and innovation adoption (i.e., designation as a magnet hospital). Table 7 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a positive 0.547 with a standard error of 0.796 resulting in a Wald statistic of 0.472 that is not statistically significant with p = 0.492 for one degree of freedom. In interpreting this factor, it is important to remember that a positive beta coefficient indicates an increasing likelihood of adoption with increasing availability of slack resources (i.e., increasing hospital occupancy), which is consistent with the hypothesis. While the direction of the relationship is consistent with the hypothesis, the beta parameter is not statistically significant so the null hypothesis cannot be rejected. Thus, these findings do not support the hypothesis of a significant relationship between slack resources and innovation adoption.

Hypothesis 2.3: external communications network. The third hypothesis for an organizational factor states that there is a positive correlation between external communications network (i.e., categorically measured as member of a system of hospitals or not) and innovation adoption (i.e., designation as a magnet hospital). Table 7 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a positive 0.397 with a standard error of 0.229 resulting in a Wald statistic of 3.003 that is not statistically significant with p = 0.083 for one degree of freedom. In interpreting this factor, it is important to remember that a positive beta coefficient indicates an increasing likelihood of adoption if the hospital is a

member of a system of hospitals versus not being a member of a system. While the direction of the sign is consistent with the hypothesis, the beta parameter is not statistically significant so the null hypothesis cannot be rejected. Thus, these findings do not support the hypothesis of a significant relationship between external communications network and innovation adoption.

*Hypothesis 2.4: control of domain***.** The fourth hypothesis for an organizational factor states that there is a positive correlation between control of domain (i.e., number of RN's per bed) and innovation adoption (i.e., designation as a magnet hospital). Table 7 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a positive 0.931 with a standard error of 0.168 resulting in a Wald statistic of 30.800 that is statistically significant with p = 0.000 (or 2.860E-8 exactly) for one degree of freedom. In interpreting this factor, it is important to remember that a positive beta coefficient indicates increasing control of domain (i.e., increasing number of RN's per bed) is associated with an increasing likelihood of adoption. The positive beta coefficient in these results is consistent with the expected positive relationship proposed by the hypothesis. The exponentiated beta indicates that there is a 2.536 times (or 253.6 percent) increase in the odds ratio, or odds of adoption, for each unit increase in this factor. These findings lead to rejection of the null hypothesis and support the alternative hypothesis of a significant positive relationship between control of domain and innovation adoption.

Control variables. Both of the control variables used in the research are statistically significant with a positive sign as shown in Table 7. Size of hospital (i.e., number of total beds) had a positive beta parameter of .003 for the study sample (N = 725 hospitals) with a standard error of 0.001 resulting in a Wald statistic of 34.290 for one degree of freedom and a significance of p = 0.000 (or 4.748E-9). The exponentiated beta indicates an increase in the odds ratio of adoption of 0.3 percent per unit increase in size. The type of hospital (i.e., measured categorically as for-profit or not for-profit) control variable had a positive beta parameter of 1.679 with a standard error of 0.620 for a Wald statistic of 7.333 with one degree of freedom and a significance of p = 0.007 (or 6.760E-3 exactly). The exponentiated beta indicates an increase in the odds ratio of adoption of 5.361 times (or 536.1 percent) when hospital type is not for-profit versus being for-profit.

Organizational factors summary. These results indicate that the organizational factors as a group were significantly related to innovation adoption. Both organizational complexity (i.e., number of hospital services) and control of domain (i.e., number of RN's per bed) were significantly related to innovation adoption (i.e., designation as a magnet hospital). The direction of the relationship was positive as hypothesized for control of domain, but was contrary to the hypothesis for organizational complexity. Neither slack resources nor external communications network were significantly related to innovation adoption, however both had signs in the hypothesized positive direction. Both of the control variables were significant and positively related to innovation adoption.

Hypothesis 3.0: Comparison of Relative Influence on Innovation Adoption

The third primary hypothesis proposed that there is a significant difference between the environmental influences (i.e., environmental complexity, competition, network externalities, and community resources) and organizational influences (i.e., organizational complexity, slack resources, external communications, and control of domain) correlations with innovation adoption (i.e., designation as a magnet hospital). This hypothesis was tested by comparing the amount of reduction in deviance (i.e., -2LL) from the null model for each set of factors, after adjusting for deviance reduction due to the control variables, and then testing the significance of the difference in deviance reduction between the environmental and organizational factors.

Table 8 presents logistic regression results for the study sample (N= 725) for the relative influence of the environmental and organizational factors. These results indicate that the deviance for the null model (i.e., model with no controls or experimental variables entered) was 755.0. When the control variables were entered, the model deviance was significantly reduced to 612.9 (χ^2 =142.1, 2 degrees of freedom, p = 1.391E-31). When the environmental variables were entered into this model, the deviance was further significantly reduced from 612.9 to 587.4 (χ^2 = 25.5, 4 degrees of freedom, p = 3.991E-5). Likewise, when the organizational variables were entered into the model with only the control variables already entered, the deviance was significantly reduced from 612.9 to 551.8 (χ^2 = 61.1, 4 degrees of freedom, p = 1.703E-12). These results indicate that the organizational factors have greater influence than the environmental factors on reduction in deviance and that this difference is statistically significant (61.1 – 25.6 = χ^2 = 35.5, 4 degrees of freedom, p = 3.E-7).

TABLE 8
Test of Relative Influence of Environmental and Organizational Factors

Hypothesis	Total Deviance - 2LL	Controls Deviance - 2LL	Environment Factors Deviance - 2LL	Organizational Factors Deviance - 2LL	Difference in Deviance - 2LL Control minus Environment	Difference in Deviance - 2LL Control minus Organizational	Difference in Deviance - 2LL Difference $\|\chi^2\|$	DF	Significance $\|\chi 2\|$ p-value
Hypothesis 3.0 There is a significant difference between the environmental influences and organizational influences correlations with innovation adoption.	755.0	612.9	587.4	551.8	25.5	61.1	35.6	4	3.5E-07

The results in this section support rejection of the null hypothesis and favor the alternative hypothesis that there is a significant difference between the environmental and organizational influences correlations with innovation adoption. Furthermore, these results indicate that organizational influences are significantly more influential than environmental influences. While not formally hypothesized, the finding that organizational influences are more salient than environmental influences is contrary to expectations opined in the rationale for this hypothesis, but not formally stated.

Hypothesis 4.0: Environmental/Organizational Factors and Innovation Adoption

The fourth primary hypothesis proposed that there is a positive correlation between environmental factors (i.e., environmental complexity, competition, network externalities, and community resources) and organizational factors (i.e., organizational complexity, slack resources, external communications, and control of domain), acting jointly, and innovation adoption (i.e., designation as a magnet hospital). Table 5 presents logistic regression results for this hypothesis for the fifteen percent sample (N = 725 hospitals) used for the study. Similar to Hypotheses 1.0 and 2.0, this regression was also done in two stages with the control variables (i.e., size of hospital, type of hospital) entered first and then the eight experimental variables entered in the next stage as a group so the impact on reduction in deviance of the control and experimental variables could be examined. Null model deviance (-2LL) of 755.0 was significantly reduced to 612.9 with addition of the control variables (χ^2 = 142.1, 2 degrees of freedom, p = 1.391E-31). This deviance was further reduced from 612.9 to 537.3 when the experimental variables were added indicating a significant unique contribution by these variables (χ^2 = 75.6, 8 degrees

of freedom, p = 3.740E-13). The chi-square statistic for the full model was very significant (χ^2 = 217.8, 10 degrees of freedom) with p = 0.000 (or 3.086E-41 exactly). This finding was supported by a non-significant Hosmer-Lemeshow statistic of 0.317 that indicates a good fit of the model to the data. The overall Classification Ratio improved from 78.5 percent for the null model to 82.6 percent for the model with the control and experimental variables. Notably the percentage of correctly classified adopters improved from zero in the null model to 41.0 percent in the full experimental model with controls. The pseudo-R^2 indices ranged from 25.9 percent (Cox-Snell) to 40.1 percent (NagelKerte) of the deviance explained by the full model, which corresponds to Cohen's guidelines of a large effect size (Cohen et al., 2003). These results support rejection of the null hypothesis in favor of the alternative hypothesis that the environmental and organizational factors, acting jointly, are significantly related to innovation adoption. With this finding, the secondary hypotheses are useful in examining which environmental and organizational factors are individually related to adoption.

Hypothesis 4.1: environmental complexity. The first secondary hypothesis for an environmental factor in the joint model states that there is a positive correlation between environmental complexity (i.e., measured categorically as location in a less versus more urbanized area) and innovation adoption (i.e., designation as a magnet hospital). Table 9 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a positive 1.094 with a standard error of 0.528 resulting in a Wald statistic of 4.290 that is statistically significant with p = 0.038 for one degree of freedom. In interpreting this factor, it is important to remember

that the coding of the data is such that a positive beta coefficient indicates an increase in environmental complexity (i.e., increasing urbanization) is associated with increasing likelihood of adoption. The exponentiated beta indicates that there is a 298.5 percent increase in the odds ratio, or odds of adoption, due to being located in a more urbanized area versus a less urbanized area. These findings support rejection of the null hypothesis and favor the alternative hypothesis of a significant positive relationship between environmental complexity and innovation adoption.

Hypothesis 4.2: competition. The second hypothesis for an environmental factor in the joint model states that there is a positive correlation between competition (i.e., inverse of Herfindahl Index) and innovation adoption (i.e., designation as a magnet hospital). Table 9 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a positive 0.048 with a standard error of 0.448 resulting in a Wald statistic of 0.012 that is not statistically significant with $p = 0.914$ for one degree of freedom. In interpreting this factor, it is important to remember that a negative beta coefficient indicates a decreasing likelihood of adoption with increasing market concentration (i.e., equivalent to decreasing market competition), which is consistent with the hypothesis (i.e., increasing likelihood of adoption with increasing competition). The positive sign of the beta coefficient in this regression is contrary to the hypothesized relationship. The direction of the relationship is inconsistent with the hypothesis and the beta parameter is not statistically significant so the null hypothesis cannot be rejected. Thus, these findings do not support the alternative hypothesis of a significant positive relationship between competition and adoption.

TABLE 9
Tests of Secondary Hypotheses for
Environmental and Organizational Factors Jointly

Hypotheses	β	S.E.	Wald	DF	p-value	Exp (β)	Lower CI	Upper CI
4.1 There is a positive correlation between environmental complexity and innovation adoption.	1.094	0.528	4.290	1	0.038	2.985	1.060	8.403
4.2 There is a positive correlation between competition and innovation adoption.	0.048	0.448	0.012	1	0.914	1.049	0.436	2.527
4.3 There is a positive correlation between network externalities and innovation adoption.	2.175	1.792	1.583	1	0.208	8.805	0.297	260.802
4.4 There is a negative correlation between community resources and innovation adoption.	0.055	0.024	5.218	1	0.022	1.057	1.008	1.108
4.5 There is a negative correlation between organizational complexity and innovation adoption.	0.012	0.004	11.30	1	0.001	1.012	1.005	1.019
4.6 There is a positive correlation between slack resources and innovation adoption.	0.218	0.819	0.071	1	0.790	1.243	0.250	6.195
4.7 There is a positive correlation between external communications network and innovation adoption.	0.375	0.233	2.595	1	0.107	1.456	0.922	2.299
4.8 There is a positive correlation between control of domain and innovation adoption.	0.892	0.169	27.88	1	0.000	2.44	1.752	3.397
Control 1 - Size = Number of Beds in use	0.003	0.001	27.38	1	0.000	1.003	1.002	1.004
Control 2 - Type of Hospital = Not For-Profit or For-Profit	1.661	0.631	6.933	1	0.008	5.226	4.529	18.135
Constant = B_0 (for Full Model)	-6.84	0.913	56.18	1	0.000	0.001		

*Hypothesis 4.3: network externalities***.** The third hypothesis for an environmental factor in the joint model states that there is a positive correlation between network externalities (i.e., percentage of other adopters in the county) and innovation adoption (i.e., designation as a magnet hospital). Table 9 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a positive 2.175 with a standard error of 1.792 resulting in a Wald statistic of 1.583 that is not statistically significant with p = 0.208 for one degree of freedom. In interpreting this factor, it is important to remember that a positive beta coefficient indicates an increasing likelihood of adoption with the presence of more adopters in an adopter's market, defined as county in this research. While the direction of the sign is consistent with the hypothesis, the beta parameter is not statistically significant so the null hypothesis cannot be rejected. Thus, these findings do not support the hypothesis of a significant relationship between network externalities and innovation adoption.

*Hypothesis 4.4: community resources***.** The fourth hypothesis for an environmental factor in the joint model states that there is a negative correlation between community resources (i.e., number of HHPs per thousand population in the adopter's county) and innovation adoption (i.e., designation as a magnet hospital). Table 9 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a positive 0.055 with a standard error of .024 resulting in a Wald statistic of 5.218 that is statistically significant with p = 0.022 for one degree of freedom. In interpreting this factor, it is important to remember that a positive beta coefficient indicates increasing community resources (i.e., increasing numbers of

health professionals) is associated with an increasing likelihood of adoption. The positive beta coefficient in these results is contrary to the expected negative relationship proposed by the hypothesis. However, the exponentiated beta indicates that there is a 5.7 percent increase in the odds ratio, or odds of adoption, for each unit increase in this factor. Since the direction of the relationship is not consistent with the hypothesis, the hypothesis is not supported even though there is a statistically significant relationship between community resources and innovation adoption, but in the opposite direction.

*Hypothesis 4.5: organizational complexity***.** The first hypothesis for an organizational factor in the joint model states that there is a positive correlation between organizational complexity (i.e., number of hospital services) and innovation adoption (i.e., designation as a magnet hospital). Table 9 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a positive 0.012 with a standard error of 0.004 resulting in a Wald statistic of 11.295 that is statistically significant with p = 0.001 (or 7.772E-4 exactly) for one degree of freedom. In interpreting this factor, it is important to remember that the coding of the data is such that a positive beta coefficient indicates an increase in organizational complexity (i.e., increasing number of services) is associated with greater likelihood of adoption. Accordingly, the exponentiated beta indicates that there is a 1.2 percent increase in the odds ratio, or odds of adoption, due to a unit increase in this factor. Since the direction of the relationship is not consistent with the hypothesis, the hypothesis is not supported even though there is a statistically significant relationship between organizational complexity and innovation adoption, but in the opposite direction.

Hypothesis 4.6: slack resources. The second hypothesis for an organizational factor in the joint model states that there is a positive correlation between slack resources (i.e., hospital occupancy) and innovation adoption (i.e., designation as a magnet hospital). Table 9 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a positive 0.218 with a standard error of 0.819 resulting in a Wald statistic of 0.071 that is not statistically significant with p = 0.790 for one degree of freedom. In interpreting this factor, it is important to remember that a positive beta coefficient indicates an increasing likelihood of adoption with increasing availability of slack resources (i.e., increasing hospital occupancy), which is consistent with the hypothesis. While the direction of the relationship is consistent with the hypothesis, the beta parameter is not statistically significant so the null hypothesis cannot be rejected. Thus, these findings do not support the hypothesis of a significant relationship between slack resources and innovation adoption.

Hypothesis 4.7: external communications network. The third hypothesis for an organizational factor in the joint model states that there is a positive correlation between external communications network (i.e., categorically measured as member of a system of hospitals or not) and innovation adoption (i.e., designation as a magnet hospital). Table 9 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a positive 0.375 with a standard error of 0.233 resulting in a Wald statistic of 2.595 that is not statistically significant with p = 0.107 for one degree of freedom. In interpreting this factor, it is important to remember

that a positive beta coefficient indicates an increasing likelihood of adoption if the hospital is a member of a system of hospitals versus not being a member of a system. While the direction of the sign is consistent with the hypothesis, the beta parameter is not statistically significant so the null hypothesis cannot be rejected. Thus, these findings do not support the hypothesis of a significant relationship between external communications network and innovation adoption.

Hypothesis 4.8: control of domain. The fourth hypothesis for an organizational factor in the joint model states that there is a positive correlation between Control of Domain (i.e., number of RN's per bed) and innovation adoption (i.e., designation as a magnet hospital). Table 9 presents logistic regression results for this hypothesis for the study sample (N = 725 hospitals). The beta parameter in this regression is a positive 0.892 with a standard error of 0.169 resulting in a Wald statistic of 27.881 that is statistically significant with p = 0.000 (or 1.290E-7 exactly) for one degree of freedom. In interpreting this factor, it is important to remember that a positive beta coefficient indicates increasing control of domain (i.e., increasing number of RN's per bed) is associated with an increasing likelihood of adoption. The positive beta coefficient in these results is consistent with the expected positive relationship proposed by the hypothesis. Accordingly, the exponentiated beta indicates that there is a 2.44 times (or 244 percent) increase in the odds ratio, or odds of adoption, for each unit increase in this factor. These findings support rejection of the null hypothesis and favor the alternative hypothesis of a significant positive relationship between control of domain and innovation adoption.

*Control variables***.** In the joint model, both of the control variables used in the research are statistically significant with a positive sign as shown in Table 9. Size of hospital (i.e., number of total beds) had a positive beta parameter of .003 for the study sample (N = 725 hospitals) with a standard error of 0.001 resulting in a Wald statistic of 27.337 for one degree of freedom and a significance of p = 0.000 (or 1.674E-7 exactly). The exponentiated beta indicates an increase in the odds ratio of adoption of 0.3 percent per unit increase in size. The type of hospital (i.e., measured categorically as For-Profit or Not For-Profit) control variable had a positive beta parameter of 1.661 with a standard error of 0.631 for a Wald statistic of 6.933 with one degree of freedom and a significance of p = 0.008 (or 8.462E-3 exactly). The exponentiated beta indicates an increase in the odds ratio of adoption of 5.226 times (or 522.6 percent) when hospital type is Not For-Profit versus being For-Profit.

*Environmental and organizational factors summary***.** These results indicate that the environmental and organization factors as a group were significantly related to innovation adoption. Environmental complexity was significantly related to innovation adoption and the direction of the relationship was positive as hypothesized. Community resources were significantly related to innovation adoption, but the direction of the relationship was positive rather than negative as hypothesized. Neither Competition nor network externalities were significantly related to innovation adoption. While the positive direction of the relationship was as hypothesized for network externalities, the sign for competition was contrary to expectations and to its sign in the earlier analysis of

environmental variables singularly. Both organizational complexity and control of domain were significantly related to innovation adoption and the directions of these relationships were positive as hypothesized. Neither slack resources nor external communications network were significantly related to innovation adoption, however both had signs in the hypothesized positive direction. Both of the control variables were significant and positively related to innovation adoption.

Summary

This chapter presented results and findings from analysis of a sample composed of both adopters and non-adopters of the magnet hospital concept. Data were available for 156 out 173 hospitals that adopted or readopted the magnet hospital concept during the period 1999-2004 (AHA data years). A random sample of approximately fifteen percent of non-adopters (N for non-adopters = 569 hospitals) for the year 2004 was drawn from a sampling frame primarily composed of non-rural U.S. hospitals reporting data in the AHA annual survey. The ratio of non-adopters to adopters was 3.6 to 1 and the total sample was 725 hospitals, which met guidelines for statistical tests. Logistic regression was the primary statistical technique used to analyze these data. Tables 10 and 11 and Figure 6 summarize results for all of the hypotheses in this research.

All of the primary hypotheses in this study were supported. The environmental factors as a group were found to be significantly correlated with innovation adoption in accord with Hypothesis 1.0. Likewise, the organizational factors were significantly correlated in accord with Hypothesis 2.0. In accord with Hypothesis 3.0, it was found that there was a significant difference between the environmental and organizational

influence factors correlations with innovation adoption and that the organizational factors as a group were significantly more influential than the environmental factors on innovation adoption. Hypothesis 4.0 that concerned the joint influence of both groups of factors was also found to be supported and provided the best model fit to the data.

Findings were mixed on support for various secondary hypotheses that investigated the significance of the individual factors and their direction of influence on adoption for each model. For the model that focused on the environmental factors singularly, environmental complexity (Hypothesis 1.1) was significantly related to innovation adoption and the direction of the relationship was positive as hypothesized. Community resources (Hypothesis 1.4) were significantly related to innovation adoption, but the direction of the relationship was positive rather than negative as hypothesized. Neither competition (Hypothesis 1.2) nor network externalities (Hypothesis 1.3) were significantly related to innovation adoption, however both had signs in the hypothesized positive direction. For the model that focused on the organizational factors singularly, both organizational complexity (Hypothesis 2.1) and control of domain (Hypothesis 2.4) were significantly related to innovation adoption and the directions of these relationships were positive as hypothesized for control of domain and contrary to hypothesis for organizational complexity. Neither slack resources (Hypothesis 2.2) nor external communications network (Hypothesis 2.3) were significantly related to innovation adoption, however both had signs in the hypothesized positive direction. For the joint model that included both environmental and organizational factors (i.e., primary Hypothesis 4.1 and secondary Hypotheses 4.1 – 4.8), the relationships were similar in direction and significance to those for the factors in the singular models. The one

exception was with regard to competition (Hypothesis 4.2) which, while still not significant, had a positive sign that was both contrary to the hypothesis and to its direction in the singular environmental factors model. Both of the control variables were significant and positively related to innovation adoption in all of these models.

TABLE 10
Summary of Findings by Hypotheses

Hypotheses	Hypothesized Relationship	Empirical Relationship	Significant ($p < 0.05$)	Hypothesis. Supported
1.0 There is a positive correlation between environmental influences and innovation adoption.	+	+	YES	YES
1.1 There is a positive correlation between environmental complexity and innovation adoption.	+	+*	YES	YES
1.2 There is a positive correlation between competition and innovation adoption.	+	+	NO	NO
1.3 There is a positive correlation between network externalities and innovation adoption.	+	+	NO	NO
1.4 There is a negative correlation between community resources and innovation adoption.	-	+	YES	NO
2.0 There is a positive correlation between organizational influences and innovation adoption	+	+	YES	YES
2.1 There is a negative correlation between organizational complexity and innovation adoption.	-	+	YES	NO
2.2 There is a positive correlation between slack resources and innovation adoption.	+	+	NO	NO
2.3 There is a positive correlation between external communications network and innovation adoption.	+	+	NO	NO
2.4 There is a positive correlation between control of domain and innovation adoption.	+	+	YES	YES
3.0 There is a significant difference between the environmental and organizational influences correlation with innovation adoption.	NA	NA	YES	YES

TABLE 10
Continued

Hypotheses	Hypothesized Relationship	Empirical Relationship	Significant ($p < 0.05$)	Hypothesis. Supported
4.0 There is a positive correlation between environmental and organizational influences, acting jointly, and innovation adoption.	+	+	YES	YES
4.1 There is a positive correlation between environmental complexity and innovation adoption.	+	+	YES	YES
4.2 There is a positive correlation between competition and innovation adoption.	+	-*	NO	NO
4.3 There is a positive correlation between network externalities and innovation adoption.	+	+	NO	NO
4.4 There is a negative correlation between community resources and innovation adoption.	-	+	YES	NO
4.5 There is a negative correlation between organizational complexity and innovation adoption.	-	+	YES	NO
4.6 There is a positive correlation between slack resources and innovation adoption.	+	+	NO	NO
4.7 There is a positive correlation between external communications network and innovation adoption.	+	+	NO	NO
4.8 There is a positive correlation between control of domain and innovation adoption.	+	+	YES	YES

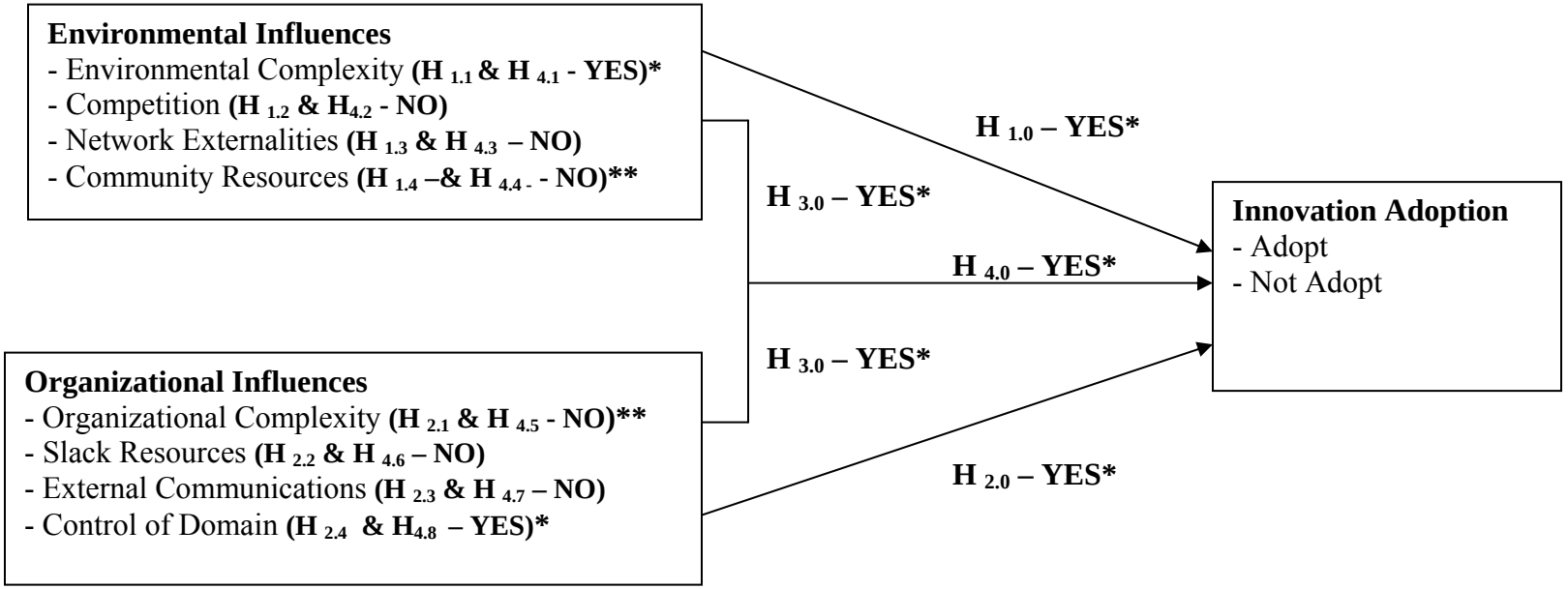
* Sign of the relationship. Sign of corresponding beta coefficient is opposite sign.

TABLE 11
Comparative Summary of Findings by Hypotheses

Hypotheses	Hypothesized. Relationship	Empirical Relation-ship	Signifi-cant ($p < .05$)	Hypothesis Supported	Hypotheses	Hypothesized Relationship	Empirical Relation	Signifi-cant ($p < .05$)	Hypothesis Supported
1.0**Environmental Influences and Adoption**	+	+	YES	YES	**4.0 Joint Influences of Env. and Org. Factors**	+	+	YES	YES
1.1 Environmental Complexity	+	+	YES	YES	4.1 Environmental Complexity	+	+	YES	YES
1.2 Competition	+	+*	NO	NO	4.2 Competition	+	-*	NO	NO
1.3 Network Externalities	+	+	NO	NO	4.3 Network Externalities	+	+	NO	NO
1.4 Community Resources	-	+	YES	NO	4.4 Community Resources	-	+	YES	NO
2.0 Oganizational Influences and Adoption	+	+	YES	YES					
2.1 Organizational Complexity	-	+	YES	NO	4.5 Organizational Complexity	-	+	YES	NO
2.2 Slack Resources	+	+	NO	NO	4.6 Slack Resources	+	+	NO	NO
2.3 External Communication Network	+	+	NO	NO	4.7 External Communication Network	+	+	NO	NO
2.4 Control of Domain	+	+	YES	YES	4.8 Control of Domain	+	+	YES	YES
3.0 Difference in Env. and Org. Influences and Adoption	NA	NA	YES	YES	*				

* Sign of the relationship. Sign of corresponding beta coefficient is opposite sign.

FIGURE 6
Summary of Findings on Support for Hypotheses



*Statistically significant $p < 0.05$, in hypothesized direction.
**Statistically significant $p < 0.05$, but sign was not in hypothesized direction.

CHAPTER 5

DISCUSSION AND CONCLUSIONS

Introduction

The purpose of this chapter is to discuss the findings from the study and their implications for scholarship and practice. First, findings related to each of the primary and secondary hypotheses are discussed and explanations of these findings are considered. Second, implications of the findings are discussed relative to advancing scholarly understanding and professional practice. Third, limitations of the study are reviewed. Finally, recommendations for future research are discussed and future research directions are suggested. This section concludes with an overall summary of the research and its findings and contributions.

Conclusions by Hypothesis and Explanation of Findings

The purpose of this study was to investigate the influence of environmental and organizational factors on the adoption of administrative innovations in order to better understand strategic adaptation by organizations. This study empirically tested a research model that related a set of selected environmental and organizational factors to adoption of the magnet hospital concept as an administrative innovation. Four research questions were posed to guide this study. These research questions concerned the influence of selected environmental factors as a group and individually on innovation adoption, the influence of selected organizational factors in a similar manner, the relative influence of

these two groups of factors, and the joint influence of these two groups and individual factors on innovation adoption. To answer these questions, a set of four primary and sixteen secondary hypotheses were proposed based on theoretical and empirical insights from the literature review. Data were collected and analyzed to address each of these hypotheses. After a review of findings related to the control variables, findings related to each of the hypotheses are discussed in the following subsections to answer the research questions.

Control Variables and Innovation Adoption

Size of hospital and type of hospital were used as control variables in this research. For each logistic regression analysis, these variables were entered into the model separately as a first step and then the experimental variables were entered together in a second step so that the unique influence of the experimental variables could be observed.

*Size of hospital***.** Size of hospital was measured as total number of beds. In all of the models this variable was significant ($p = 0.000$ or approximately 4.748E-9) with a positive sign. The odds of adoption were found to increase approximately 0.3 percent for each additional bed in all of the models. While this effect seems small on a per unit basis, this is equivalent to a 30 percent increase for each additional hundred bed increase in hospital size. This finding is consistent with the trend in empirical results in the literature review, which indicated that size tends to have a positive relationship with innovation adoption when it is significant. This finding does not seem to support a

suggestion in the literature that size might have a curvilinear relationship to adoption indicative of an increasing likelihood until some threshold is reached and thereafter likelihood declines, however further investigation is needed.

Type of hospital. Type of hospital was measured categorically based on whether a hospital was a not for-profit or a for-profit hospital. Type of hospital was significant ($p = 0.00676$ to 0.008) with a positive sign in all of the models. If a hospital was a not for-profit then the odds of adoption increased from 522 to 854 percent depending on the model. The literature indicated mixed results on this variable, with some suggestion that for-profits are more likely to adopt innovations that result in economic benefits. In accord with this reasoning, these findings suggest that economic benefits may not be the primary motivation for adopting a magnet hospital strategy. The literature suggested that not for-profits are more oriented toward quality and community service benefits. These findings tend to align with this view, but need more in-depth investigation.

Environmental Influences and Innovation Adoption

The first research question asked what, if any, influence do environmental factors have on innovation adoption and if environmental factors as a group are influential, which environmental factors significantly influence innovation adoption and what is the direction of this influence. The first primary hypothesis proposed that there is positive correlation between the selected environmental factors as a group and innovation adoption. Logistic regression results supported this hypothesis. The full environmental factors regression model (i.e., control and experimental variables) was statistically

significant (χ^2 =167.7, 6 degrees of freedom, p = 0.000 or 1.383E-33 exactly) with a 30 percent improvement in classification of adopters and some 21 to 32 percent of the deviance in innovation adoption explained by these factors. Thus, these results support that the environmental factors as a group influence innovation adoption. This finding supports the market structure view (MSV) (Porter, 1980; Porter, 1985; Shortell & Kaluzny, 2006) from the strategic adaptation perspective that environmental forces in an organization's environment are salient influences on strategic choices by the organizations. Considered singularly, these factors also align with population ecology theory (Hannan & Freeman, 1977) that environmental forces have a deterministic influence on organizational survival.

The next part of the first research question asked which environmental factors were influential and what was the direction of their influence if the factors as a group were significant. The secondary hypotheses addressed these questions for each of the four environmental factors.

Environmental complexity. It was found that environmental complexity was positively and significantly (p = 0.033) associated with greater likelihood of innovation adoption with a 296.7 percent increase in the odds of adoption when a hospital is located in a more urban (i.e., metropolitan) versus less urban (i.e., micropolitan) area. This finding aligns with prior empirical results and theoretical expectations based on contingency theory (Lawrence & Lorsch, 1969; Shortell & Kaluzny, 2006). In a subsidiary analysis, when location was entered as an indicator variable for environmental complexity with three categories [i.e., micropolitan, metropolitan, metro division (greater

that 2.5 million population in area)] it was found that the metropolitan category was significant (p = 0.038) versus the other two categories which were not. This suggests a possible curvilinear relationship between urban location and innovation adoption since both lower density (i.e., micropolitan) and very high density locations (i.e., metro divisions) were not significantly associated with adoption, although their signs were in the expected direction. This insight is bolstered by the lack of any magnet hospitals in rural areas. Also, in a subsidiary analysis it was found that when population density from the year 2000 county census was used as a measure for environmental complexity, it was not significant (p. = 0.314).

*Competition***.** Competition was not found to be statistically significant (p = 0.437), although the relationship was in the hypothesized positive direction. Competition was measured by the degree of concentration in a hospital's market as captured by the Herfindahl Index. Higher values of this index indicate more concentration in markets and thus less competition, while lower values indicate more competitive markets. The assumption inherent in use of the Herfindahl Index was that competition in a hospital's product/service market (i.e., the Herfindahl is calculated based on a hospital admission shares in a market) would be mirrored in its labor market for health professional manpower such as RNs. In light of the findings from this research, this assumption needs to be questioned. Product/service market competition may not capture labor market dynamics. Further compounding interpretation of these results is definition of market as county for calculating the Herfindahl Indices. This might be problematical since county may not conform to actual medical trade areas or labor markets very closely. When

number of competitors was used as an alternative measure of competition in a subsidiary analysis, while the sign was in the expected positive direction, it was not significant ($p = 0.896$) either. These findings do not shed new light on very mixed findings concerning the role of competition in other empirical studies. Competition needs substantial additional investigation concerning its role as an environmental influence factor.

*Network externalities***.** Network externalities were not found to be statistically significant ($p = 0.126$), although the sign was in the hypothesized positive direction. This factor was measured by the percentage of prior adopters in a hospital's county. Finding that this factor was not significant was not surprising given the limited extent of diffusion of the magnet hospital concept, with only 156 adopters out of 725 hospitals in the sample and 3773 in the sampling frame. In terms of the Ryan and Gross (1943) schema for diffusion of an innovation, adoption of the magnet hospital concept is at best in the early adopter phase with diffusion substantially below fifteen percent of potential adopters (Rogers, 2003). Indeed, diffusion might still be in the innovator phase where less than two and a half percent of potential adopters have adopted (Rogers, 2003). Network externalities can be expected to become more influential as diffusion moves further into the early adopter phase and into the early majority phase and particularly the late majority phase when institutional pressures typically lead to imitation and mimicry (Rogers, 2003). Potentially confounding measurement of network externalities is the use of county as the definition of market similar to the concerns for competition concerning whether county adequately captures the medical trade area. This factor needs further investigation as diffusion of the magnet hospital concept continues.

Community resources. It was found that community resources were positively (contrary to the hypothesis) and significantly ($p = 0.003$) associated with a greater likelihood of innovation adoption with a 7.1 percent increase in the odds of adoption for each additional HPP per thousand of county population. The number of HPPs is at best a gross measure of healthcare workforce supply in a community since it encompasses a number of different healthcare occupations that may or may not be associated with the supply of RNs in the community. However, RN supply by county was not uniformly available. Thus, use of HHP requires the assumption that RN supply varies in synchrony with HPP. The finding of a positive relationship between community resources and innovation adoption suggests that the more healthcare workers available in a community the more adoption of a magnet strategy might be viewed as a useful competitive tool in attracting supply to a particular facility. Conversely, when fewer healthcare workers are available in a community this may mean that a magnet strategy is viewed as less useful since there is inadequate supply in the market to attract to a particular facility. Thus, increasing overall supply (e.g., training programs, scholarships) may need to be the strategic priority and/or a more potent competitive strategy than the magnet concept might be needed to attract RNs from employment with competitors or from other communities.

Organizational Influences and Innovation Adoption

The second research question asked what, if any, influence do organizational factors have on innovation adoption and if organizational factors are influential, which

organizational factors significantly influence innovation adoption and what is the direction of this influence. The second primary hypothesis proposed that there is positive correlation between the selected organizational factors as a group and innovation adoption. Logistic regression results supported this hypothesis. The full organizational factors regression model (i.e., control and experimental variables) was statistically significant (χ^2 =203.2, 6 degrees of freedom, p = 0.000 or 3.954E-41 exactly) with a 40.4 percent improvement in classification of adopters and some 24.4 to 37.8 percent of the deviance in innovation adoption explained by these factors. Thus, these results support that the organizational factors as a group influence innovation adoption. This finding supports the resourced based view (RBV) (Barney, 1991; Hamel & Prahalad, 1994, Shortell & Kaluzny, 2006) from the strategic adaptation perspective that internal capabilities and characteristics of an organization are salient influences on the strategic choices that organizations make.

The next part of the second research question asked which organizational factors were influential and what was the direction of their influence if the factors as a group were significant. The secondary hypotheses addressed these questions for each of the four organizational factors.

Organizational complexity. It was found that organizational complexity was positively (contrary to the hypothesis) and significantly (p = 0.000133) associated with a greater likelihood of innovation adoption with a 1.4 percent increase in the odds of adoption for each additional service a hospital provided. These findings are consistent with empirical results in the literature review that found a positive relationship between

organizational complexity and innovation adoption. This finding is contrary to the hypothesized negative relationship that was based on theoretical reasoning that more complex organizations would find it more difficult to adopt innovations due to structural inertia (Hannan & Freeman, 1984) and the other constraints of more bureaucratic structures (Mintzberg, 1979). The finding of a positive relationship suggests that more complex organizations may be more experienced at adaptation, in that their very complexity implies that they have adopted a number of innovations in the past and thus, they may be both more flexible and more experienced in skills necessary for successful adoption having possibly developed this as a core competence (Hamel & Prahalad, 1994). Also greater complexity may imply that these organizations have specialized technical resources (Damanpour's, 1991) available to facilitate adaptation, which may be related to their size and availability of slack resources which could facilitate adoption by reducing risk and increasing resource support. This significant positive relationship needs to be examined further in future research.

Slack resources. Slack resources were not found to be statistically significant ($p = 0.492$), although the sign was in the hypothesized positive direction. This factor was measured by hospital occupancy. While the literature review indicated that this measure was widely used to operationalize slack resources, hospital occupancy is at best an indirect measure that assumes that hospitals that than have higher occupancies are better able to accumulate slack resources. Other more direct operatorationalizations might be better proxies for slack resources, such as net income, operating margin, reserves, return on assets, and other financial indicators that have been cited in the literature. Also,

potentially confounding the influence of this factor is size (Rogers, 2003) and organizational complexity, which could be related to a hospital's accumulation of surplus resources. Finally, slack resources as measured by hospital occupancy loaded on the environmental influences instead of the organizational influences component or factor as expected in factor analysis. Intuitively hospital occupancy seems to be an internal organizational measure, but it is de facto comparing internal resources (i.e., beds) with external demand (i.e., admissions). It is possible that variation in this measure was actually capturing variation in external demand across the sample versus availability of internal resources and so loaded with the demand versus resources side of the ratio. Regardless of whether slack resources was modeled in the environmental or organizational category of influences, it was not statistically significant and conclusions concerning any other hypotheses were not affected. This variable clearly needs further investigation with alternate operators in future research.

External communications network. External communications network was not found to be statistically significant ($p = 0.083$), although the sign was in the hypothesized positive direction. (It is interesting to note that this factor achieved near significance with $p < 0.10$ in the study sample.) This factor was measured by whether a hospital was a member of a multi-unit hospital system. While the literature review indicated that this measure has been widely used to operationalize external linkages, it might not be a broad enough measure to adequately capture a wide array of inter-organizational linkages and relationships. A more comprehensive measure might better capture these linkages. For example, Brazzoli, Shortell, Dubbs, Chan, and Kralovec (1999) developed a measure that

provides a series of categories or clusters of hospitals that capture increasing levels of system integration with common strategic and structural features. Essentially, a health system is assigned to one of five categories based on differentiation and centralization of their hospital services, physician arrangements, and insurance products. This measure of relationships is included in the AHA annual survey data, however it was available for only a subset of the hospitals included in the survey. This methodology may provide a useful starting point for developing a broader measure of organizational relationships.

Control of domain. It was found that control of domain was positively and significantly ($p = 0.000$ or 2.860E-8 exactly) associated with greater likelihood of innovation adoption with a 253.6 percent increase in the odds of adoption for each additional RN per bed. These findings align with Flood and Scott's (1978; 1987) finding that control of a profession over its domain is a salient factor in influencing organizational outcomes. Aiken (2002) drew on Flood and Scott's work (1987) in formulating a model to explain the power of magnet hospital practices in attracting and retaining RNs. In Aiken's model, staffing levels and skill mix were proposed as an important factor in creating a superior surveillance system to protect patients which was viewed as foundational to creating a professional practice environment attractive to RNs. This finding is supportive of Aiken's model. Also, this finding is consistent with Dammanpour's (1991) report of a positive relationship between the technical resources an organization has available to facilitate adoption and adoption of an administrative innovation. However, this finding is somewhat counterintuitive from the standpoint of competitive strategy since there is less need for a magnet hospital strategy if a hospital

already has a higher RN to bed ratio, unless magnet strategy is viewed as a pre-emptive strategy to prevent loss of nursing staff to competitors that might adopt such a strategy. More research is need on the strategic orientation and rationale of hospitals adopting a magnet strategy

Relative Influence of Environmental and Organizational Factors

The third research question asked, if environmental and organizational factors both influence innovation adoption, whether one set of factors is more influential than the other, and if so, which set is more influential? Essentially this question asks, what is the relative influence of each set of factors on innovation adoption? Results from the logistic regression models supported differential influence. After inclusion of the control variables, environmental factors as a group reduced deviance by a significant amount (χ^2 = 25.5, 4 degrees of freedom, p = 3.991E-5). Likewise, when organizational factors were entered as a group in a similar model, after inclusion of the control variables, deviance was significantly reduced (χ^2 = 61.1, 4 degrees of freedom, p = 1.703E-12). The organizational factors reduced model deviance by over twice the amount of the environmental factors. This difference in deviance (61.1 – 25.5 = 35.5 =χ^2 , 4 degrees of freedom, p = 3.5E-7) was significant. While a specific hypothesis was not stated concerning which group of factors was more influential, it was opined that environmental factors probably exerted dominant influence due to theoretical considerations related to environmental determinism (Hannan & Freeman, 1977) and competitive market rivalry (Porter, 1980; Porter, 1985) influencing strategic choice. This argument is consistent with the so called market structure view (MSV) (Shortell & Kaluzny, 2006) that

environmental dynamics via market forces and competitive rivalry shape an organization's choice of competitive strategies. However, these findings tend to support the resource base view (RBV) (Barney, 1991; Hamel & Prahalad, 1994) that organizational characteristics and capabilities are more influential in strategic choices.

Joint Environmental and Organizational Factors and Innovation Adoption

The fourth research question asked what, if any, influence do environmental and organizational factors, acting jointly, have on innovation adoption and, if these factors are jointly influential, which of the individual environmental and organizational factors significantly influence innovation adoption and what is the direction of this influence? The fourth primary hypothesis proposed that there is positive correlation between the selected environmental and organizational factors, acting jointly, and innovation adoption. Logistic regression results supported this hypothesis. The joint environmental and organizational factors regression model (i.e., control and experimental variables) was statistically significant ($\chi^2 = 217.8$, 10 degrees of freedom, p = 3.086E-41) with a 41 percent improvement in classification of adopters and some 25.9 to 40.1 percent of the deviance in innovation adoption explained by these factors. Thus, it is clear from these results that environmental and organizational factors, acting jointly, significantly influence innovation adoption and that these factors acting jointly are more influential than the singular influence of either group of factors. These findings support the strategic management perspective that both internal (i.e., organizational) and external (i.e., environmental) factors influence strategy formation (i.e., innovation adoption) to achieve strategic adaptation (Learned et al., 1965; Ginter, Swayne & Duncan, 2002; Mintzberg,

Ahlstrand & Lampel, 1998) consistent with GST (von Bertalanffy, 1968; Kast & Rosenzweig, 1985). However, it should be noted that in this research the contribution of environmental factors beyond that of organizational factors was statistically significant ($\chi^2 = 14.6$, 4 degrees of freedom, p = 0059) but of marginal practical significance since the increase in correct classification of adopters was less than one percent (i.e., 40.4 to 41 percent) and increased explanation of deviance was only about two percent (i.e., R^2 increased from 24-38 percent to 26-40 percent). This finding reaffirms the dominance of organizational factors in influencing adoption, but both sets of factors do make a contribution, however that of the environmental factors is marginal.

The next part of the fourth research question asked which environmental and organizational factors were influential and what was the direction of their influence if the factors as a group were significant. The secondary hypotheses addressed these questions for each of the four environmental and four organizational factors.

Environmental complexity. It was found that environmental complexity was still positively and significantly (p = 0.038) associated with a greater likelihood of innovation adoption in the joint model. In comparison to the singular model, the degree of significance for the joint model decreased slightly (i.e., p = 0.033 to 0.038) and the odds of adoption increased slightly (i.e., 296.7 to 298.5 percent) when a hospital is located in a more urban (i.e., metropolitan) versus less urban (i.e., micropolitan) area. Other findings for the joint model are consistent with those of the singular model.

Competition. As in the singular model (p = 0.437), competition was not found to be statistically significant (p = 0.914) in the joint model. However, unlike the singular model, the relationship was not in the hypothesized direction in the joint model. This finding may be anomalous since in 80 percent (i.e., 12 out of 15) of the joint model analyzes of this factor, using the different sampling frames and sample sizes in Appendix C, the sign was in the hypothesized direction. [In addition, in 100 percent (i.e., 15 out of 15) of the analyzes of this factor in the singular model with only environmental factors, the sign was in the hypothesized direction.] This finding emphasizes the need for additional investigation of this factor. Other findings for the joint model are consistent with those of the singular model.

*Network externalities***.** As in the singular model (p = 0.126), network externalities were not found to be statistically significant (p = 0.208), although the sign was in the hypothesized positive direction. Other findings for the joint model are consistent with those of the singular model.

*Community resources***.** It was found that community resources were still positively (contrary to the hypothesis) and significantly (p = 0.022) associated with a greater likelihood of innovation adoption in the joint model as in the singular model. In comparison to the singular model, the degree of significance for this factor in the joint model decreased (i.e., p = 0.003 to 0.022) as did the odds of adoption (i.e., 7.1 to 5.7 percent) for each additional HPP per thousand in county population. Other findings for the joint model are consistent with those of the singular model.

Organizational complexity. It was found that organizational complexity was still positively (contrary to the hypothesis) and significantly ($p = 0.0007772$) associated with a greater likelihood of innovation adoption in the joint model. In comparison to the singular model, the degree of significance for the joint model decreased slightly (i.e., $p = 0.0001326$ to 0.0007772) as did the odds of adoption (i.e., 1.4 to 1.2 percent) for each additional service offered by a hospital. Other findings for the joint model are consistent with those of the singular model.

*Slack resources***.** As in the singular model ($p = 0.492$), slack resources were not found to be statistically significant ($p = 0.790$) in the joint model, although the sign was in the hypothesized positive direction. Other findings for the joint model are consistent with those of the singular model.

*External communications network***.** As in the singular model ($p = 0.083$), external communications network was not found to be statistically significant ($p = 0.107$) in the joint model, although the sign was in the hypothesized positive direction. [It is interesting to note that this factor once again achieved near significance at the $p = 0.10$ level in the study sample. In 33 percent of the alternative sampling frames and samples in Appendix C this factor was significant and it attained near significance ($0.05 < p < 0.10$) in another 10 percent.] This finding emphasizes the need for additional investigation of this factor. Other findings for the joint model are consistent with those of the singular model.

Control of domain. It was found that control of domain was still positively and significantly (p = 1.290E-7) associated with greater likelihood of innovation adoption in the joint model as in the singular model. In comparison to the singular model, the degree of significance for this factor in the joint model decreased (i.e., p = 2.860E-8 to 1.290E-7) as did the odds of adoption (i.e., 256.3 to 244.0 percent) for each additional RN per bed. Other findings for the joint model are consistent with those of the singular model.

Implications

This research study adds an empirical test of theory driven hypotheses to strategic adaptation and diffusion of innovation scholarship in general and to magnet hospital scholarship in particular. This study also suggests guidelines for managerial practice. These implications are discussed in this section.

Implications for Scholarly Understanding and Theory Building

The findings in this study are consistent with theoretical linkages proposed in this paper between GST (von Bertalanffy, 1968; Kast & Rosenzweig, 1985), strategic adaptation and management (Learned et al., 1965; Mintzberg, Ahlstrand & Lampel, 1998; Ginter, Swayne & Duncan, 2002), strategic choice (Child, 1972; Child, 1997) and diffusion of innovation perspectives (Rogers, 2003) as a theoretical framework for the study of organizational strategy. These theories focus on the interplay between organizations as transformation systems that acquire resource inputs from their environment to produce product/service outputs via their internal processes. This

suggests that both external environmental and internal organizational factors influence an organization's success in adaptation. The significance of the primary hypotheses in this study support the salience of both environmental and organizational factors in the adaptation of organizations via the adoption of innovations, in accord with the theoretical perspectives cited above. However, somewhat contrary to expectations, organizational influences were found to be more salient than environmental influences in adoption of administrative innovations. This tends to support the RBV (Barney, 1991; Hamel & Prahalad, 1994) that organizational characteristics and capabilities dominate strategic choices compared to the MSV (Porter, 1980; Porter; 1985; Shortell & Kaluzny, 2006) that environmental forces like markets factors and competitive rivalry are dominant.

The findings from this study also support Aiken's model (2002) concerning the role of staffing levels as an important factor in creating a patient care surveillance system that is instrumental in promoting a professional practice environment that attracts and retains RNs. Flood and Scott's (1978; 1987) work on control of domain underpins Aiken's model and is likewise supported by the findings in this study. Control of domain (i.e., RNs per bed) empowers professionals to adopt innovations that support professional mores and goals and thereby contributes to satisfaction and actualization thus providing a rationale for attraction and retention of RNs in magnet hospitals. In addition, this factor also supports Damanpour's (1991) finding that organizations with more technical resources relevant to innovation adoption are more successful in adoption.

Findings in this study relative to individual factors in the secondary hypotheses are mixed relative to theoretical expectations. Environmental complexity and control of domain are consistent with theoretical expectations and prior empirical results in term of

a positive direction and the significance of their relationship with innovation adoption, which supports prior findings on these factors. However, organizational complexity, while significant and consistent with prior empirical results in direction of relationship, was contrary to theoretical expectations drawn from population ecology theory views on structural inertia (Hannan & Freeman, 1977; 1984). The sign of this factor in the study suggests that structural inertia does not dominate compared to organizational flexibility and learning capabilities, based on the RBV (Barney, 1991; Hamel & Prahalad, 1994, Mintzberg, 1998), in adopting innovations. Community resources was significantly related to adoption, but the sign was positive versus negative as expected based on theoretical expectations that organizations in communities with more munificent resources would be less inclined or at least have less need to adopt innovations. The reversed sign on this factor tends to support the salience of internal versus external factors in influencing strategic choices consistent with the RBV discussed above.

In keeping with the maxim that negative findings do not necessarily mean no findings, some theoretical insights can be gleaned from factors that were not significant. Network externalities, theoretically related to institutional theory (Dimaggio & Powell, 1983), were not significant, but the sign was in the anticipated direction, which is notable for this emergent factor, particularly considering the early stage of diffusion of the magnet concept. While signs were predominantly in the expected direction, the lack of significance of slack resources, theoretically related to transactional economics theory (Oliver, 1991), and external communications network , theoretically related to institutional theory (Dimaggio & Powell, 1983), are troubling since prior empirical results suggest significance should be anticipated. This suggests the need for better

measures for these factors before theoretical reasoning from institutional and transactional economics theories is abandoned. While competition, theoretically related to the MSV (Porter, 1980; Porter, 1985), has had very mixed empirical results, there is good reason to suspect that the measure needs improvement in this particular study given the potential differences between product/service market and labor market competition.

Implications for Professional Practice and Decision-Making

The findings from this study inform practicing managers of those characteristics that are most closely associated with successful adoption of the magnet hospital concept so they can make prudent strategic decisions to address RN workforce shortages. In essence, hospitals that are located in metropolitan areas (i.e., population > 50,000) and that have higher levels of HPPs per thousand in population are environmentally favored toward successful adoption due to their location. Those that provide more services, have higher ratios of RNs per bed, that are larger, and that are not for-profit are organizationally favored for successful adoption due to their capabilities. Those hospitals that have the above organizational characteristics are more favored than those have the environmental characteristics. Those hospitals that have both sets of characteristics are most favored of all for successful adoption.

On the basis of these findings health care managers should seriously evaluate environmental and organizational factors related to their hospital to determine their potential for successful adoption (i.e., designation) of the magnet concept. Environmentally, major consideration should focus on hospital location. To be successful hospitals need to be located in areas where there is a supply of RNs munificent

enough to be attracted by the magnet hospital concept. If there is a profound scarcity of supply in the hospital's market, then other workforce strategies that focus on building supply infrastructure (e.g., starting or expanding nursing schools; offering scholarships) or attracting supply from other markets (e.g., raising wages; offering hiring incentives) might be more successful in addressing shortages. Organizationally, primary consideration should focus on the scope of services offered by the hospital and RN staffing per bed. Again, hospitals with limited scopes of services (e.g., small hospitals, specialty hospitals) or those that cannot increase staffing ratios are probably not good candidates for a magnet hospital strategy and managerial efforts might be better focused on alternatives. However, managers that can adjust their staffing ratio, perhaps substituting RNs for LPNs or other practitioners, might consider a magnet strategy.

Once again, negative findings can be instructive. While secondary consideration should be give to the level of product/service market concentration (i.e., competition) and to the presence of other adopters (i.e., network externalities) in the hospital's market, finding that competition and network externalities are not salient might be viewed by practitioners as an opportunity to still be an early adopter of the magnet hospital concept when first or early mover advantages can be maximized (Porter, 1980). Likewise, managers need not interpret availability of slack resources and/or lack of membership in a multiunit hospital system as necessarily an impediment to successful adoption.

Limitations of the Study

There are a number of limitations that needed to be considered related to this study. First, this is a field study subject to the limitations that are inherent in the nature of

ex post facto research methodologies (Trochim, 2001). Namely, this is a nonexperimental design in which other relevant variables may not be controlled such that they could influence results. The ability to manipulate variables and establish complete experimental control was not possible. Only indirect methods were available for controlling the influence of extraneous factors that might confound the effects of the experimental variables. Causal attributions cannot be made on the basis of this research as this was essentially a cross-sectional study using only hospitals designated or redesignated by the ANCC as a magnet hospital in different years between 1999 and 2004 and non-designated hospitals for 2004. Second, this study was conducted using an administrative innovation unique to hospitals and the health care industry. Thus, results from this setting may not be generalizable too other organizations in other industries. Indeed, findings may not be generalizable to all hospitals as only a subset of U.S. hospitals and only ANCC designated magnet hospitals were included in this study. There could have been hospitals that implemented magnet practices that did not seek ANCC designation. Third, while random sampling was used in sample selection there is always the possibility that the study sample may not be representative of the sampling frame and that the sampling frame may not be representative of the population. Fourth, validity of the measures used to capture environmental influences and organizational influences are primarily based on theoretical considerations and their use in the health services research literature, although supported by more statistically robust methods. There is the potential that the variables selected and/or their measures do not adequately capture the constructs. Also, only a limited number of variables were used to operationalize each construct. Fifth, data reliability is always a concern in studies relying on secondary data. In such

studies, the researcher does not have the ability to verify the accuracy of the coding, processing, and consistency of raw information in the reported data. Aside from data collection and processing errors, potential changes from year to year in definition of variables and in computation of measures in secondary data are always potential risks. Sixth, no mediators or moderators that might influence relationships were included in this research. Finally, there was no consideration of preceding or concurrent innovations that might have also influenced adoption of the magnet hospital concept.

Future Research Directions

While the present study has contributed to the body of scholarly work on strategic adaptation via adoption and diffusion of innovations, it also points strongly to the need for additional research. This research can be meaningfully extended both generally, in furthering the study of adoption of administrative innovations, and particularly, in furthering study of adoption of the magnet hospital concept.

Future research on adoption of administrative innovations needs to be repeated in other industries, settings, and with other types of organizations in order to support the generalizability of these findings. In the context of this research for example, two recent phenomena present opportunities for further study of adoption and diffusion of the magnet hospital concept. Hospitals have begun to adopt the magnet concept in other countries, as have other health care providers besides hospitals. Both of these new groups of adopters provide comparative opportunities for studying both adoption and diffusion of administrative innovations and the magnet concept in new settings.

Future research also needs to address limitations in this study, such as the limitations inherent in non-experimental studies. For example, in addition to more and better control variables, inclusion of moderators and mediators of the proposed relationship need to be incorporated. A number of potential moderators and mediators are identified in the literature review.

Investigation of factors that influence adoption by stage of the adoption process is particularly needed. Virtually no studies were found in the literature reviewed that examined adoption by stage for any particular adoption schema. This research only examined the influence of factors at the implementation stage in Rogers' schema (2003). Just using Rogers' schema, research is needed on the influence of factors at the knowledge, feasibility, decision, and confirmation stages of the adoption process. Of particular interest to this research would be investigation of factors influencing the confirmation stage (i.e., redesignation as a magnet hospital) via those hospitals that do not choose to confirm (i.e., do not seek redesignation as a magnet hospital).

This research was essentially cross-sectional. Longitudinal study of the adoption and diffusion of administrative innovations is particularly needed. As regards future adoption studies, of particular interest would be how the salience of factors change over time. As regards future diffusion studies, how the salience of factors change in different phases of the diffusion process (Ryan & Gross, 1943) needs to be studied. Given the early stage of diffusion of the magnet hospital concept, this innovation presents a particularly useful opportunity for these types of studies. Use of survival analysis methods might be of particular utility in future studies.

This study investigated the role of a limited set of environmental and organizational influences that were thought to reasonably capture these constructs. There are many other factors that merit investigation in these categories, as noted in the literature review. Also, the literature review noted the importance of individual level factors that were not included in this study. This category of factors needs to be investigated singularly and jointly with environmental and organizational factors. Also, there is a particular need to investigate the influence of an organization's strategic orientation (Miles & Snow, 1978; Porter, 1980) on adoption as this might be a major factor influencing decision-making.

There are a number of future research needs that relate to particular variables in this study. First, further research on the location of magnet hospitals is needed. No magnet hospitals were located in rural areas and only a small number were located in micropolitan and metro-divisions. Second, the role of competition in influencing adoption of the magnet concept also needs further study. The measure used in this study captured concentration in a hospital's product/service market. Better measures of labor market competition and dynamics need to be studied. Third, network externalities present an interesting factor that links innovation adoption and diffusion. The magnet hospital concept is barely in the early adopter phase of diffusion. Continuing analysis of the influence of growing numbers of adopters on subsequent adoption behavior is needed, particularly as the number of adopters grows in some markets to critical mass or a tipping point. Given this relatively early phase of diffusion, tracking changes in this factor offers a particularly timely research opportunity. Fourth, investigation of community resources would benefit from a more precise measure of nursing supply in a hospital's market

versus the gross measure used in this study. Also, a better matching of nursing workforce relative to the adoption decision is needed versus the static measure in this research. In addition, other measures of community resources need to be investigated such as measures of social, economic, and other heath care resources. Fifth, since type of hospital was found to be very influential, further study of the reason for this significant difference needs investigation. This might provide a useful opportunity to examine the potentially differing motives (i.e., financial versus quality/service) of different types of organizations concerning adoption of innovations. Finally, alternative operationalizations of variables are always of interest in terms of how well they capture the constructs. For example, organizational complexity might be better captured by a measure of acuity or case mix intensity. Slack resources might benefit from more direct operationalization by various financial measures, such as operating margin, net income, reserves and so forth. External communications network might benefit from a broader measure of external relationships than system membership. Also, control of domain might benefit from a broader measure that captures all of the resources under nursing control.

Summary

The present study reviewed the literature and used general systems theory, strategic adaptation theory, and diffusion of innovation theory to develop an applied research framework for empirically examining the adoption of administrative innovations. This study focused on identifying the relationship between a set of four environmental and four organization variables with innovation adoption and their relative and joint influence in the presence of two control variables. Secondary data on U.S. hospitals from the AHA, ARF, and ANCC were used to test hypothesized relationships using logistic regression methods.

It was found that the groups of environmental and organizational influences singularly and jointly influenced adoption of administrative innovations and organizational influences were more salient than environmental influences. Specifically, it was found that environmental and organizational complexity, community resources, and control of domain were all positively and significantly associated with adoption of administrative innovations versus competition, network externalities, slack resources, and external communications network that were not significant. The control variables of size of hospital and type of hospital were both positive and significant.

Findings from this study are useful to both scholars and practitioners. Scholars can use these results to extend knowledge of each of the factors investigated and a number of additional factors. Particularly compelling is the need for future research on the influence of these factors in different stages of the adoption process and in different phases of the diffusion process. Practitioners can use these findings to assess the potential for successful adoption of the magnet concept by their hospitals and to better plan their strategy for addressing workforce shortages. Overall, much has been learned from this research that now needs to be meaningfully extended to provide future benefits to scholarship and practice.

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APPENDIX A

INSTITUTIONAL REVIEW BOARD APPROVAL

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM

Form 4: IRB Approval Form
Identification and Certification of Research
Projects Involving Human Subjects

UAB's Institutional Review Boards for Human Use (IRBs) have an approved Federalwide Assurance with the Office for Human Research Protections (OHRP). The UAB IRBs are also in compliance with 21 CFR Parts 50 and 56 and ICH GCP Guidelines. The Assurance became effective on November 24, 2003 and expires on February 14, 2009. The Assurance number is FWA00005960.

Principal Investigator: SANDERS, TOMMY J
Co-Investigator(s):
Protocol Number: **X060616012**
Protocol Title: *Factors Influencing the Adoption of Administrative Innovations (Dissertation Proposal)*

The IRB reviewed and approved the above named project on 6/23/06. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services. This Project will be subject to Annual continuing review as provided in that Assurance.

This project received EXPEDITED review.

IRB Approval Date: 6/23/06

Date IRB Approval Issued: 6/23/06

Marilyn Doss

Marilyn Doss, M.A.
Vice Chair of the Institutional Review
Board for Human Use (IRB)

Investigators please note:

The IRB approved consent form used in the study must contain the IRB approval date and expiration date.

IRB approval is given for one year unless otherwise noted. For projects subject to annual review research activities may not continue past the one year anniversary of the IRB approval date.

Any modifications in the study methodology, protocol and/or consent form must be submitted for review and approval to the IRB prior to implementation.

Adverse Events and/or unanticipated risks to subjects or others at UAB or other participating institutions must be reported promptly to the IRB.

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APPENDIX B

RESULTS FOR FACTOR ANALYSIS

Comparison of Principle Components and Factor Analysis Results								
Method	**Principle Components**				**Factor Analysis (Principle Axis Method)**			
Determinant	.454		.454		.454		.454	
KMO test	.711		.711		.711		.711	
Bartlett test	p<0.000		p<0.000		p<0.000		p<0.000	
Kaiser Criterion Factors	2		2		2		2	
Scree Plot Factors	2		2		2		2	
Variance Explained	47.7%		47.7%		47.7%		47.7%	
Rotation	Varimax		Promax		Varimax		Promax	
Category of Components or Factors	Org.	Env.	Org.*	Env.*	Org.	Env.	Org.*	Env.*
Org. Complexity	**.790**	.132	**.805/ .801**	-.012/ .266	**.859**	.113	**.910/ .862**	-.102/ .327
Control of Domain	**.709**	-.043	**.752/ .690**	-.180/ .080	**.348**	.157	**.337/ .375**	.081/ .240
Size	**.634**	.363	**.599/ .689**	.260/ .466	**.489**	.374	**.429/ .562**	.283/ .485
Competition	-.123	**-.732**	.005/ -.252	**-.744/ -.742**	-.115	**-.611**	.049/ -.254	**-.643/ -.620**
Network Externalities	-.096	**.696**	-.225/ .026	**.730/ .653**	.090	**.314**	.008/ .161	**.323/ .327**
Slack Resources	.269	**.574**	.177/ .367	**.551/ .612**	.184	**.483**	.063/ .291	**.485/ .514**
Community Resources	.298	**.378**	.243/ .360	**.340/ .423**	.183	**.300**	.115/ .248	**.282/ .336**

*Pattern Matrix Loadings/Structure Matrix Loadings

APPENDIX C

RESULTS FOR VARIOUS SAMPLING FRAMES AND SIZES

Hypothesis 1. There is a positive correlation between environmental factors as a group and innovation adoption.

Sample Frame	Sample	Adopters = NA	Non-Adopters = NN	Total = N	Sample Ratio = NN/NA	2LLR	Model χ^2	DF	Signifi-cance	Classification Ratio Percentage Null/Cntl/Cntl&Expr			% Correctly Classified Adopters Null/Cntl/Cntl&Expr			Cox-Snell R-Square	NagelKerte R-Square	Hosmer Lemeshow
	All	174	5702	5877	32.8	1243.3	324.3	6	0.000	97.0	96.8	96.9	0.0	1.1	1.1	0.054	0.229	0.348
	20%	174	1140	1314	6.6	728.7	298.8	6	0.000	86.8	87.3	88.1	0.0	19.5	24.7	0.203	0.375	0.793
	15%	174	864	1038	5.0	652.0	286.5	6	0.000	83.2	85.1	85.7	0.0	28.2	32.2	0.241	0.405	0.766
	10%	174	563	737	3.2	547.2	258.4	6	0.000	76.4	80.0	81.3	0.0	38.5	47.7	0.296	0.445	0.014
All Hospitals	5%	174	302	476	1.7	396.0	229.0	6	0.000	63.4	76.9	79.4	0.0	58.0	70.7	0.382	0.522	0.644
	All	156	4637	4793	29.7	1076.2	299.3	6	0.000	96.7	96.5	96.6	0.0	1.3	1.3	0.061	0.243	0.653
	20%	156	886	1042	5.7	617.9	262.0	6	0.000	85.0	85.7	86.1	0.0	22.4	26.3	0.222	0.390	0.656
	15%	156	742	899	4.8	570.7	258.6	6	0.000	82.6	84.6	85.1	0.0	29.5	34.0	0.250	0.415	0.666
Reporting	10%	156	501	657	3.2	464.6	255.6	6	0.000	76.3	82.2	82.0	0.0	44.9	48.7	0.322	0.484	0.544
Hospitals	5%	156	255	411	1.6	311.2	234.5	6	0.000	62.0	80.0	81.8	0.0	66.0	75.0	0.435	0.592	0.335
	All	156	3617	3773	23.2	1070.0	229.7	6	0.000	95.9	95.6	95.7	0.0	1.3	1.3	0.059	0.203	0.440
	20%	156	696	852	4.5	589.7	221.5	6	0.000	81.7	83.9	85.0	0.0	29.5	34.6	0.229	0.373	0.758
Reporting	15%	156	569	725	3.6	587.4	167.7	6	0.000	78.5	80.0	81.2	0.0	24.4	30.1	0.207	0.319	0.212
Non-Rural	10%	156	362	518	2.3	448.2	185.6	6	0.000	69.9	78.0	79.0	0.0	46.8	51.9	0.301	0.427	0.610
Hospitals	5%	156	184	340	1.2	328.1	141.0	6	0.000	54.1	76.2	76.5	0.0	67.9	71.2	0.339	0.454	0.058

Hypothesis 1.1. There is a positive correlation between environmental complexity and innovation adoption.

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
All Hospitals	All	2.068	0.491	17.77	1	0.000	7.937	3.021	20.833
	20%	1.836	0.503	13.32	1	0.000	6.289	2.342	16.949
	15%	-1.871	0.508	13.57	1	0.000	0.154	0.057	0.416
	10%	1.854	0.517	12.87	1	0.000	6.369	2.320	17.544
	5%	1.863	0.534	12.17	1	0.000	6.452	2.262	18.182
Reporting Hospitals	All	1.896	0.496	14.63	1	0.000	6.667	2.519	17.544
	20%	1.623	0.517	9.868	1	0.002	5.076	1.842	13.889
	15%	1.829	0.516	12.58	1	0.000	6.211	2.268	17.241
	10%	1.567	0.537	8.507	1	0.004	4.785	1.672	13.699
	5%	1.603	0.555	8.353	1	0.004	4.975	1.675	14.706
Reporting Non-Rural Hospitals	All	1.265	0.489	6.699	1	0.010	3.546	1.359	9.259
	20%	1.239	0.518	5.717	1	0.017	3.448	1.250	9.524
	15%	1.089	0.510	4.564	1	0.033	2.967	1.094	8.065
	10%	0.970	0.530	3.353	1	0.067	2.639	0.934	7.463
	5%	0.674	0.573	1.382	1	0.240	1.961	0.638	6.024

Hypothesis 1.2. There is a positive correlation between competition and innovation adoption

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
All Hospitals	All	-0.613	0.341	3.228	1	0.072	0.542	0.277	1.057
	20%	-0.647	0.387	2.798	1	0.094	0.524	0.245	1.117
	15%	-0.836	0.407	4.227	1	0.040	0.433	0.195	0.962
	10%	-0.899	0.433	4.323	1	0.038	0.047	0.174	0.95
	5%	-0.453	0.489	0.859	1	0.354	0.636	0.244	1.657
Reporting Hospitals	All	-0.547	0.362	2.283	1	0.131	0.579	0.285	1.176
	20%	-0.873	0.409	4.561	1	0.033	0.418	0.188	0.931
	15%	-0.761	0.417	3.340	1	0.068	0.467	0.206	1.057
	10%	-0.346	0.484	0.509	1	0.475	0.708	0.274	1.829
	5%	-1.330	0.552	5.800	1	0.016	0.265	0.090	0.781
Reporting Non-Rural Hospitals	All	-0.526	0.36	2.134	1	0.144	0.591	0.292	1.197
	20%	-0.820	0.419	3.828	1	0.050	0.440	0.194	1.001
	15%	-0.329	0.424	0.603	1	0.437	0.719	0.313	1.652
	10%	-0.859	0.442	3.774	1	0.052	0.423	0.178	1.008
	5%	-0.852	0.529	2.588	1	0.108	0.427	0.151	1.204

Hypothesis 1.3 . There is a positive correlation between network externalities and innovation adoption.

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
	All	2.143	0.983	4.755	1	0.029	8.525	1.242	58.509
	20%	2.038	1.257	2.627	1	0.105	7.673	0.653	90.185
	15%	2.400	1.341	3.214	1	0.073	11.067	0.799	153.292
	10%	1.052	1.402	0.564	1	0.453	2.865	0.184	44.701
All Hospitals	5%	3.229	2.015	2.568	1	0.109	25.266	0.486	1312.24
	All	2.033	1.128	3.250	1	0.071	7.640	8.380	69.691
	20%	2.164	1.443	2.248	1	0.134	8.705	0.514	147.338
	15%	1.527	1.565	0.952	1	0.329	4.604	0.214	98.855
Reporting	10%	2.379	1.929	1.521	1	0.218	10.79	0.246	473.047
Hospitals	5%	1.014	2.408	0.177	1	0.674	2.758	0.025	309.029
	All	2.009	1.122	3.203	1	0.073	7.454	0.826	67.263
	20%	0.294	1.505	0.038	1	0.845	1.342	0.070	25.662
	15%	2.518	1.647	2.339	1	0.126	12.409	0.492	312.824
Reporting Non-	10%	3.411	2.107	2.619	1	0.106	30.285	0.487	1883.8
Rural Hospitals	5%	0.429	2.075	0.043	1	0.863	1.536	0.026	89.555

Hypothesis 1.4 . There is a negative correlation between community resources and innovation adoption.

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
	All	0.052	0.016	11	1	0.001	1.054	1.022	1.087
	20%	0.068	0.019	12.58	1	0.000	1.070	1	1.111
	15%	0.058	0.022	6.905	1	0.009	1.060	1.015	1.107
	10%	0.057	0.024	5.843	1	0.016	1.059	1.011	1.109
All Hospitals	5%	0.065	0.030	4.846	1	0.028	1.067	1.007	1.131
	All	0.071	0.018	15.4	1	0.000	1.074	1.036	1.113
	20%	0.088	0.022	15.51	1	0.000	1.092	1.045	1.141
	15%	0.066	0.023	8.185	1	0.004	1.069	1.021	1.118
Reporting	10%	0.096	0.027	12.35	1	0.000	1.101	1.044	1.162
Hospitals	5%	0.076	0.030	6.347	1	0.012	1.079	1.017	1.144
	All	0.069	0.018	14.62	1	0.000	1.072	1.034	1.11
	20%	0.083	0.022	14.22	1	0.000	1.087	1.041	1.135
	15%	0.069	0.023	9.085	1	0.003	1.071	1.024	1.120
Reporting Non-	10%	0.073	0.028	6.784	1	0.009	1.076	1.018	1.137
Rural Hospitals	5%	0.056	0.033	2.896	1	0.089	1.057	0.992	1.127

Control 1 - Size = Number of Beds in use

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
All Hospitals	All	0.003	0.000	90.33	1	0.000	1.003	1.002	1.003
	20%	0.004	0.000	70.92	1	0.000	1.004	1.003	1.004
	15%	0.003	0.000	54.14	1	0.000	1.003	1.002	1.004
	10%	0.004	0.000	50.11	1	0.000	1.004	1.003	1.004
	5%	0.005	0.001	40.82	1	0.000	1.005	1.003	1.006
Reporting Hospitals	All	0.003	0.000	86.79	1	0.000	1.003	1.002	1.004
	20%	0.003	0.000	58.17	1	0.000	1.003	1.003	1.004
	15%	0.003	0.001	45.78	1	0.000	1.003	1.002	1.004
	10%	0.005	0.001	58.94	1	0.000	1.005	1.004	1.006
	5%	0.006	0.001	45.18	1	0.000	1.006	1.004	1.008
Reporting Non-Rural Hospitals	All	0.003	0.000	86.18	1	0.000	1.003	1.002	1.004
	20%	0.004	0.001	63.15	1	0.000	1.004	1.003	1.005
	15%	0.003	0.000	46.9	1	0.000	1.003	1.002	1.004
	10%	0.004	0.001	49.7	1	0.000	1.004	1.003	1.005
	5%	0.006	0.001	43.42	1	0.000	1.006	1.004	1.007

Control 2 - Type of Hospital = For Profit or Not for Profit

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
All Hospitals	All	2.56	0.588	18.98	1	0.000	12.941	4.089	40.955
	20%	2.403	0.598	16.16	1	0.000	11.051	3.425	35.658
	15%	2.458	0.600	16.77	1	0.000	11.677	3.602	37.861
	10%	2.423	0.606	15.99	1	0.000	11.277	3.439	36.982
	5%	2.370	0.631	14.09	1	0.000	10.693	3.103	36.845
Reporting Hospitals	All	2.246	0.591	14.47	1	0.000	9.450	2.970	30.069
	20%	2.280	0.627	13.24	1	0.000	9.781	2.864	33.409
	15%	2.366	0.603	15.39	1	0.000	10.660	3.268	34.767
	10%	1.969	0.616	10.2	1	0.001	7.162	2.140	23.973
	5%	2.564	0.756	11.52	1	0.001	12.990	2.954	57.117
Reporting Non-Rural Hospitals	All	2.258	0.590	14.62	1	0.000	9.560	3.006	30.408
	20%	2.276	0.602	14.28	1	0.000	9.734	2.991	31.684
	15%	2.145	0.602	12.68	1	0.000	8.538	2.623	27.795
	10%	2.595	0.678	14.63	1	0.000	13.391	3.543	50.611
	5%	1.710	0.650	6.924	1	0.009	5.531	1.547	19.771

Constant = B_0 (for Full Model)

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)
All Hospitals	All	-6.873	0.636	116.6	1	0.000	0.001
	20%	-5.673	0.671	71.51	1	0.000	0.003
	15%	-6.979	0.842	68.73	1	0.000	0.001
	10%	-4.674	0.692	45.58	1	0.000	0.009
	5%	-4.617	0.790	34.12	1	0.000	0.010
Reporting Hospitals	All	-6.909	0.655	111.2	1	0.000	0.001
	20%	-5.658	0.727	60.62	1	0.000	0.003
	15%	-5.144	0.701	53.39	1	0.000	0.066
	10%	-5.535	0.783	49.95	1	0.000	0.004
	5%	-4.808	0.882	29.69	1	0.000	0.008
Reporting Non-Rural Hospitals	All	-6.883	0.654	110.7	1	0.000	0.001
	20%	-5.601	0.695	64.68	1	0.000	0.004
	15%	-5.152	0.702	53.82	1	0.000	0.006
	10%	-5.227	0.830	40.41	1	0.000	0.005
	5%	-3.871	0.813	22.69	1	0.000	0.021

Hypothesis 2. There is a positive correlation between organizational factors as a group and innovation adoption.

Sample Frame	Sample	Adopters = NA	Non-Adopters = NN	Total = N	Sample Ratio = NN/NA	2LLR	Model χ^2	DF	Signifi-cance	Classification Ratio Percentage Null/Cntl/Cntl&Pred			% Correctly Classified Adopters Null/Cntl/Cntl&Pred			Cox-Snell R-Square	NagelKerte R-Square
	All	174	5703	5877	32.8	1225.9	341.9	6	0.000	97.0	96.8	96.8	0.0	1.1	2.3	0.057	0.241
	20%	174	1140	1314	6.6	703.8	323.6	6	0.000	86.8	87.3	87.8	0.0	19.5	32.2	0.218	0.402
	15%	174	864	1038	5.0	638.9	299.7	6	0.000	83.2	85.1	85.8	0.0	28.2	40.2	0.251	0.421
All	10%	174	563	737	3.2	562.1	243.5	6	0.000	76.4	80.1	81.7	0.0	38.5	46.6	0.281	0.423
Hospitals	5%	174	302	476	1.7	375.0	250.0	6	0.000	63.4	76.9	79.8	0.0	58.0	69.0	0.409	0.559
	All	156	4638	4794	29.7	1070.3	305.2	6	0.000	96.7	96.5	96.5	0.0	1.3	3.2	0.062	0.247
	20%	156	886	1042	5.7	589.7	290.2	6	0.000	85.0	85.7	87.1	0.0	22.4	35.9	0.243	0.426
	15%	156	743	899	4.8	547.3	282.4	6	0.000	82.6	84.6	85.8	0.0	29.5	42.9	0.270	0.447
Reporting	10%	156	501	657	3.2	450.5	269.7	6	0.000	76.3	82.2	83.0	0.0	44.9	52.6	0.337	0.506
Hospitals	5%	156	255	411	1.6	278.3	267.4	6	0.000	62.0	80.0	84.2	0.0	66.0	74.4	0.478	0.651
	All	156	3617	3773	23.2	1047.9	251.5	6	0.000	95.9	95.6	95.6	0.0	1.3	3.2	0.064	0.221
	20%	156	696	852	4.5	561.9	249.3	6	0.000	81.7	83.9	85.2	0.0	29.5	40.4	0.254	0.413
Reporting	15%	156	569	725	3.6	551.8	203.2	6	0.000	78.5	80.1	82.3	0.0	24.4	40.4	0.244	0.378
Non-Rural	10%	156	362	518	2.3	423.4	210.5	6	0.000	69.9	78.0	79.7	0.0	46.8	55.8	0.334	0.473
Hospitals	5%	156	184	340	1.2	309.1	159.9	6	0.000	54.1	76.2	79.4	0.0	67.9	73.7	0.375	0.501

Hypothesis 2.1. There is a negative correlation between organizational complexity and innovation adoption.

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
	All	0.010	0.002	18.001	1	0.000	1.010	1.005	1.015
	20%	0.017	0.004	24.691	1	0.000	1.018	1.011	1.025
	15%	0.015	0.004	17.050	1	0.000	1.015	1.008	1.022
	10%	0.012	0.004	8.547	1	0.003	1.012	1.00	1.02
All Hospitals	5%	0.017	0.005	12.388	1	0.000	1.017	1.007	1.026
	All	0.009	0.002	14.500	1	0.000	1.009	1.00	1.014
	20%	0.019	0.004	25.985	1	0.000	1.019	1.012	1.026
	15%	0.017	0.004	20.485	1	0.000	1.017	1.01	1.025
Reporting	10%	0.013	0.004	11.485	1	0.001	1.013	1.006	1.021
Hospitals	5%	0.019	0.005	13.395	1	0.000	1.019	1.009	1.029
	All	0.008	0.002	11.556	1	0.001	1.008	1.003	1.013
	20%	0.013	0.004	12.688	1	0.000	1.013	1.006	1.02
	15%	0.014	0.004	14.605	1	0.000	1.014	1.007	1.021
Reporting Non-	10%	0.010	0.004	6.947	1	0.008	1.010	1.00	1.018
Rural Hospitals	5%	0.010	0.005	5.064	1	0.024	1.010	1.00	1.02

Hypothesis 2.2 . There is a positive correlation between slack resources and innovation adoption.

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
	All	0.624	0.532	1.379	1	0.240	1.867	0.658	5.295
	20%	-0.111	0.646	0.030	1	0.863	0.895	0.252	3.174
	15%	0.235	0.645	0.133	1	0.715	1.266	0.357	4.481
	10%	0.042	0.672	0.004	1	0.950	1.043	0.279	3.892
All Hospitals	5%	0.501	0.872	0.33	1	0.566	1.650	0.30	9.18
	All	0.649	0.422	2.364	1	0.124	1.915	0.837	4.382
	20%	0.933	0.331	7.958	1	0.005	2.541	1.329	4.857
	15%	1.239	0.768	2.600	1	0.107	3.451	0.766	15.55
Reporting	10%	0.538	0.837	0.413	1	0.521	1.712	0.332	8.828
Hospitals	5%	2.057	1.062	3.751	1	0.053	7.825	0.976	62.76
	All	0.414	0.573	0.523	1	0.470	1.513	0.492	4.649
	20%	1.469	0.769	3.653	1	0.056	4.346	0.963	19.61
	15%	0.547	0.796	0.472	1	0.492	1.728	0.363	8.225
Reporting Non-FP	10%	1.275	0.906	1.981	1	0.159	3.578	0.606	21.11
Hospitals	5%	0.267	1.012	0.070	1	0.792	1.306	0.18	9.498

Hypothesis 2.3. There is a positive correlation between external communication network and innovation adoption.

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
	All	0.240	0.174	1.893	1	0.169	1.271	0.903	1.788
	20%	0.442	0.210	4.410	1	0.036	1.555	1.030	2.348
	15%	0.395	0.217	3.316	1	0.069	1.484	0.970	2.269
	10%	0.233	0.229	1.039	1	0.308	1.262	0.807	1.976
All Hospitals	5%	0.786	0.285	7.582	1	0.006	2.194	1.254	3.838
	All	0.246	0.186	1.747	1	0.186	1.279	0.888	1.842
	20%	0.555	0.233	5.659	1	0.017	1.742	1.103	2.753
	15%	0.454	0.237	3.662	1	0.056	1.575	0.989	2.508
Reporting	10%	0.453	0.262	2.995	1	0.084	1.572	0.942	2.625
Hospitals	5%	-0.100	0.322	0.096	1	0.757	0.905	0.481	1.701
	All	0.270	0.185	2.136	1	0.144	1.310	0.912	1.881
	20%	0.032	0.228	0.02	1	0.888	1.033	0.660	1.615
	15%	0.397	0.229	3.003	1	0.083	1.487	0.949	2.328
Reporting Non-	10%	0.175	0.261	0.450	1	0.502	1.191	0.715	1.985
Rural Hospitals	5%	0.727	0.310	5.488	1	0.019	2.069	1.126	3.83

Hypothesis 2.4. There is a positive correlation between control of domain and innovation adoption.

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
	All	0.872	0.110	62.883	1	0.000	2.393	1.929	2.968
	20%	1.001	0.149	45.197	1	0.000	2.721	2.032	3.642
	15%	0.914	0.150	37.002	1	0.000	2.495	1.858	3.349
	10%	0.695	0.146	22.757	1	0.000	2.004	1.506	2.667
All Hospitals	5%	1.184	0.204	33.571	1	0.000	3.266	2.189	4.875
	All	0.800	0.118	46.056	1	0.000	2.226	1.767	2.80
	20%	1.081	0.169	41.038	1	0.000	2.948	2.118	4.105
	15%	0.955	0.157	37.138	1	0.000	2.598	1.911	3.532
Reporting	10%	1.026	0.188	29.807	1	0.000	2.791	1.931	4.035
Hospitals	5%	1.618	0.275	34.698	1	0.000	5.045	2.944	8.645
	All	0.739	0.121	37.393	1	0.000	2.094	1.652	2.653
	20%	0.947	0.160	34.897	1	0.000	2.578	1.883	3.53
	15%	0.931	0.168	30.800	1	0.000	2.536	1.826	3.524
Reporting Non-	10%	1.111	0.209	28.201	1	0.000	3.038	2.016	4.579
Rural Hospitals	5%	0.989	0.237	17.422	1	0.000	2.688	1.690	4.277

Control 1 - Size = Number of Beds in use

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
All Hospitals	All	0.003	0.000	81.733	1	0.000	1.003	1.002	1.003
	20%	0.004	0.000	58.360	1	0.000	1.004	1.003	1.005
	15%	0.004	0.001	50.999	1	0.000	1.004	1.003	1.005
	10%	0.004	0.001	51.686	1	0.000	1.004	1.003	1.005
	5%	0.005	0.001	40.800	1	0.000	1.005	1.004	1.007
Reporting Hospitals	All	0.003	0.000	86.350	1	0.000	1.003	1.003	1.004
	20%	0.003	0.000	48.925	1	0.000	1.003	1.002	1.004
	15%	0.004	0.001	45.633	1	0.000	1.004	1.003	1.005
	10%	0.005	0.001	55.285	1	0.000	1.005	1.004	1.007
	5%	0.006	0.001	36.886	1	0.000	1.006	1.004	1.008
Reporting Non-Rural Hospitals	All	0.003	0.000	72.036	1	0.000	1.003	1.002	1.004
	20%	0.004	0.001	43.445	1	0.000	1.004	1.003	1.005
	15%	0.003	0.001	34.290	1	0.000	1.003	1.002	1.004
	10%	0.004	0.001	37.567	1	0.000	1.004	1.003	1.005
	5%	0.006	0.001	37.734	1	0.000	1.006	1.004	1.007

Control 2 - Type of Hospital = For Profit or Not for Profit

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
All Hospitals	All	1.898	0.595	10.172	1	0.001	6.673	2.079	21.43
	20%	1.619	0.609	7.057	1	0.008	5.048	1.529	16.67
	15%	1.648	0.614	7.215	1	0.007	5.197	1.561	17.3
	10%	1.761	0.613	8.264	1	0.004	5.82	1.752	19.34
	5%	1.661	0.674	6.074	1	0.014	5.265	1.405	19.73
Reporting Hospitals	All	1.651	0.603	7.487	1	0.006	5.211	1.597	17.00
	20%	1.624	0.744	4.762	1	0.029	5.075	1.180	21.83
	15%	1.406	0.619	5.154	1	0.023	4.079	1.212	13.73
	10%	1.016	0.642	2.508	1	0.113	2.763	0.786	9.721
	5%	2.320	0.829	7.836	1	0.005	10.176	2.005	51.65
Reporting Non-Rural Hospitals	All	1.759	0.600	8.583	1	0.003	5.804	1.790	18.82
	20%	1.547	0.615	6.327	1	0.012	4.696	1.407	15.67
	15%	1.679	0.620	7.333	1	0.007	5.361	1.590	18.08
	10%	2.076	0.730	8.088	1	0.004	7.972	1.907	33.34
	5%	1.126	0.686	2.694	1	0.101	3.083	0.804	11.82

Constant = B_0 (for Full Model)

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)
All Hospitals	All	-8.242	0.669	151.99	1	0.000	0.000
	20%	-6.888	0.728	89.559	1	0.000	0.001
	15%	-6.549	0.723	81.962	1	0.000	0.001
	10%	-5.726	0.732	61.167	1	0.000	0.003
	5%	-6.789	0.918	54.645	1	0.000	0.001
Reporting Hospitals	All	-7.938	0.675	138.314	1	0.000	0.000
	20%	-7.702	0.877	77.176	1	0.000	0.000
	15%	-7.310	0.797	84.164	1	0.000	0.001
	10%	-6.339	0.792	63.974	1	0.000	0.002
	5%	-8.865	1.211	53.598	1	0.000	0.000
Reporting Non-Rural Hospitals	All	-7.554	0.681	123.049	1	0.000	0.001
	20%	-7.105	0.800	78.864	1	0.000	0.001
	15%	-6.471	0.804	64.792	1	0.000	0.002
	10%	-7.129	0.932	58.474	1	0.000	0.001
	5%	-5.418	0.917	34.904	1	0.000	0.004

3.0 There is a significant difference between the environmental influences and organizational influences correlations with innovation adoption.

Sample Frame	Sample	Adopters = NA	Non-Adopters = NN	Total = N	Sample Ratio = NN/NA	Controls 2LLR	Environmental 2LLR	Organizational 2LLR	Difference in 2LLR Cntrl - Env	Difference in 2LLR Cntrl - Org	Difference in 2LLR Difference $\lvert \chi^2 \rvert$	DF	Significance $\lvert \chi^2 \rvert$
All Hospitals	All	174	5702	5877	32.8	1332	1243.3	1225.8	88.2	105.7	17.5	4	0.001545
	20%	174	1140	1314	6.6	795.0	728.7	703.8	66.3	91.2	24.9	4	5.27E-05
	15%	174	864	1038	5.0	715.0	652.0	638.9	63.0	76.1	13.1	4	0.010797
	10%	174	563	737	3.2	603.7	547.2	562.1	56.5	41.6	14.9	4	0.004913
	5%	174	302	476	1.7	437.9	396.0	375.0	41.9	62.9	21.0	4	0.000317
Reporting Hospitals	All	156	4637	4794	29.7	1152	1076.2	1070.3	75.6	81.5	5.9	4	0.206742
	20%	156	886	1042	5.7	678.7	617.9	589.7	60.8	89.0	28.2	4	1.14E-05
	15%	156	742	899	4.8	624.1	570.7	547.1	53.4	77.0	23.6	4	0.000259
	10%	156	501	657	3.2	506.5	466.1	450.4	40.4	56.1	15.7	4	0.003449
	5%	156	255	411	1.6	353.7	311.2	278.3	42.5	75.4	32.9	4	1.25E-06
Reporting Non-FP Hospitals	All	156	3617	3773	23.2	1112	1069.7	1047.9	42.5	64.3	21.8	4	0.00022
	20%	156	696	852	4.5	624.7	589.4	561.9	35.3	62.8	27.5	4	1.57E-05
	15%	156	569	725	3.6	612.9	587.4	551.8	25.5	61.1	35.6	4	3.5E-07
	10%	156	362	518	2.3	476.3	448.3	423.4	28.0	52.9	24.9	4	5.27E-05
	5%	156	184	340	1.2	339.5	328.1	309.1	11.4	30.4	19.0	4	0.000786

Hypothesis 4. There is a positive correlation between environmental and organizational factors, acting jointly, and innovation adoption.

Sample Frame	Sample	Adopters = NA	Non-Adopters = NN	Total = N	Sample Ratio = NN/NA	2LLR	Model χ^2	DF	Signifi-cance	Classification Ratio Percentage Null/Cntl/Cntl&Expr			% Correctly Classified Adopters Null/Cntl/Cntl&Expr			Cox-Snell R-Square	Nagel-Kerte R-Square	Hosmer Leme-show
	All	174	5702	5877	32.8	1173.9	393.8	10	0.000	97.0	96.8	96.9	0.0	1.1	2.3	0.065	0.277	0.382
	20%	174	1140	1314	6.6	664.0	363.4	10	0.000	86.8	87.3	88.0	0.0	19.5	33.9	0.242	0.445	0.626
	15%	174	864	1038	5.0	600.7	337.9	10	0.000	83.2	85.1	87.0	0.0	28.2	45.4	0.278	0.467	0.139
All	10%	174	563	737	3.2	522.3	283.3	10	0.000	76.4	80.1	82.1	0.0	38.5	51.1	0.319	0.480	0.227
Hospitals	5%	174	302	476	1.7	346.3	278.7	10	0.000	63.4	76.9	82.6	0.0	58.0	76.4	0.443	0.606	0.242
	All	156	4637	4793	29.7	1026.9	348.5	10	0.000	96.7	96.5	96.6	0.0	1.3	3.2	0.070	0.281	0.597
	20%	156	886	1042	5.7	559.9	319.9	10	0.000	85.0	85.7	87.3	0.0	22.4	38.5	0.264	0.464	0.730
	15%	156	742	898	4.8	518.6	310.7	10	0.000	82.6	84.6	85.9	0.0	29.5	45.5	0.293	0.485	0.735
Reporting	10%	156	501	657	3.2	428.0	292.2	10	0.000	76.3	82.2	84.2	0.0	44.9	57.1	0.359	0.539	0.274
Hospitals	5%	156	255	411	1.6	260.5	285.2	10	0.000	62.0	80.0	85.0	0.0	66.0	78.8	0.500	0.681	0.610
	All	156	3617	3773	23.2	1021.5	277.9	10	0.000	95.9	95.6	95.7	0.0	1.3	3.2	0.071	0.244	0.449
	20%	156	696	852	4.5	544.0	267.2	10	0.000	81.7	83.9	84.7	0.0	29.5	41.0	0.269	0.438	0.320
Reporting	15%	156	569	725	3.6	537.3	217.8	10	0.000	78.5	80.0	82.6	0.0	24.4	41.0	0.259	0.401	0.317
Non-Rural	10%	156	362	518	2.3	408.9	225.0	10	0.000	69.9	78.0	80.7	0.0	46.8	59.6	0.352	0.499	0.484
Hospitals	5%	156	184	340	1.2	302.4	166.6	10	0.000	54.1	76.2	79.4	0.0	67.9	75.6	0.387	0.518	0.231

Hypothesis 4.1. There is a positive correlation between environmental complexity and innovation adoption.

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
All Hospitals	All	1.867	0.494	14.260	1	0.000	6.452	2.457	16.949
	20%	1.698	0.511	11.038	1	0.001	5.464	2.004	14.925
	15%	1.720	0.518	11.022	1	0.001	5.587	2.024	15.385
	10%	1.813	0.525	11.935	1	0.001	6.135	2.193	17.241
	5%	1.981	0.579	11.701	1	0.001	7.246	2.331	22.727
Reporting Hospitals	All	1.707	0.499	11.677	1	0.001	5.525	2.07	14.706
	20%	1.382	0.537	6.637	1	0.010	3.984	1.393	11.364
	15%	1.684	0.533	9.966	1	0.002	5.376	1.894	15.385
	10%	1.430	0.554	6.670	1	0.010	4.184	1.412	12.346
	5%	1.541	0.620	6.177	1	0.013	4.673	1.385	15.873
Reporting Non-Rural Hospitals	All	1.184	0.492	5.791	1	0.016	3.268	1.245	8.547
	20%	1.114	0.534	4.343	1	0.037	3.049	1.068	8.696
	15%	1.094	0.528	4.290	1	0.038	2.985	1.06	8.403
	10%	0.626	0.551	1.291	1	0.256	1.869	0.635	5.495
	5%	0.666	0.613	1.179	1	0.278	1.946	0.585	6.494

Hypothesis 4.2. There is a positive correlation between competition and innovation adoption

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
All Hospitals	All	-0.321	0.352	0.833	1	0.361	0.725	0.364	1.446
	20%	-0.408	0.403	1.024	1	0.312	0.665	0.302	1.466
	15%	-0.579	0.419	1.912	1	0.167	0.560	0.247	1.273
	10%	-0.630	0.450	1.958	1	0.162	0.533	0.221	1.287
	5%	0.050	0.542	0.008	1	0.927	1.051	0.363	3.042
Reporting Hospitals	All	-0.242	0.373	0.421	1	0.516	0.785	0.378	1.630
	20%	-0.519	0.427	1.473	1	0.225	0.595	0.258	1.376
	15%	-0.337	0.443	0.579	1	0.447	0.714	0.299	1.702
	10%	0.170	0.519	0.108	1	0.743	1.186	0.429	3.280
	5%	-0.729	0.619	1.384	1	0.239	0.483	0.143	1.625
Reporting Non-Rural Hospitals	All	-0.235	0.371	0.401	1	0.527	0.791	0.382	1.636
	20%	-0.380	0.431	0.777	1	0.378	0.684	0.294	1.592
	15%	0.048	0.448	0.012	1	0.914	1.049	0.436	2.527
	10%	-0.439	0.475	0.854	1	0.356	0.645	0.254	1.636
	5%	-0.673	0.565	1.417	1	0.234	0.510	0.169	1.545

Hypothesis 4.3 . There is a positive correlation between network externalities and innovation adoption.

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
All Hospitals	All	2.51	1.002	6.281	1	0.012	12.307	1.728	87.647
	20%	1.854	1.338	1.920	1	0.166	6.384	0.464	87.863
	15%	2.523	1.394	3.277	1	0.070	12.47	0.812	191.6
	10%	1.132	1.440	0.618	1	0.432	3.103	0.185	52.148
	5%	2.569	2.093	1.507	1	0.220	13.048	0.216	788.38
Reporting Hospitals	All	2.221	1.151	3.728	1	0.054	9.22	0.967	87.912
	20%	1.749	1.520	1.325	1	0.250	5.751	0.293	113.05
	15%	1.829	1.682	1.183	1	0.277	6.228	0.231	168.13
	10%	2.571	2.038	1.592	1	0.207	13.078	0.241	709.900
	5%	0.875	2.776	0.099	1	0.753	2.339	0.010	553.000
Reporting Non-Rural Hospitals	All	2.187	1.146	3.641	1	0.056	8.909	0.942	84.225
	20%	0.330	1.578	0.044	1	0.834	1.391	0.063	30.646
	15%	2.175	1.792	1.583	1	0.208	8.805	0.297	260.8
	10%	3.865	2.262	2.920	1	0.087	47.722	0.567	4018.1
	5%	0.220	2.131	0.011	1	0.918	1.246	0.019	81.117

Hypothesis 4.4 . There is a negative correlation between community resources and innovation adoption.

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
All Hospitals	All	0.042	0.016	6.681	1	0.010	1.043	1.010	1.077
	20%	0.059	0.020	8.534	1	0.003	1.061	1.020	1.103
	15%	0.049	0.023	4.748	1	0.029	1.050	1.005	1.098
	10%	0.051	0.024	4.386	1	0.036	1.052	1.003	1.104
	5%	0.072	0.032	5.172	1	0.024	1.074	1.010	1.143
Reporting Hospitals	All	0.058	0.019	9.399	1	0.002	1.060	1.021	1.099
	20%	0.076	0.024	10.034	1	0.002	1.079	1.029	1.130
	15%	0.054	0.024	4.989	1	0.026	1.056	1.007	1.107
	10%	0.083	0.029	8.460	1	0.004	1.087	1.028	1.150
	5%	0.051	0.032	2.515	1	0.113	1.053	0.988	1.122
Reporting Non-Rural Hospitals	All	0.056	0.019	8.855	1	0.003	1.058	1.019	1.097
	20%	0.070	0.023	9.040	1	0.003	1.072	1.025	1.122
	15%	0.055	0.024	5.218	1	0.022	1.057	1.008	1.108
	10%	0.071	0.030	5.612	1	0.018	1.073	1.012	1.138
	5%	0.048	0.034	2.039	1	0.153	1.050	0.982	1.122

Hypothesis 4.5. There is a negative correlation between organizational complexity and innovation adoption.

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
All Hospitals	All	0.007	0.002	9.119	1	0.003	1.007	1.002	1.012
	20%	0.014	0.004	14.718	1	0.000	1.014	1.007	1.021
	15%	0.011	0.004	9.681	1	0.002	1.012	1.004	1.019
	10%	0.008	0.004	4.581	1	0.033	1.008	1.001	1.016
	5%	0.012	0.005	6.612	1	0.010	1.012	1.003	1.022
Reporting Hospitals	All	0.006	0.002	6.807	1	0.009	1.006	1.002	1.011
	20%	0.014	0.004	14.849	1	0.000	1.014	1.007	1.022
	15%	0.012	0.004	10.379	1	0.001	1.012	1.005	1.020
	10%	0.010	0.004	6.544	1	0.011	1.010	1.002	1.018
	5%	0.017	0.005	9.835	1	0.002	1.017	1.006	1.028
Reporting Non-Rural Hospitals	All	0.006	0.002	6.693	1	0.010	1.006	1.002	1.011
	20%	0.012	0.004	10.047	1	0.002	1.012	1.004	1.019
	15%	0.012	0.004	11.295	1	0.001	1.012	1.005	1.019
	10%	0.008	0.004	4.237	1	0.040	1.008	1.000	1.016
	5%	0.009	0.005	3.757	1	0.053	1.009	1.000	1.018

Hypothesis 4.6. There is a positive correlation between slack resources and innovation adoption.

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
All Hospitals	All	-0.167	0.524	0.102	1	0.750	0.846	0.303	2.362
	20%	-0.959	0.646	2.208	1	0.137	0.383	0.108	1.358
	15%	-0.664	0.659	1.016	1	0.313	0.515	0.141	1.873
	10%	-0.529	0.646	0.671	1	0.413	0.589	0.166	2.09
	5%	-0.288	0.958	0.090	1	0.764	0.750	0.115	4.903
Reporting Hospitals	All	0.093	0.560	0.028	1	0.868	1.098	0.366	3.287
	20%	0.991	0.416	5.669	1	0.017	2.694	1.191	6.089
	15%	0.492	0.826	0.354	1	0.552	1.635	0.324	8.247
	10%	-0.212	0.916	0.053	1	0.817	0.809	0.134	4.871
	5%	1.297	1.119	1.343	1	0.246	3.659	0.408	32.807
Reporting Non-Rural Hospitals	All	0.015	0.557	0.001	1	0.979	1.015	0.340	3.025
	20%	1.049	0.791	1.757	1	0.185	2.855	0.605	13.466
	15%	0.218	0.819	0.071	1	0.790	1.243	0.250	6.195
	10%	0.656	0.955	0.472	1	0.492	1.927	0.297	12.524
	5%	-0.226	1.044	0.047	1	0.829	0.798	0.103	6.175

Hypothesis 4.7. There is a positive correlation between external communication network and innovation adoption.

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
	All	-0.284	0.175	2.626	1	0.105	0.753	0.534	1.061
	20%	0.459	0.214	4.587	1	0.032	1.582	1.040	2.408
	15%	0.454	0.223	4.139	1	0.042	1.575	1.017	2.439
	10%	0.381	0.237	2.578	1	0.108	1.464	0.919	2.330
All Hospitals	5%	0.853	0.300	8.072	1	0.004	2.346	1.303	4.224
	All	0.267	0.187	2.041	1	0.153	1.306	0.905	1.884
	20%	0.614	0.241	6.505	1	0.011	1.847	1.153	2.960
	15%	0.442	0.242	3.325	1	0.068	1.556	0.967	2.501
Reporting	10%	0.500	0.269	3.471	1	0.062	1.650	0.974	2.793
Hospitals	5%	0.214	0.351	0.372	1	0.542	1.239	0.622	2.466
	All	0.270	0.187	2.088	1	0.149	1.309	0.908	1.887
	20%	0.088	0.232	0.142	1	0.706	1.092	0.692	1.721
	15%	0.375	0.233	2.595	1	0.107	1.456	0.922	2.299
Reporting Non-	10%	0.186	0.268	0.480	1	0.488	1.204	0.712	2.036
Rural Hospitals	5%	0.809	0.323	6.247	1	0.012	2.245	1.191	4.232

Hypothesis 4.8. There is a positive correlation between control of domain and innovation adoption.

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
	All	0.783	0.111	49.938	1	0.000	2.189	1.761	2.720
	20%	0.910	0.151	36.296	1	0.000	2.485	1.848	3.341
	15%	0.816	0.152	28.686	1	0.000	2.261	1.677	3.047
	10%	0.580	0.149	15.095	1	0.000	1.786	1.333	2.394
All Hospitals	5%	1.235	0.228	29.293	1	0.000	3.437	2.198	5.375
	All	0.693	0.120	33.211	1	0.000	1.999	1.579	2.530
	20%	0.950	0.175	29.408	1	0.000	2.585	1.834	3.643
	15%	0.944	0.169	31.262	1	0.000	2.571	1.847	3.580
Reporting	10%	0.938	0.196	22.910	1	0.000	2.554	1.740	3.750
Hospitals	5%	1.491	0.295	25.509	1	0.000	4.442	2.490	7.922
	All	0.689	0.120	32.894	1	0.000	1.991	1.573	2.519
	20%	0.849	0.161	27.715	1	0.000	2.337	1.704	3.206
	15%	0.892	0.169	27.881	1	0.000	2.440	1.752	3.397
Reporting Non-	10%	10.73	0.214	25.055	1	0.000	2.923	1.920	4.448
Rural Hospitals	5%	0.916	0.239	14.722	1	0.000	2.499	1.565	3.989

Control 1 - Size = Number of Beds in use

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
All Hospitals	All	0.002	0.000	62.223	1	0.000	1.002	1.002	1.003
	20%	0.003	0.000	42.065	1	0.000	1.003	1.002	1.004
	15%	0.003	0.001	31.828	1	0.000	1.003	1.002	1.004
	10%	0.003	0.001	33.214	1	0.000	1.003	1.002	1.004
	5%	0.004	0.001	24.751	1	0.000	1.004	1.002	1.006
Reporting Hospitals	All	0.003	0.000	60.597	1	0.000	1.003	1.002	1.003
	20%	0.003	0.000	29.365	1	0.000	1.003	1.002	1.004
	15%	0.003	0.001	26.914	1	0.000	1.003	1.002	1.004
	10%	0.005	0.001	41.881	1	0.000	1.005	1.003	1.006
	5%	0.005	0.001	25.825	1	0.000	1.005	1.003	1.007
Reporting Non-Rural Hospitals	All	0.003	0.000	60.629	1	0.000	1.003	1.002	1.003
	20%	0.003	0.001	34.318	1	0.000	1.003	1.002	1.004
	15%	0.003	0.001	27.377	1	0.000	1.003	1.002	1.004
	10%	0.004	0.001	30.484	1	0.000	1.004	1.002	1.005
	5%	0.005	0.001	31.866	1	0.000	1.005	1.003	1.007

Control 2 - Type of Hospital = For Profit or Not for Profit

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β)	Lower CI	Upper CI
All Hospitals	All	2.134	0.596	12.831	1	0.000	8.447	2.628	27.149
	20%	1.918	0.620	9.582	1	0.002	6.810	2.021	22.946
	15%	1.975	0.624	10.030	1	0.002	7.208	2.123	24.473
	10%	2.062	0.620	11.073	1	0.001	7.862	2.334	26.485
	5%	1.689	0.653	6.678	1	0.010	5.412	1.504	19.475
Reporting Hospitals	All	1.810	0.601	9.078	1	0.003	6.108	1.882	19.821
	20%	1.639	0.671	5.967	1	0.015	5.149	1.383	19.176
	15%	1.732	0.632	7.526	1	0.006	5.654	1.640	19.496
	10%	1.239	0.650	3.631	1	0.057	3.450	0.965	12.334
	5%	2.053	0.796	6.648	1	0.010	7.787	1.636	37.067
Reporting Non-Rural Hospitals	All	1.830	0.600	9.290	1	0.002	6.236	1.922	20.231
	20%	1.654	0.623	7.057	1	0.008	5.229	1.543	17.719
	15%	1.661	0.631	6.933	1	0.008	5.226	4.529	18.135
	10%	2.142	0.718	8.894	1	0.003	8.513	2.084	34.781
	5%	1.220	0.690	3.126	1	0.077	3.387	0.876	13.097

Constant = B_0 (for Full Model)

Sample Frame	Sample	β	S.E.	Wald	DF	Sig.	Exp(β
All Hospitals	All	-7.664	0.723	112.27	1	0.000	0.000
	20%	-6.702	0.801	70.090	1	0.000	0.001
	15%	-6.114	0.802	58.095	1	0.000	0.002
	10%	-5.462	0.802	46.426	1	0.000	0.004
	5%	-6.729	1.064	39.987	1	0.000	0.001
Reporting Hospitals	All	-7.931	0.739	115.11	1	0.000	0.000
	20%	-7.989	0.918	75.793	1	0.000	0.000
	15%	-7.083	0.904	61.319	1	0.000	0.001
	10%	-6.835	0.947	52.081	1	0.000	0.001
	5%	-8.074	1.278	39.90	1	0.000	0.000
Reporting Non-Rural Hospitals	All	-7.854	0.736	113.983	1	0.000	0.000
	20%	-7.501	0.894	70.364	1	0.000	0.001
	15%	-6.843	0.913	56.179	1	0.000	0.001
	10%	-7.472	1.046	51.047	1	0.000	0.001
	5%	-5.387	1.044	26.617	1	0.000	0.005