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A Study of Early Adopters of Innovation

John B. McWhorter
University of Alabama at Birmingham

A STUDY OF EARLY ADOPTERS OF INNOVATION

by

JOHN MCWHORTER

S. ROBERT HERNANDEZ, COMMITTEE CHAIR
ROSEMARY LUQUIRE
PATRICIA A. PATRICIAN
BISAKHA SEN

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JOHN MCWHORTER

DEPARTMENT OF HEALTH SERVICES ADMINISTRATION

ABSTRACT

This study reviewed the literature regarding diffusion of innovation and characteristics that accelerate early adoption of innovation. This research utilized strategic management theory, contingency theory, institutional theory, bureaucratic theory, and resource dependence theory to explore how complex adaptive organizations adopt innovation. Particular emphasis was placed on Everett Rogers' work, and his diffusion of innovation theory was used to develop an applied research framework for empirically assessing the characteristics and attributes of organizations and environments to identify those characteristics that accelerate the early adoption of administrative innovation. Rogers' adopter categories were utilized to segregate all magnet hospitals from 1994 to 2010 into four adopter categories. This research focused on identification of environmental and organizational variables that influence the rate of adoption of administrative innovation in organizations, and specifically hospitals that have adopted the magnet hospital concept. Secondary data from the American Hospital Association, American Nurses Credentialing Center, American Association of Accredited Nursing Schools, Bureau of Labor Statistics, and the U.S. Census Bureau were used as the basis to conduct the analysis.

The study identified both organizational and environmental factors as statistically significant. Organizational influences were stronger than environmental influences in determining the rate of adoption of innovation in hospitals, and organizational influences were statistically significant and present among early adopters of magnet programs in hospitals. Organizational complexity, size, available resources, influence over internal environment, and the presence of a competitor with magnet designation were the factors associated with the rate of innovation among hospitals and specifically influencing the early adoption of innovation among hospitals. The combination of both organizational and environmental factors had a significant influence on the rate of early adoption of nurse magnet programs within hospitals.

Key Words: Early Adopter, Innovation, Nurse Magnet Programs

DEDICATION

This study is dedicated to Jesus Christ, family, and friends in that order. Thanks to my wife Suzanne, son Chip, and daughter Allie because I could not have completed this journey without their constant love and support. The continued encouragement of Mr. and Mrs. Forbes Anderson was a blessing and motivation.

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INTRODUCTION

Innovation has historically been a foundation of the nation and has contributed immensely to our standard of living. Thomas Edison ultimately held over 1,000 patents stemming from his inventive work on communications and, in 4 years, Henry Ford slashed the processing time to build a car from 12 hours to 93 minutes (Brown & Anthony, 2011). Innovation has been a steady influence on healthcare with the emergence of diagnostic and therapeutic tools over the last two decades such as minimally invasive surgery (Cain and Mittman, 2002).

Why do some organizations adopt innovation early while others do so much later or not at all? Hundreds of studies on innovation have appeared in the literature, but few have actually answered this question. Research on innovation has yielded many inconsistent and conflicting findings, and this deficient state of knowledge has been attributed to serious problems with existing measures of innovation adoption (Wilson, Ramamurthy, & Nystrom, 1999). The empirical literature on adopters and adoption of innovation is less extensive than the study of innovation (Greenhalgh et al., 2005).

The purpose of this dissertation was to explore why particular innovations in health service delivery are adopted more rapidly by some organizations than others. Both environmental factors and organizational factors were studied for predictive influence regarding adoption of administrative innovation. The administrative innovation studied was the magnet hospital concept for enhancing recruitment and retention of registered nurses by U.S. hospitals (McClure & Hinshaw, 2002).

This chapter provides an introduction to the dissertation. Background on the issue is reviewed and the research problem is articulated. The theoretical framework is then described along with the program of study and research questions. Terms are then defined, scope and limitations addressed, and assumptions explained. The justification and rationale for the study ends the chapter.

Background

The healthcare delivery system in America has historically focused on technology, research, and education to improve the quality of care. The foundation of each of these elements is the human resources used to generate and implement innovations. Nursing care is fundamental to quality of care, patient education, and communication with both patient and physician. The nurse-patient relationship has been a key element of inpatient medical care for over a century, as evidenced by the fact that nursing continues to be one of the most trusted professions in America. The nurse serves many roles not the least of which is the person who often has the most information regarding the patient.

The Nursing Shortage

The national health system is plagued by a cyclical shortage of registered nurses (Buerhaus, Staiger, & Auerbach, 2003, Juraschek et al, 2012). According to a report by the American Hospital Association (AHA) (2008), there were more than 135,000 vacancies for registered nurses in the United States. In 2012, scholars released projections that the national nursing shortage would grow to nearly one million nurses by the year 2030 (Juraschek et al. 2012). It was also predicted that most of the 50 states would experience a shortage of nurses by 2020.

The economic recession of 2008 to some extent, mitigated projected shortfalls. Surveys of existing nurses revealed that many plan to extend their career due to the economy, and more applicants have entered the field historically as nurse salaries increase (Buerhaus, 2003). However, despite the less severe state of the nursing shortage, the U.S. nursing shortage is projected to grow to a minimum of 260,000 registered nurses by 2025. A shortage of this magnitude would be twice as large as any nursing shortage experienced in this country in the last 50 years (Buerhaus, 2009). A rapidly aging workforce will also heighten demand for new graduates. The average age of registered nurses is projected to be 44.5 years by 2012, and nurses in their 50s are expected to become the largest segment of the nursing workforce, accounting for almost one quarter of the registered nurse population (Southern Regional Board of Education, 2002).

Buerhaus (2005) found that more than 75% of registered nurses believe that the nursing shortage represents a major obstacle to the quality of work life. Almost all nurses surveyed by Buerhaus see the shortage of the future as a catalyst for increasing stress on nurses (98%) thus motivating nurses to leave the profession. Kovner (2007) reported that 13% of newly licensed nurses in her study changed principal jobs within a year, and 37% were looking for opportunities outside of nursing.

In addition to turnover, a number of adverse outcomes occur as a result of the nursing shortage. Nurse staffing levels have been empirically linked to mortality, quality of nursing care provided, safety issues, adequacy of discharge planning instructions, and readmission rates (Aiken, 2002).

Turnover, a rapidly aging workforce, and heightened demand for healthcare from an aging population will increase the shortage of registered nurses. There is a compelling need to attract skilled professionals to the nursing profession and enhance the ability to retain them in the health sector.

National, regional, and local efforts have been undertaken to address the nursing shortage. Both public- and private-sector policy initiatives have been introduced to address the supply of registered nurses. Hospitals as the primary employer of nurses have a vested interest in innovative concepts to address the challenge of an adequate supply of registered nurses for patient care. From this diverse set of ideas, a number of novel approaches to increase the supply of registered nurses have arisen with varying degrees of success (Kimball & O'Neil, 2002; Buerhaus, 2008). This challenge has led researchers to explore the concept of innovation and what ideas are available to address the issue of supply of nurses.

Innovation and the Innovation Adoption Process

An innovation is defined as any idea, object, or practice that is considered new by members of a social system (Rogers, 2003). Innovation can be internally generated or adopted from competitors. Administrative innovations are novel concepts focused on programs, processes, practices, and systems that relate to the management and control of an organization (Kimberly & Evanisko, 1981; Damanpour, 1991). Technical innovations are new technologies, algorithms, or products that enhance the productivity of an organization and are clearly identifiable within a company. Innovations that involve the use of technology are common in health service organizations and are generally considered complex with a more complicated adoption process (Greenhalgh et al., 2005). A study of the banking industry found that administrative innovations led to improvements in organizational efficiency, while technological innovations led to improvements in efficiency and organizational effectiveness (Subramanian & Nilakanta, 1996; Sanders, 2007). Other types of innovations include product, process, and radical/incremental.

Innovation research is often referred to as attribution research, defined as the study of the characteristics of innovation perceived by potential adopters as associated with successful adoption. It should be noted that different types of innovations may have different attributes and may be influenced by different organizational factors. Additionally, the process for initiating and implementing different types of innovations varies in significant ways (Wilson et al., 1999; Sanders, 2007), and the likelihood that an organization will adopt an innovation is not constant across all innovation types (Sanders, 2007; Cooper, 1998).

The innovation adoption process is defined as a series of choices and actions over a period of time whereby the stakeholder evaluates the innovation and then elects whether or not to incorporate the innovation into ongoing practice (Rogers, 2003). According to Rogers (2003), the process has five sequential stages:

- Knowledge: Exposure and understanding of the concept and how it functions.
- Persuasion: Forming favorable or unfavorable attitudes toward the innovation.
- Decision: Engaging in a choice to adopt or reject the innovation.

- Implementation: Putting an idea to use.
- Confirmation: Seeking reinforcement of an innovation decision already made.

Over the last two decades, the magnet hospital concept has emerged as an innovative vehicle to address the nursing shortage at an institutional level. The magnet concept is a specific set of organizational practices implemented by hospitals to enhance the recruitment and retention of nurses (American Nurses Credentialing Center [ANCC], 2002). It has been widely advocated by the nursing profession and adopted by over 400 organizations as a tool to address nursing shortages. The results have been impressive, including workforce advantages and quality of patient care improvements (Sanders, 2010; McClure & Hinshaw, 2002). Linda Aiken has studied magnet hospitals for two decades and reported that mortality, and patient satisfaction are significantly better in magnet hospitals (Aiken, 2002). The magnet concept has been classified as an administrative innovation that represents a significant departure from historical recruitment and retention methods (Zinn, Weech, & Brannon, 1998; Sanders, 2007).

Statement of the Problem

The problem addressed in this dissertation was the need to improve knowledge regarding the adoption of administrative innovations in order to better understand strategic adaptation by organizations. At a more granular level, this research focused on early adopters of innovation compared to later adopters to better understand what factors led to more rapid adoption of innovation. The innovation studied was the magnet hospital concept.

The empirical evidence related to the success of magnet organizations is substantial. The benefit to hospitals that have not yet adopted this innovation seems compelling. If this is the case, then why has the assimilation of this innovation taken so long? Less than 8% of all hospitals have adopted the magnet concept, and the assimilation process for the 400 adopting hospitals has occurred over 15 years. What causes hospitals to be early adopters or late adopters? What knowledge can be learned from the adoption process? What characteristics of the environment or organization might predict receptivity to innovation and accelerate the process of adopting innovation?

A number of studies have examined an array of factors influencing the adoption of administrative innovations, with some findings that are inconsistent with theoretical expectations (Kimberly & Evanisko, 1981; Damanpour, 1991, 1996). Administrative innovations have been studied less than other types of innovation, and more research is needed to better understand the influence of factors on adoption of innovation (Ravichandran, 2000; Rogers, 2003). At least two studies have addressed the influence of environmental and organizational factors on adoption of magnet programs (Sanders, 2007; Jerome - D’emilia et al., 2008). Both studies found a positive correlation between both environmental and organizational factors and the adoption of this innovation. Neither study assessed early and late adopters, and both studies identified this issue as a potential future research topic (Sanders, 2007; Jerome - D’emilia et al., 2008). No empirical studies were identified that examined the influence of environmental and organizational factors on the early adoption process of magnet hospitals. As a consequence, this research study contributes to the scholarly literature by examining the influence of select environmental and organizational factors on early or late adoption of the magnet hospital concept as an administrative innovation.

While this study focused on the adoption of an administrative innovation (magnet program), the results could have applications to all innovations within the health sector. The implementation of a technological or clinical innovation takes years to diffuse. The simple task of hand hygiene is an example of lengthy diffusion. What characteristics of organizations or the environment are necessary to accelerate the adoption of innovation in healthcare?

It is important to acknowledge that researchers conducting systematic literature reviews of innovation in health service organizations have been unable to find a single, all-encompassing theoretical framework to connect with the diffusion of innovations (Greenhalgh et al., 2005). Greenhalgh et al. (2005) noted that for all of the research on organizational change and innovation that has accumulated over three decades, no general theory incorporating the attributes of innovations and their adoptability within organizations has emerged. This research aimed to contribute to the theoretical understanding of diffusion of innovation.

Theoretical Framework

The S-Curve of Innovation Adoption

In the year 1900, French sociologist Gabriel Tarde plotted an “S-shaped curve” representing the cumulative adoption of an innovation over time (Rogers, 2003). The S-curve has been repeatedly validated in subsequent studies (Mahajan & Peterson, 1985; Sanders, 2007). The curve results from initial adoption of an innovation by a few members of a social system, with a rise as more members of a system accelerate adoption and then a flattened curve as saturation is reached. The slope depicts the rate of diffusion of an innovation over time. Innovations that diffuse rapidly have steeply sloped S curves, and those with slower rates of adoption have a less severe slope. By the end of the adoption cycle, nearly all potential adopters have implemented the innovation, to the point that diffusion is complete (Rogers, 2003; Sanders, 2007).

When is an innovation totally diffused? While the obvious answer might be when all eligible participants adopt the innovation, Valente (1999) defined saturation at the point when 80% of the eligible population adopts an innovation.

The S-curve is the primary model for explaining the rate of adoption and diffusion of innovation (Mahajan & Peterson, 1985; Sanders, 2010). The curve has four main assumptions: (a) there is a fixed ceiling on the number of adopters, which does not change; (b) each adopter implements the innovation only once; (c) the innovation is independent of all other innovations; and (d) all relevant information regarding adoption is captured in the model (Mahajan & Peterson, 1985; Sanders, 2007). These assumptions are foundational to studies related to adoption behavior.

Rogers (2003) attributed modern innovation research to a study by two sociologists in the 1940s. Ryan and Gross studied the diffusion of hybrid corn seed among Iowa farmers and verified that the rate of adoption followed the S-curve pattern. Based on the time needed for different farmers to accept the new seed, Ryan and Gross identified five categories of adopters: innovators, early adopters, early majority, late majority, and laggards (Ryan & Gross, 1943; Rogers, 2003). Each category related to a different portion of the S-curve and represented the adoption pattern of that specific group of adopters (Sanders, 2007).

By 1960, enough research had been accumulated for Rogers to author a book, *The Diffusion of Innovations*. Utilizing studies ranging from anthropology to the education system and healthcare system, Rogers offered a more detailed explanation of adoption and diffusion of innovation using the S-curve (Sanders, 2007). Rogers explained the new model as a cost-benefit analysis resulting from a small group of early adopters who concluded that the incremental benefit of early adoption outweighed the incremental disadvantages and justified the change (Rogers, 2003). The risk paradigm of potential adopters influenced their behavior. Thus, the five categories of adopters might each have a different risk profile. Rogers concluded that diversity in risk profiles of potential adopters made diffusion possible (Rogers, 2003).

A successful adoption of an innovation (given enough time) will generally have an adoption pattern that resembles the S-shape curve (Valente, 1999; Rogers, 2003). Rogers identified a critical mass or tipping point driven by early adopters who transformed into opinion leaders and subsequently influenced the early majority until critical mass was achieved (Rogers, 2003). Sanders (2007) pointed out that a substantial amount of literature exists on conformity pressures that lead organizations to mimic competitors and particularly administrative innovations in the latter stages of the diffusion process (Abrahamson, 1991; Abrahamson & Rosenkopf, 1993, 1997). The beginning of the S-curve occurs when the earliest adopters of an innovation elect to assimilate the innovation into their sphere of influence.

Frequency and Characteristics of Early and Late Adopters

Rogers noted that we know more about innovativeness, or the degree to which an individual is relatively early in adopting new ideas, than we know about any other concept in diffusion research (Rogers, 2003). Rogers cited empirical studies in declaring that adopter distributions follow a bell-shaped curve over a period of time and approach normality. Many agricultural and consumer studies nationally as well as internationally support the proposition that innovation adoption rates are essentially normal distribution curves. The S-curve is innovation specific and sector specific, describing the diffusion of an innovation in a particular industry (Rogers, 2003). The normal frequency distribution has several characteristics that are useful in classifying adopters. Rogers divided the normal frequency distribution into five adopter categories (see Figure 1):

- Innovators represent the first 2.5% of members in a system to adopt an innovation. Innovators are included in the area lying to the left of the mean minus two standard deviations.
- Early adopters represent the next 13.5% of members in an industry sector to adopt an innovation. Early adopters are included in the area between the mean minus one standard deviation and the mean minus two standard deviations.
- Early majority adopters represent 34% of adopters and are included in the area between the mean and the mean minus one standard deviation.
- Late majority adopters also represent 34% of adopters, and they are included in the area between the mean and one standard deviation to the right of the mean.
- Laggards represent the last 16% of adopters and are included in the area beyond one standard deviation from the mean.

The adopter classification system is not entirely symmetrical since there are three adopter categories to the left of the mean and only two to the right. A concern identified with this method of adopter classification is an incomplete adoption universe, which occurs for innovations that have not reached 100% use (Rogers, 2003). Rogers claimed that the five categories are exhaustive, mutually exclusive, and derived from one classification principle. He elaborated: “Pronounced breaks in the innovativeness continuum do not occur between each of the five categories” (Rogers, 2003, p. 282). He added that past research shows no support for the claim of a chasm between adopter categories and suggests that innovativeness, if measured properly, is a continuous variable (Rogers, 2003).

Rogers’ past research identified many important differences regarding socioeconomic characteristics, personality variables, and communication behavior between adopters. Rogers also included studies regarding international industry segments. A study of adopter categorization of 324 German banks on the basis of their innovativeness scores demonstrated that the distribution of adopter categories was approximately similar to that of individuals (Rogers, 2003). Rogers also validated the study of organizational attributes as a method of studying adopter groups. The variables advanced by Rogers (2003) for study of innovativeness in organizations include centralization, complexity, formalization, interconnectedness, and organizational slack.

Alan Meyer and James B. Goes (1988) studied 12 medical innovations representing 300 innovation decisions used as units of analysis. They used a nine-point scale for each innovation decision process, progressing from awareness of the innovation through implementation. Meyer and Goes found that the degree of progress of an innovation was explained by

- The perceived attributes of the innovation (40% of the variance)
- Hospital environmental, organizational, and leadership variables (11% of the variance)

Meyer and Goes concluded that larger urban hospitals with complex structures applying aggressive marketing techniques were particularly innovative. They did not study attributes of adopters by adopter categories. A research design that studied the perceived attributes by adopter category would add to the knowledge in the scientific literature.

Organizational Theory with Application to Healthcare Innovation

Organizational theory seeks to understand, explain, and predict the impact of factors that influence the structure, behavior, and performance of organizations (Dressler, 1992; Sanders, 2010). Theory has been compared to mental maps that people use to explain how organizations behave and function in relation to the macroenvironment (Morgan, 2006; Shortell & Kaluzny, 2006; Sanders, 2010). Organizational theory is not a unitary answer to how organizations function in their environment; instead, it is a montage of different perspectives or schools of thought that examine differences in organizations from different perspectives (Astley & Van de Ven, 1983; Sanders, 2010). Sanders referenced Allison in stating that organizational theory is the lens for viewing an organization, and multiple lenses are available to gain varied perspective (Allison, 1971; Sanders, 2010).

This section describes major organizational theories and their application to the administrative innovation of magnet status while offering possible hypotheses relevant to the study of early and late adoption of innovation.

Classical bureaucratic theory. Bureaucratic theory, one of the oldest management theories, was originally conceived by sociologist Max Weber and still serves as a foundation for modern theory reviews (Dressler, 1992; Shortell & Kaluzny, 2006; Sanders, 2010). Bureaucratic theory is based on five characteristics: the organization has explicit procedures for governance, activities are distributed among office holders, command is arranged in a hierarchy, candidates are selected for their technical competence, and officials carry out their duties in an impersonal fashion (Shortell & Kaluzny, 2006). Centralization of authority and control are key tenets of bureaucratic theory, and bureaucratic organizations are most successful in predictable and stable environments (Shortell & Kaluzny, 2006).

Magnet facilities are the antithesis of bureaucratic theory. While most healthcare organizations are to some degree organized along bureaucratic lines (Shortell & Kaluzny, 2006), other forms of organization have been advocated to better deal with rapidly changing environments (Shortell & Kaluzny, 2006). The 41 original magnet hospitals demonstrated decentralized department structures (McClure, Poulin, Sovie, & Wandelt, 1983), and one of the key factors in accreditation is the shared governance concept of nurses having a sense of control over their working environment (Sanders, 2010). Nurse participation in decision making has been identified as an important variable in explaining job satisfaction (Gleason-Scott, Sochalski, & Aiken, 1999; Sanders, 2010; Upenieks, 2003).

The original magnet hospitals were found to have fewer layers of management, and unit managers were empowered to collaborate horizontally with colleagues in a participative management culture (McClure & Hinshaw, 2002). Empirical research has validated these findings over the last two decades (McClure & Hinshaw, 2002; Sanders, 2010). Overall, the less bureaucratic and more decentralized an organization is, the greater its expected success in adopting the magnet concept (Sanders, 2010).

Classic bureaucratic organizational structure could have an impact on adoption of innovation. To the extent that organizations are more rigidly bureaucratic with centralized power and decision-making, this culture could impact the adoption of innovation. More specifically, more bureaucratic organizations are more likely to be a late adopter of innovation. Organizational complexity has been identified in the literature as an element of bureaucracy. Therefore, the more complex the organization, the more likely the organization will have bureaucratic elements, and subsequently, the more likely it is to be a later adopter of innovation. It is important to note that previous studies of organizational complexity and the influence on adoption of innovation have demonstrated that more complex organizations are more receptive to innovation.

Contingency theory. Bureaucracy works best in a simple and stable environment. However, when the environment is complex and dynamic, other models are more effective. Contingency theory was developed as a more organic organizational structure with a greater reliance on decentralization, flexibility, information, and expertise (Shortell & Kaluzny, 2006). Size is also viewed as an advantage in contingency theory, since resources are critical to sustaining competitive advantage in a dynamic environment.

Contingency theorists view the approach as a continuum from more bureaucratic models to more organic models (Marion & Bacon, 1999). While empirical support for contingency theory has been mixed, the perspective has been advocated as having wide application to healthcare (Mohr, 1982; Shortell & Kaluzny, 2006).

Another clear contrast of contingency theory relates to the qualifications of leadership and emphasis on education. Bureaucratic theory places emphasis on technical competence, with clear specification of organizational roles and incumbent experience (McClure et al., 1983; Sanders, 2010). Virtually all chief nursing officers of magnet hospitals are prepared at the master's level, and the ANCC (2011) now expects chief nursing officers to have doctoral degrees. All directors of magnet facilities must have a bachelor's degree at a minimum, and the ANCC expects more than 60% of all registered nurses in a hospital to have a bachelor's degree. Registered nurses have been referred to as "knowledge workers," and the concept of content experts seems most applicable to contingency theory. Education was once a top down practice but the concept of shared governance in nursing is a novel method of communication, decision making and advancing knowledge among the workforce.

The contingency variable of size is problematic in terms of analyzing the magnet concept. While many of the early adopters were academic medical centers of significant size, larger organizations tend to be more bureaucratic and hierarchical, which can be a deterrent to change. However, large organizations also tend to have more slack resources, which provide the assets necessary to experiment with innovative strategy (Zinn et al., 1998; Sanders, 2010). According to Sanders, it appears that factors other than size alone tend to impact the decision to pursue magnet designation (Sanders, 2010). However, Sanders, along with many other authors, found empirical evidence that larger healthcare organizations were more likely to adopt the magnet concept (Sanders, 2007).

On the basis of contingency theory, one could expect that both a higher percentage of registered nurses in the community and a higher percentage of resources devoted to nursing education in the community would lead to more rapid adoption of the magnet concept. Resources devoted to nursing education could be in the form of schools of nursing in a city, community, or metropolitan area.

Resource dependence theory. Resource dependence theory emphasizes the critical nature of the organizational ability to secure needed resources from the environment to maintain viability (Shortell & Kaluzny, 2006; Hickson et al., 1971; March & Olsen, 1976; Williamson, 1981). Organizations with access to key external resources will exhibit greater power and influence (Shortell & Kaluzny, 2006). The theory presumes that leaders can actively influence their environment to reduce unwanted dependencies (Alexander & Morrisey, 1989; Sanders, 2010). This effort could take the form of external alliances or collaborative arrangements with other organizations.

As previously discussed, registered nurses are a key organizational resource. The magnet hospital concept is specifically intended to facilitate procurement of this key resource in an institution (Sanders, 2010). The empirical research is plentiful in demonstrating that magnet hospitals have an increased ability to recruit and retain nurses (McClure & Hinshaw, 2002; Sanders, 2010). The need for a key resource such as registered nurses in very competitive healthcare markets would seem to make the magnet concept attractive to organizations locked in competitive situations (Sanders, 2010). Therefore, on the basis of resource dependence theory, one could expect that in tighter healthcare labor markets for registered nurses, organizations would be more likely to be early adopters of the magnet concept. Additionally, on the basis of resource dependence theory, one could surmise that hospitals that are a part of systems or networks (versus freestanding hospitals) would more readily adopt the magnet concept.

Strategic management perspective. The strategic management perspective emphasizes the importance of positioning the organization relative to its environment and its competitors in order to achieve its objectives and ensure its survival (Porter, 1980, 1985; Shortell & Zajac, 1990; Shortell & Kaluzny, 2006). The theory links the macroenvironment, internal capabilities, competencies, and objectives into a cohesive framework called strategy (Shortell & Kaluzny, 2006). Strategy must be aligned with the external and internal environment to be successful. While this perspective is related to resource dependence theory, its focus is on the proactive direction of the organization to sustain a competitive advantage (Sanders, 2010). Strategic adaptation is often perceived as driving innovation in an organization. For purposes of this research, complex adaptive organizations are referred to as organizations influenced by their environment that seek strategic change to adapt to the environment.

The strategic management perspective is relevant to the magnet concept. First, an organization must make a proactive decision to prioritize magnet accreditation as a goal and focus resources and organizational expertise to achieve the goal (Sanders, 2010). Hospitals have to make internal adjustments in command and control, decision making, education, and internal structure to become accredited as a magnet facility (Sanders, 2010). Logically, it stands to reason that hospitals with attributes that are “magnet ready” would be more likely to see magnet designation as having strategic value.

The strategic management lens assumes that hospitals can proactively undertake actions to achieve objectives such as magnet accreditation. Therefore, it seems logical that hospitals engaged in an active strategic planning process might be better prepared to pursue magnet accreditation and to recognize magnet status as a strategic value (Sanders, 2010). The more rapidly an organization adopts magnet designation, the more likely the organization has elected to pursue magnet designation as a strategic priority.

Institutional theory. Institutional theory assumes that organizations face environments characterized by external requirements that must be adhered to in order to achieve legitimacy and support (Shortell & Kaluzny, 2006; Meyer & Scott, 1983; Flood & Scott, 1987). Institutional theory operates from the premise that the environment rewards organizations for having structures and processes in conformance with the external environment (Shortell & Kaluzny, 2006). Conformity helps the organization receive recognition, status, and legitimacy. This conformance is often referred to as "isomorphism" and leads organizations to resemble each other in form and function (Shortell & Kaluzny, 2006; Scott, 1995; DiMaggio & Powell, 1983).

Institutional theory would suggest that seeking magnet designation might be attractive to hospitals seeking legitimacy for excellence in nursing (Sanders, 2010). Sanders offered a very important point when he stated that the benefits of such recognition are a function of the degree of acceptance and support of magnet status conveyed by relevant entities in their environment (Sanders, 2010). There is certainly growing external endorsement of the magnet concept by professional nursing associations, the Joint Commission, and trade associations. Sanders also noted that while the number of designated hospitals is still small relative to the total number of hospitals nationally, this could serve to underscore a perception of prestige and exclusivity, further enhancing the attractiveness of magnet designation. Another tangible factor is that the original magnet hospitals had good reputations locally and nationally for excellence in nursing. Therefore, external validation as a nursing center of excellence seems to have been a priority since inception of the concept. The original magnet hospitals clearly saw themselves as having a reputation for professional practice above the norm (McClure et al., 1983; Sanders, 2010). Healthcare organizations whose nursing leaders have more extensive linkage with external organizations will be more likely to adopt the magnet concept (Sanders, 2010).

Program of Study

The problem addressed in this study was the influence of environmental and organizational factors on early versus late adoption of administrative innovation in order to better understand the impact of innovation on the strategic adaptation of organizations over a period of time. In accordance with strategic management theory, Figure 2 depicts the relationship between environmental and organizational influences and adoption of innovation for five categories of adopters as described in Rogers' work (2003).

Based on a review of the literature, the variables of environmental complexity, competition, critical mass, and community resources comprised the list of variables used to predict environmental influences that impact adoption of magnet programs by hospitals at one of five adoption stages. Health services research from secondary sources such as the AHA, the Herfindahl index, and the Bureau of Health Manpower's area resource file were used to measure each of these variables.

In similar fashion, the literature review identified variables such as level of organizational complexity, size of organization, slack resources, external network affiliation, control of domain, and hospital structural characteristics (ownership, teaching status) as factors used to capture the influence of organizational variables on early versus late adoption of magnet-accredited nursing programs. Common health services research data were used to measure these variables. Rogers' (2003) definition of adoption was used to capture the assimilation of magnet programs for each hospital in the study. The measure of adoption was obtained from the ANCC related to whether a hospital was designated a magnet hospital or not during the study period. Ordinal regression was used to determine both the significance and direction of the association of environmental and organizational factors collectively and in singular manner with the speed of adoption of magnet programs by hospitals. The significance and direction were compared for each of the five adopter categories as described by Rogers (2003).

Research Questions

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

1. Do environmental factors influence the speed of adoption of innovation? If environmental factors do influence the speed of adoption, then which environmental factors significantly influence adoption, and what is the direction of their influence?
2. Do organizational factors influence the speed of adoption of innovation? If organizational factors do influence the speed of adoption, then which

organizational factors significantly influence adoption, and what is the direction of their influence?

3. If environmental and organizational factors do influence the speed of adoption of innovation, is one set of factors more influential than the other? If one set of factors is more influential, what is the direction of the influence and the magnitude?
4. What, if any, influence do both environmental and organizational factors acting jointly have on speed of adoption of innovation?
5. If environmental and organizational factors significantly influence speed of adoption of innovation, which environmental and organizational factors are singularly significant? What is the direction of the influence for each of those variables?

Definition of Terms

For purposes of this study, the following terms have been defined theoretically and operationally. Most of these terms are similar to the terms used by Tom Sanders in his dissertation (2007).

An *innovation* is any idea, object, or practice 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, p. 168).

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 to adopt 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 emerges and/or within which it operates that are influential in innovation adoption (Kimberly & Evanisko, 1981). Environmental influences investigated in this study were environmental complexity, competition, critical mass, 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). 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 et al., 1996; Krein, 1999).

Competition seeks to capture the contention between organizations for acquisition of resource inputs and disposition of production outputs within market areas (Bernstein & 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).

Critical mass referred to as a competitive adopter attempts 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 and was measured as the presence of a competitor 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 et al., 1996; Bigelow & Mahon, 1989; Krein, 1999; Zajac & Shortell, 1989). Given the focus of this study, community resource availability was operationalized as the number of nursing schools per 100,000 population for the hospital's geographic region (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, size, slack resources, external networks, control of domain, and hospital structural characteristics (not-for-profit status, teaching affiliation).

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 & Goodman, 1996).

Size of hospital is a measure of the scope of operations. Hospital size was operationally defined as number of beds and was measured by the number of staffed beds in operation (Alexander et al., 1996; Gautam & Goodman, 1996; Trinh & O'Connor, 2000; Wheeler, Burkhardt, Alexander, & Magnus, 1999).

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 networks 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 a hospital system (Krein, 1999; Wheeler et al., 1999).

Control of domain refers to the means used 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, 1987). The greater the control of a domain of a professional group, such as nursing, the greater the influence the group exerts over outcomes relevant to its professional arena, such as adoption of the magnet hospital concept. This factor was defined as a hospital's nursing supply in this study and was measured by the number of registered nurses per bed in operation at the hospital (Alexander et al., 1996; Wheeler et al., 1999).

Hospital structural characteristics was used as a variable with two elements: ownership type and teaching affiliation. Differing objectives have been 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 was operationally defined as for-profit or not for-profit and was measured dichotomously (Alexander et al., 1996; Trinh & O'Connor, 2000; Wheeler et al., 1999; Zajac & Shortell, 1989). Similarly, teaching affiliation was measured dichotomously in terms of whether a not an organization was involved in the education of medical students, nursing students, or allied health professionals.

The *magnet hospital concept* is a set of organizational practices implemented by a hospital that are intended to influence the behavior of registered nurses such that they choose to initiate and remain in an employment relationship with the hospital (McClure & Hinshaw, 2002). These practices are summarized as the 14 “Forces of Magnetism” (Urden & Monarch, 2002) (Table 1).

A *magnet hospital* is a U.S. hospital that has been formally designated by the ANCC Magnet Recognition Program as successfully implementing a number of administrative, clinical, and professional development practices consistent with the magnet hospital concept (ANCC, 2002) based on the 14 “Forces of Magnetism” (Urden & Monarch, 2002) (Table 1).

The *American Nurses Credentialing Center* 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, 2002).

Scope and Limitations

A number of potential limitations constrained the scope of the study. Because the dependent variable was magnet-designated hospitals, this research essentially became a cross-sectional study using only hospitals that were designated by the ANCC. A second potential limitation is that since only ANCC-designated hospitals were included in the study, some hospitals could have implemented magnet practices while not seeking ANCC designation. Third, only a limited number of environmental and organizational factors were included in this study. Additionally, no moderators or mediators that may have influenced adoption were included. Fifth, there was no opportunity to study preceding or concurrent innovations that might have also influenced more rapid adoption of the magnet hospital designation, and there may have been other conditions that were not controlled for that could have influenced results.

In spite of these limitations, the variables and measures utilized in this study are commonly used in research regarding hospitals throughout the health services research literature. Additionally, the data and databases utilized have been used for over two decades by other scholars. The methods employed to study these variables are considered appropriate based on the research objectives.

Assumptions

Several key assumptions were made throughout this research process. The most critical assumption was that the adopter categories advanced in Rogers' work (2003) can be used to classify magnet-designated hospitals. Second, it was assumed that the organizational and environmental factors selected for this study could be operationalized and measured. A third key assumption was that variables could be identified that influence more rapid adoption of the magnet hospital concept and that the selected variables, measures, and operational definitions for both environmental and organizational influences on speed of adoption are considered valid for the purpose of this study. Fourth, it was assumed that the nursing shortage was a constant issue during the entire 15-year timeframe of this study and that magnet designation was perceived as an attractive innovation by adopting hospitals to address the issue.

Contribution to the Literature

The research advances knowledge of early and late adoption of innovation by hospitals. The research further advances knowledge regarding the influence of specific environmental and organizational factors on the adoption of nurse magnet programs. This study is the first empirical contribution to the literature regarding the influence of organizational and environmental factors and their collective impact on early or late adoption of an administrative innovation.

Greenhalgh et al. (2005) conducted a systematic literature review of diffusion of innovations in health service organizations and concluded that the ubiquitously cited landmark studies of diffusion of innovation, although outstanding in design and structure, focused exclusively on individuals and relatively fixed innovations. The conclusion was that their findings were limited in transferring knowledge regarding the spread of organizational innovation in healthcare organizations.

This research makes several singular contributions to the literature that could be useful. First, the research makes a useful contribution to the organizational, strategic, and innovation literature by incorporating environmental and organizational factors into a theoretical model that may explain differences in the speed of adoption of innovation. Second, the use of both environmental and organizational variables and their joint influence on early and late adoption contributes to the knowledge regarding multiple determinants of influence. Third, this research adds to the knowledge regarding administrative innovations, which have been studied less extensively than technical innovations (Kimberly & Evanisko, 1981; Damanpour, 1991).

This research also contributes to managerial practice in healthcare. It can facilitate successful adoption of innovation by allowing hospital executives to understand and assess the readiness of their organization to adopt such innovation and can assist in identifying how organizations can speed up the process of adopting innovation.

Summary

Innovation is essential for organizations seeking to adapt strategically to their environment. The ability to adopt innovations and assimilate more innovations into an organization may enhance the survival of the business. When organizations better understand how to adopt innovations more quickly and more successfully, they have a greater opportunity to succeed. Understanding the environmental and organizational factors that influence adoption of innovation over a period of time is useful information for any organization attempting to innovate.

From a national perspective, it is critical for the national health system to accelerate the adoption and implementation of evidence-based practice. This study may assist in the understanding of why some organizations are successful in adopting innovation more rapidly than others.

CHAPTER 2:

REVIEW OF THE LITERATURE

Introduction

This chapter reviews the literature pertinent to the research study. It begins by reviewing the history of the magnet concept and the application of magnet designation as an administrative innovation. That section is followed by a discussion of complex adaptive systems theory and its application to innovation. The chapter then provides historical background information on the adoption and diffusion of innovation related to classical diffusion theory and a review of the empirical literature regarding process-based innovation research. The next major sections include all relevant literature regarding organizational factors and their influence on rate of adoption of innovation and environmental factors and their influence on adoption of innovation in healthcare organizations. The last section identifies gaps in the literature in accordance with the research model of this study.

The Magnet Concept and Its Application as an Administrative Innovation

This section focuses on the evolution of the magnet concept and the application of magnet designation as a legitimate administrative innovation. The evolution of the magnet concept began three decades ago in response a cyclical shortage of nurses among hospitals in the 1980's. Recognizing that solutions were not forthcoming, the Governing

Council of the American Academy of Nursing appointed a task force to study why certain organizations were successful in attracting and retaining nurses.

In 1981, 165 hospitals were identified as “good places to work,” meaning they had low professional nurse turnover rates, a reputation for staff satisfaction, high quality, and success in highly competitive environments. Of these 165 hospitals, 41 were willing to participate in further study. These hospitals have been referred to as the original magnet hospitals.

The resulting study, *Magnet Hospitals: Attraction and Retention of Nurses,* was published in 1983 (McClure et al., 1983), determined what combination of factors regarding nursing practice produced working environments that attracted nurses to hospitals and help achieve recruitment and retention goals (McClure et al., 1983). A summary of best practice was consolidated into the magnet concept, which eventually became a set of 14 forces that encompass best practices including leadership, organizational structure, a professional model of nursing, shared governance, quality of care, teaching, and image of nursing. The “forces of magnetism” were broadly grouped into three areas: administration, professional practice, and professional development (McClure & Hinshaw, 2002). The 14 forces of magnetism are described in Table 1.

The magnet hospital concept has been studied for two decades. At least two major research streams have originated from the research. Researchers have sought to identify those factors underlying the 14 forces of magnetism, including organizational characteristics, patient outcomes, and nurse outcomes (McClure & Hinshaw, 2002). Linda Aiken has become the most prolific researcher in the field of nurse magnet programs and clinical outcomes. Aiken has contributed to a theoretical understanding of shared governance and a professional nurse practice environment and the impact of those streams on recruitment and retention of nurses (Aiken, 2002). Additionally, Aiken and her colleagues have proposed theoretical frameworks to explain organizational traits and their linkage to patient outcomes (Aiken & Sloane, 1997a, 1997b; Aiken, Clarke, and Sloane, 2000). Sanders inferred that the nurse work environment is composed of structural and behavioral dimensions that create the magnet properties of the hospital (Sanders, 2007). The structural dimension as explained in his study relates to shared governance and the model of care employed, including decentralized decision-making. The behavioral dimension relates to nurse-physician relationships, peer relationships, leadership, and autonomy (Sanders, 2007). Magnet hospitals must successfully integrate the combination of traits to bolster the professional nurse practice environment and improve outcomes (Aiken, 2002). The creation of the professional nurse environment is considered the foundation of recruitment and retention (Aiken, 2002).

Two decades of research have produced credible studies with a host of positive outcomes, including reduced mortality, improved safety, improved patient satisfaction, and shorter length of stay (Aiken, 2001; Aiken, Sloane, & Lake, 1996; Aiken, Havens, & Sloane, 2000). Nurses also experience lower turnover, less burnout, and fewer work-related injuries (Aiken, Lake, Sochalski, & Sloane, 1997; Clarke, Sloane, & Aiken, 2002). Magnet hospitals have experienced higher ratings from the Joint Commission and an increased ability to recruit new nurses (Clarke et al., 2002). Recent studies have continued to demonstrate the superior outcomes of magnet hospitals (e.g., a third fewer needlestick injuries and a 10% lower fall rate), and one of the most recent studies has claimed that the return on investment for magnet programs is 10-fold (Drenkard, 2010).

Other research findings have concluded that magnet practices are durable even when magnet facilities have leadership turnover or face internal reorganization or mergers (Buchan, 1999). The magnet concept can legitimately be classified as an administrative innovation that is distinct from typical retention and recruitment strategies (Zinn et al., 1998).

In the early 1990's, a formal designation process for attaining recognition as a magnet-designated hospital was established by the American Nurses Credentialing Center (ANCC), an affiliate of the American Nurses Association. Designation was considered a proclamation to applicants and the public that a magnet hospital provides outstanding care and an outstanding work environment (Moore & Sharkey, 2001). The number of magnet-designated hospitals has grown from five in 1997 to nearly 400 today (ANCC, 2011). Magnet hospitals have been recognized by organizations such as the American Hospital Association (AHA), Voluntary Hospitals of America, and Johnson and Johnson.

The success and impressive outcomes of nurse magnet programs emphasize the need to expand the program beyond the ten percent of all hospitals who are currently magnet designated. Examining environmental and organizational factors and the impact on speed of adoption of magnet designation to the 3,800 hospitals that have not yet been magnet designated nationally will add to professional knowledge, answer the research questions posed for this study, and provide findings that will benefit future adoption of this administrative innovation.

Complex Adaptive Systems Theory and Its Application to Innovation

Extensions of complexity science to healthcare organizational theory began to emerge in the scholarly literature in the mid 1990s (Begun et al., 2008). A series in *Quality Management in Health Care* examined clinical pathways as nonlinear, evolving systems and provided tools to improve care. Marion and Bacon (2000) interpreted the fitness of three eldercare organizations based on a complexity science perspective, and Dooley and Plsek (2001) used models of complex natural processes to interpret medication errors and make recommendations regarding organizational learning. Begun and White extended complex adaptive systems theory to the nursing profession, noting its resistance to change (Begun et al., 2008).

Healthcare organizations fit the generally defined characteristics of complex adaptive organizations (McDaniel, Lanham, & Anderson, 2009; Rouse, 2008; Begun, 2003). The environment that healthcare organizations operate within is dynamic, unpredictable, and often chaotic. In addition, healthcare organizations have been well studied as complex adaptive systems (McDaniel et al., 2009). Although no real consensus exists on a set of characteristics that define complex adaptive systems, the following five characteristics have been identified as capturing the major concepts from the literature (McDaniel et al., 2009): diverse learning agents, nonlinear interdependency, self-organization, positioning, and co-evolution. Diverse learning agents, self-organization, and co-evolution seem most applicable to this research. Healthcare organizations have diverse agents that learn, including providers, patients, employees, and other stakeholders. Diversity is often a source of creativity and innovation (McDaniel & Walls, 1997). Self-organization is the development of dynamic but stable patterns of organization that arise through the interaction of agents (Bonabeau & Meyer, 2001). This may include the way work is designed, organized, allocated, or scheduled. Nurse magnet programs certainly fit the idea of self-organization. Adaptation occurs when the organizational response to its environment alters both the organization and the environment, often causing the original response to no longer be adaptive (McDaniel et al., 2009). For example, if an innovation is copied by a competitor, then a hospital may look for additional ways to differentiate from others.

Hospitals operating as part of complex adaptive systems must strategically adapt to the external environment (Kirby, Spetz, Maiuro, & Scheffler, 2006, Nayar, 2008) and must often adapt quickly to the environment (Killingsworth, Newkirk, & Seeman, 2006). In a dynamic environment, organizations must continuously innovate and update strategies, constantly seeking position and differentiation (Begun et al., 2008). Distinct organizational competencies such as differentiation (Torgovicky et al., 2005), positioning (Moliner, 2006), ability to innovate (Salge & Vera, 2009), speed to market of innovation, and ability to execute a strategy are perceived as distinct organizational skills to navigate through a complex environment.

The essence of strategy in a complex adaptive system is to choose to perform differently than competitors. Innovation, market positioning, flawless execution, and enhancement of core competencies are all well-discussed options to sustain organizations. Nurse magnet programs are examples of innovation that also serve as differentiators for hospitals to compete for scarce resources (nurses). The next section explains how diffusion of innovation has matured over decades to its present state.

Historical Background of Diffusion Research

Classical diffusion research has roots in anthropology, physical geography, sociology, and education (Greenhalgh et al., 2005). The earliest scholarly work influencing diffusion of innovation was contributed by Tarde, a French lawyer and sociologist (Greenhalgh et al., 2005). Tarde formulated what he referred to as the "laws of imitation," which included the concept of invention and imitation (adoption) as social acts. Tarde also expounded on the concept of adoption or rejection of invention as a key outcome variable in the diffusion process. Furthermore, Tarde identified the role of geographic proximity as part of the adoption process, a variable that was studied as part of this research. Tarde also argued that imitation would eventually lead to assimilation (Greenhalgh et al., 2005). Greenhalgh et al. (2005) suggested that Tarde's book, *The Laws of Imitation*, was ahead of its time since it took sociologists over 40 years to develop empirical methods to test its key theoretical concepts.

The roots of modern anthropology were developed in the 1920s when the technique of participant observation became popular. An anthropologist would spend years living as a member of a particular community to study a small social system. The anthropologist had a rich picture of the patterns of adoption, especially of how and why adoption did or did not occur (Greenhalgh et al., 2005). The meticulous qualitative methods used in anthropology allowed scientists to document in detail the features of an innovation that increased or decreased the chance of adoption (Greenhalgh et al., 2005). Many of the qualitative methods regaining popularity in health services research were originally described in relation to the study of the adoption of new customs, technologies, or practices by remote tribal communities (Rogers, 1962; Greenhalgh et al., 2005).

The discipline of geography has also had an impact on diffusion of innovation research. Early geographers studying the spread of innovations believed that innovation originated at a single point and diffused outward (Greenhalgh et al., 2005). Geographical patterns of diffusion have more recently been distorted by cultural globalization and by the telecommunications revolution, in which physical distance is increasingly irrelevant to adoption of innovation (Greenhalgh et al., 2005).

The study of sociology and its impact on diffusion of innovation involved both rural and medical sociology. Rural sociology includes the study of the social structures, networks, and customs of rural communities. The classic study and probably the most widely cited diffusion of innovation study of all time was Ryan and Gross's study of the adoption of hybrid corn by Iowa farmers during the 1930s (Greenhalgh et al., 2005; Rogers, 1995). Their study demonstrated that it took 20 years for 99% of farmers to adopt new seed for their crops. Ryan and Gross's study had a powerful influence on the methodology of subsequent diffusion research (Greenhalgh et al., 2005).

In the next decade, a parallel research endeavor was developed among medical sociologists at Columbia University, focused on physician receptivity to new antibiotics. A diffusion study on acceptance of tetracycline among physicians was hailed by Rogers as one of the most important diffusion studies of the era due to its rigorous design (Greenhalgh et al., 2005). The study by Coleman et al. (1966) had many parallel findings to the Iowa hybrid corn study published 15 years earlier. The adoption curve was S shaped in a different field of study, and Coleman's study was accepted by mainstream sociologists as a paradigm for studying networks of potential adopters (Greenhalgh et al., 2005).

The final element of early diffusion research was education, which addressed the spread of innovation in teaching, assessment, and school management for nearly a century. The study of teachers varies significantly from the study of farmers in that teachers are not self-employed and do not act as autonomous decision makers. Teachers work in large, bureaucratic, change-resistant organizations whose physical space, administrative constraints, and organizational culture have significant impact on adoption decisions (Greenhalgh et al., 2005). Rogers' classification of adoption decisions in complex organizations was based on early work in schools.

The history of conventional diffusion of innovation theory in the United States was clearly articulated by Rogers in the four editions of his book, *Diffusion of Innovations*, published in 1962, 1972, 1983, and 1995. In the 1950s, Rogers was a postdoctoral student of rural sociology, and his primary motivation for conducting the research was to point out the lack of interest in diffusion research at that time (Greenhalgh et al., 2005). Early sociology research conducted by Rogers among farmers and doctors led independently to the confirmation that the adoption curve is S shaped, as originally discovered by Tarde.

Rogers outlined nine major diffusion research traditions, ranging from anthropology to education, including geography, marketing, public health, and medical sociology. Those major research segments involved diverse groups such as tribal villages, farmers, school systems, hospitals, consumers, and health departments. Kermack and McKendrick (1927) provided the first systematic diffusion research in epidemiology by studying population density (Valente, 1999).

Eight main types of diffusion research have been identified, according to Rogers:

1. Early knowledge of innovation
2. Rate of adoption of different innovations in a social system
3. Innovativeness
4. Opinion leadership
5. Diffusion networks
6. Rate of adoption of the same innovation in different social systems
7. Communication channel usage
8. Consequences of innovation

Rogers identified four major criticisms of diffusion research: pro-innovation bias, individual blame instead of system blame, recall problems related to timing of adoption of innovation, and equality. Equality relates to the diffusion of innovation among socioeconomic groups, since income gaps often accelerate as a result of the spread of new ideas (Rogers, 2003).

Innovation Attributes

The study of innovation is often referred to as attribution research. Attribution research is defined as the study of characteristics of innovation associated with successful adoption. The study of attributes was a key focus of early sociologists, and the literature was capably synthesized by Rogers. Most of these studies replicated the method originally developed by Ryan and Gross (1943) and independently replicated by Coleman et al. (1966). There was a remarkable consistency in the overall findings of the early sociological research, with the six key attributes of innovation originally described by Rogers (relative advantage, compatibility, low complexity, observability, trialability, and reinvention) accounting for up to 87% of the variance in rate of adoption of innovations (Rogers, 2003; Greenhalgh et al., 2005). Additional attributes related to administrative innovations that have been studied include the relevance of the innovation to a particular task, the complexity of the implementation process, and the degree of risk associated with adoption of innovation in the organizational context (Greenhalgh et al., 2005). Attributes involving the adoption of a technical innovation include the visibility of the innovation, the nature of the knowledge required to utilize the innovation, and the quality of support provided during the implementation process (Greenhalgh et al., 2005). Repetitive use has also been a variable studied in technology-based innovation studies.

In reviewing the literature on innovation attributes, Rogers noted the need for a standard classification scheme to measure the attributes of any innovation study. Other researchers have also proposed combining Rogers' classification and alternative classifications to develop an accepted typology of attributes that could result in greater generalization of results. Nevertheless, the six attributes form the conventional introduction for many studies of innovation adoption (Greenhalgh et al., 2005). It is worth noting that according to Greenhalgh (2005), these six attributes are not sufficient to explain the adoption of innovation in complex service organizations. A comprehensive list of all studies in this section is provided in Appendix A, Table A2.

The type of innovation is important to this study since it has been noted that not all innovations share the same attributes, nor are they impacted necessarily by the same organizational factors. Additionally, the process of adoption may differ among types of innovations (Wilson et al., 1999). Damanpour (1991) classified innovation according to several types: administrative, technical, product, process, and radical/incremental.

Product innovations are defined as development of new products or technology as well as modifications to existing products that create value to the customer. Process innovations represent internal changes in process flow to transform organizational inputs into resource outputs (Utterback & Abernathy, 1975). Classification of an innovation as radical or incremental depends on the degree of change necessary to complete an implementation. If the innovation significantly impacts systems, routines, practices, people, or resources, then it may be considered radical.

This study did not attempt to address innovation attributes as expressed by Rogers; however, the type of innovation is relevant to this study, since an administrative innovation was the dependent variable studied.

Process-Based Innovation Research

Is adoption of innovation viewed as an event or process? Researchers continue to debate this issue. The scholars from the previous section who amplified the literature regarding process-based innovation research would suggest it is a process. However, advocates for viewing adoption of innovation as a singular event would argue that adoption occurs when resources are committed and risk is assumed. Scholars prescribing to the "discrete event" school focus on predictors of implementation, such as organizational characteristics or contextual factors (Cooper, 1998). Studies using this framework tend to capture predictors of implementation such as organizational characteristics (size, age of company, type of industry) and contextual variables such as industry maturity (Cooper, 1998). However, even the supporters of the "discrete event" school note that successful organizations still follow a pattern of steps or phases (Burgelman & Sayles, 1986).

During the 1970s, the key focus of research in organizational studies moved away from determining the variables of more innovative and less innovative organizations toward the study of developing, adopting, and implementing innovation in single organizations over a period of time (Greenhalgh et al., 2005). Kervasdoue and Kimberly, studying the innovation process in U.S. and French hospitals, examined the extent to which variability in rates of adoption of medical technology could be explained by variations in organizational structure (Greenhalgh et al., 2005).

Scholars refer to the study of diffusion of innovation within a single company or industry over a period of time as process-based innovation research (Greenhalgh et al., 2005). The principles of process-based innovation research as distinguished from studies of structural determinants include a focus on organizational events in their natural settings, study of both vertical and horizontal levels of organization for variables of impact, the interconnection of these levels over time, and a systematic review of the properties of process (Greenhalgh et al., 2005). One important outcome of this research was the idea of sustainability of the innovation over a period of time, which organizational theorists referred to as institutionalization. Institutionalization is linked with both institutional theory and bureaucratic organizational structure.

Adoption of innovation is widely considered a form of change. An innovation requires organizational change, and resistance to adoption is therefore considered resistance to change. The research literature on adoption of innovation in organizations overlaps conceptually and at times empirically with the literature on change (Greenhalgh et al., 2005). Adoption is considered an "event" in an organization; however, the early sociological research illustrated that adoption is often a lengthy process comprising sequential stages (Greenhalgh et al., 2005). Rogers initiated the early study of process-based innovation research with his study of stages of adoption.

Stages of Adoption

Rogers (2003) considered the adoption of innovation as a process of identifiable stages. Rogers suggested that the five stages of knowledge, persuasion, decision, implementation, and confirmation capture the entire innovation process. Each stage provides inputs to the next stage and also serves as a potential point of termination.

Knowledge stage. The knowledge stage begins when the organization learns of the existence of the innovation and gains knowledge of how it works (Rogers, 2003). Gathering this information can be a passive exercise or an active pursuit, depending upon the perceived need for the innovation. Knowledge is fundamental to proceed to a comparison of risks and benefits of the innovation (Rogers, 2003). Logic would dictate that organizations with more communication linkages both internally and externally are better positioned to acquire useful information about the new program. Additionally, organizations that are more introspective should be more in tune with their strengths and weaknesses and therefore be better positioned to move to the next stage of the adoption process.

Persuasion stage. This stage of the adoption process begins with knowledge of the utility of the innovation and concludes with either a favorable or unfavorable attitude toward the innovation based on some form of assessment. The potential adopter seeks information to evaluate the new concept using criteria such as relative advantage of the innovation over status quo, compatibility with existing practices, complexity in terms of understanding the ramifications of the innovation and its implementation, opportunity to conduct a pilot or trial of the innovation, and, finally, surveillance of the innovation for its potential success or failure (Rogers, 2003).

Decision stage. The decision stage occurs when the decision-making entity makes a choice to accept or reject the innovation. The opportunity to conduct a trial of the implementation in a pilot program is particularly useful in reducing uncertainty about the relative advantages of the innovation (Rogers, 2003). It is not uncommon for an innovation to be accepted with some revision in order to fit the innovation with the culture of the organization.

Implementation stage. When an adopter puts the innovation into active status and continues until the innovation is standard practice in the organization, the innovation is considered implemented (Rogers, 2003). During implementation, the innovation is frequently revised, whereby the adopter modifies the innovation to enhance compatibility and accelerates the adoption of the innovation and the sustainability of its use (Rogers, 2003). Organizational resistance may be encountered based on both structural and situational factors, and resistance may be even stronger based on organizational size and complexity.

Confirmation stage. Confirmation is the final stage of the adoption process, as adopters can decide to terminate an innovation even after substantial resources have been expended. Adopters seek reinforcement of the adoption decision through feedback, measures, or value propositions, and a decision may be reversed if confirmation is not received (Rogers, 2003). Failure to receive confirmation may indicate that the innovation was never engrained into the organization. A decision may be reversed due to failure to realize anticipated benefits relative to the initial decision criteria such as relative advantage or compatibility (Rogers, 2003).

While each of the five stages is a potential outcome of the adoption process, adoption for purposes of this study incorporated the decision and implementation stage. Magnet designation can only result when the decision to pursue magnet designation (submit application) is coupled with the decision to implement magnet processes (survey process and certification). Studies of the adoption process of administrative innovations have generally not considered the entire adoption process (Frambach & Schillewaert, 2002), in part because of the difficulty in delineating each stage (Wilson et al., 1999).

Empirical Studies on the Adoption Process

A host of studies in the literature have focused on a single stage of the adoption process. Kimberly and Evanisko (1981) measured adoption of innovation from a self-reported survey of implementation regarding administrative and technical innovations. Provan (1987) used surveys that were self-reported with participants claiming implementation of cost-containment policies and used the adoption response as the dependent variable in a regression analysis. Damanpour (1991) used implementation as the dependent variable in his meta-analysis. Glandon and Counte (1995) used self-reported responses regarding implementation of cost accounting systems as the dependent variable in a logistic regression analysis. At least four other studies followed the same pattern. Meyer and Goes (1988) performed the only study that examined multiple stages of adoption as the dependent variable.

Meyer and Goes (1988) used the term *assimilation* to describe the adoption process, rationalizing that the term better reflects the complex adjustments needed to adopt innovation in the organizational setting. Meyer and Goes (1988) conducted an extensive 6-year study of assimilation of service innovation in 25 community hospitals in the United States. Their study identified three stages in the adoption process as the dependent variable: knowledge awareness, evaluation choice, and adoption implementation. Knowledge awareness includes learning about the innovation, considering its merits, and discussing adoption. Evaluation choice includes assessing the strategic costs and benefits, and adoption implementation includes deciding to adopt the innovation and monitoring its implementation within the organization (Meyer & Goes, 1988). This theoretical model of the assimilation process drew on the work of Zaltman, Duncan, and Holbek (1973), who proposed key stages of matching an innovation to an opportunity, conducting a cost-benefit analysis, adopting or rejecting the innovation, and ensuring acceptance of the innovation (Greenhalgh et al., 2005).

Meyer and Goes (1988) tested three hypotheses in relation to the dependent variable: (1) particular attributes of the innovation would be independently associated with assimilation; (2) particular features of the organization (specifically size, complexity, market strategy, leadership variables, urbanization, affluence, and extent of insurance) would be independently associated with assimilation; and (3) interactions between the innovation and the organization would add additional predictive value to the independent variables. The results broadly confirmed all three hypotheses, with the independent variables explaining nearly 60% of the variance in adoption of innovation (Meyer & Goes, 1988).

Three additional empirical studies that focused on the process of adoption in healthcare organizations were identified as part of the literature review. An overview of each study is explained in Appendix A, Table A3. The major findings of the four studies can be synthesized in the following observations:

- Innovation attributes explained 37% of the variance in the adoption process.
- The process of adoption was lengthy and complex, with multiple barriers identified at multiple levels within the organization. Many barriers were technological.
- The nature of diffusion was highly interactive. There was no single adoption decision.
- Adoption of complex innovations was determined by subtle and complex interactions between multiple variables.

What was meant by adoption in most of these studies is unclear. Most could have been referring to both the decision stage and the implementation stage. Only one study (Meyer & Goes, 1988) examined multiple stages of adoption, and that study focused on technical innovation as the dependent variable. No study was discovered that examined multiple stages of adoption of administrative innovations.

The various empirical studies suggest that except in a few circumstances, organizations should not be thought of as rational decision-making machines that move sequentially through an ordered process of adoption; instead, the adoption process should be recognized as complex, iterative, organic, and loose (Greenhalgh et al., 2005). While process-based innovation research is valuable, this research study did not address the process or stages of innovation.

Organizational Influence Factors on Adoption of Innovation

This section and the next section review literature regarding two types of factors that may influence adoption of innovation: organizational influences and environmental influences. Several specific factors in each category are explained and discussed based on their theoretical application and utility for investigation. Damanpour (1991) classified these factors into determinants and moderators. Mediators could also be considered a group of influential factors (Easterby-Smith, 1991). Determinants are factors believed to influence the adoption of an innovation and are typically categorized as independent variables in research studies. Moderators impact the direction and/or strength of the relationship between dependent and independent variables, while mediators intervene in this relationship. This review focuses on determinant factors that could influence the adoption of innovation.

Given the number of potential factors of influence, a method of classifying variables into relevant categories was necessary. In a study of administrative innovations, Kimberly and Evanisko (1981) used a three-category classification system consisting of contextual, organizational, and individual characteristics. The contextual category refers to characteristics of the organization's environmental context, such as environmental complexity and the age of the organization (Kimberly & Evanisko, 1981). The organizational category comprises characteristics of the adopting organization. The individual category was defined as characteristics of organizational members in authority who were influential in the adoption decision. Influence was characterized by position, tenure, education, attitude toward change, and external relationships (Kimberly & Evanisko, 1981). While early diffusion studies focused almost exclusively on the individual adoption decision (Greenhalgh et al., 2005), organizational scholars began to focus on the potential impact of organizational variables. The late 1980s saw the publication of 1300 journal articles and 351 dissertations addressing organizational innovation (Greenhalgh et al., 2005). Since organizational innovation was the focus of this research study, only characteristics of the organization and environment are explored here. Factors classified in the individual category are not considered as part of this analysis.

Organizational influence factors are defined in this study as the visible organizational structure in a firm or company as distinguished from the soft variables of culture and climate, both of which can vary enormously between organizations. Greenhalgh et al. (2005) referred to organizational determinants as the "inner context." Variables such as size, slack resources, organizational complexity, network linkage, and hospital ownership characteristics are examples of organizational influence factors. These terms were previously defined in chapter 1. The organizational factor category utilized by Kimberly and Evanisko (1981) used similar terms for the factors studied in this research, and these characteristics were defined in Kimberly and Evanisko's work as factors that influenced the likelihood of adoption of an innovation.

A meta-analysis by Damanpour, which is reviewed later in this section, identified the most frequently studied factors at the organizational level. The factors included the following:

- Specialization
- Complexity
- Differentiation
- Technical knowledge
- Size
- Functional differentiation
- Formalization
- Attitude toward change
- Administrative focus
- Communication
- Professionalism
- Centralization
- Managerial tenure
- Slack resources
- Education

Damanpour (1991) provided a description of each factor, operational measures, and findings from various studies, including the positive or negative direction of each variable and whether or not it was significant. Damanpour conducted three meta-analysis studies over a 5-year period (1991-1996). Additional factors identified by other scholars as influential in adoption of innovation include network linkage, critical mass, competition, and strategic orientation of the organization.

Pettigrew suggested that rational and linear sociological diffusion models fail to distinguish adopters of innovation from nonadopters in terms of key characteristics and, furthermore, are unable to explain different rates of diffusion of innovation among different groups or markets (Pettigrew, 1992). Baldridge noted that less than 18% of studies reported in Rogers' 1983 revision referred to a complex organization as the innovation adopter or to organizational factors as independent variables impacting the innovation process (Baldridge & Burnham, 1975; Damanpour & Evan, 1984). There seems substantial justification to consider these variables for further study. Each of these factors is reviewed in more detail followed by a review of large empirical studies that examined a conglomeration of these variables.

Organizational Complexity

As used here, this factor is considered as a composite combining the concept of specialization (diversity of skill sets, programs, or clinical excellence), functional differentiation (degree to which an organization has departments or subunits), and professionalism (use of professional knowledge in subunits). A greater complexity within the organization leads to challenges in change management. Changing organizational routines, processes, programs, employee expectations, or existing resource allocations all serve as forces to maintain the status quo and inhibit change. Organizational complexity can be expected to reduce the likelihood of adopting an administrative innovation based on theoretical foundations.

Organizational complexity has been studied by a host of academicians in a number of empirical studies. Ginn and Young (1992) used case mix index in a study of adoption of business strategies by hospitals as a measure of complexity and concluded that it was a significant positive predictor of adoption of innovative programs. Glandon and Counte (1995) used teaching status as a factor of hospital complexity and found that the variable was a significant positive predictor of adoption of an administrative innovation (cost accounting systems). Alexander et al. (1996) examined organizational complexity using specialty beds as a surrogate for complexity and found that the variable was a significant positive predictor. Sanders (2007) found a significant positive correlation between organizational complexity and adoption of magnet programs by hospitals. D'emilia et al. (2008) found a positive correlation between teaching affiliation and adoption of the nurse magnet concept among hospitals in a nationwide study.

Eight primary studies were identified within the healthcare sector that explored the relationship between adoption of innovation and the complexity of the adopting organization. Baldridge and Burnham (1975) hypothesized an association between functional differentiation and innovation. A functionally differentiated organization creates multiple interest groups, leading to potential competition for resources and competitive energy for innovative programs. Additionally, a functionally differentiated organization is divided into larger numbers of functional units, leading to problems of coordination and control; this increases the demand for administrative innovations to enhance coordination. The findings of these authors confirm that large, functionally differentiated organizations tend to be more innovative (Greenhalgh et al., 2005).

The literature is compelling and the evidence substantial that there is a correlation between organizational complexity and innovation. Contrary to theoretical assumptions, organizational complexity has been positively associated with adoption of innovation. No empirical research has been conducted regarding the influence of organizational complexity on adoption of innovation by assessing differences by adopter category. The theoretical basis for study assumes that the most complex organizations should have the greatest need to strategically adapt on multiple fronts, and thus the earliest adopters would have the most complex organizations.

Size and Slack Resources

The size of a healthcare organization has been measured using a multitude of different factors. Number of beds, revenue, patient days, and number of employees have been utilized as surrogates for size in a number of empirical studies. Slack resources refer to the resources an organization has at its disposal beyond what is required to maintain ongoing operations (Damanpour, 1991). Slack resources have been operationally defined as cash, intellectual property, employee resources, and program expertise. Slack resources enhance an organization's ability to adopt an innovation in two respects. First, surplus resources provide the ability to fund new innovation. Second, slack resources reduce the risk associated with adoption by providing a financial reserve in the event of failure to implement or failure to capture the intended benefits of the innovation (Kimberly & Evanisko, 1981). The availability of slack resources should theoretically increase the likelihood of adoption of innovation by making it less likely that financial ramifications of failure could cripple the organization.

The linkage between size and slack resources seems logical. The larger an organization, the more likely it is to have greater resources to utilize, a greater breadth of intellectual property, and additional talented staff to consider innovation. Larger organizations may also have better linkages to benchmark programs and education about new concepts.

Both size and slack resources have been studied extensively as factors influencing adoption of innovation in healthcare organizations. The Damanpour meta-analysis found a positive association with both variables. Meyer and Goes (1975) studied the adoption of complex innovations in 75 community hospitals and the assimilation of 12 medical innovations into community hospitals. Their conclusions were consistent with research conducted by Kimberly and Evanisko to the extent that innovations were more likely to be adopted by larger hospitals with relatively complex structures. In both studies, organizational variables afforded the best predictions of innovation, with environmental variables explaining half as much variance as organizational-level variables (Meyer & Goes, 1975; Kimberly & Evanisko, 1981; Greenhalgh et al., 2005). The innovation attributes in Meyer and Goes' study explained 37% of the variance in organizational innovativeness (Meyer & Goes, 1975). Ginn and Young (1992) used hospital size (number of beds) and two measures for slack resources (hospital ownership, multihospital system membership) and found all three measures to be significant positive predictors of adoption of innovative strategy. Glandon and Counte (1995), as previously mentioned, used hospital occupancy as a measure of slack resources and found the variable to be a significant positive predictor of adoption of hospital cost accounting systems.

Goes and Park (1987) orchestrated a 10-year longitudinal study of adoption of both technical and administrative innovations in 356 California hospitals. They concluded that size and linkage to other hospitals were factors consistently found in more innovative hospitals. Nystrom (2002) explored adoption of imaging technology in U.S. hospitals, testing a hypothesis that organizational size and slack resources have a significant positive effect on innovation. Using a survey of imaging leaders in hospitals, the authors concluded that both organizational size and slack resources had a significant positive influence on innovation.

While the majority of the empirical research has demonstrated a positive correlation between size and slack resources and the adoption of innovation, a few studies have concluded differently. Krein (1999), in a study of adoption of provider-based rural health clinics, utilized hospital occupancy, operating margin, and payer mix as substitutes for slack resources, and none were found as significant predictors of adoption of this particular innovation. No research has been identified that has examined size and slack resources and their impact on rate of adoption of innovation.

Theoretically, it stands to reason that the largest organizations with slack resources would be in the best position to innovate. What motivates one organization to innovate early instead of later in the process of adoption is an open research question.

External Networks

External network is the idea of interaction with other actors in the environment leading to transmission of knowledge. An external network consists of two distinct concepts. An external communications network that provides opportunity for information, education, and intellectual stimulus for innovation is one facet of the variable. The second concept is the idea of multihospital membership in a larger system. Network linkage is also embedded in institutional theory. Kaluzny described institutional theory as the rules, norms, and expectations of a larger-system influence on an organization, such that the organization conforms to the larger social system in an effort to be recognized as legitimate and worthy (Shortell & Kaluzny, 2006; DiMaggio & Powell, 1983). The organization seeks recognition and support from relevant external entities; Joint Commission accreditation is a crude example of this effort. Another example of conformity is illustrated by adherence to professional standards, laws, and requirements related to board certification and licensure (Shortell & Kaluzny, 2006). Employees' interactions with peers in their respective environment leads to transmission of norms, standards, and expectations that the organization seeks to meet in order to attain credibility. Institutional theory implies that organizations that have extensive linkages with their external peers will be more likely to adopt innovation.

Several empirical studies have studied external networks and network relationships relative to adoption of innovation. Ginn and Young (1992) and Wheeler et al. (1999) found that multihospital system membership was a significant positive predictor of innovation, and Trinh and Begun (1999) found system membership to be a positive predictor of strategy adoption. Damanpour's meta-analysis (1991) found a significant positive correlation between external communications and adoption of administrative innovations. The large studies and meta-analysis are reviewed in the next section.

The evidence regarding system membership, defined as external networks, and influence on adoption of innovation is strong. No empirical research has been conducted on differences between the influence of this factor and rate of adoption of innovation. We do not know whether any system linkage will influence adoption or whether specific network linkage impacts rates of adoption. There is also no empirical research on whether network linkage is as influential over a period of time. By studying rate of adoption, we have an opportunity to advance knowledge regarding this variable.

Large Empirical Studies on Organizational Influence Factors

Several empirical studies have examined all of the variables described in the previous section. Eleven studies were identified as part of the literature review for this section, and a comprehensive summary of them is located in Appendix A, Table A5. The most comprehensive studies are reviewed in this section.

Only one meta-analysis from the management literature external to healthcare was identified that addressed attributes of innovation and their relationship to adoption and implementation of innovation in the organizational context. Tornatzky and Klein studied product innovation in manufacturing, reviewing 75 primary studies whose main research question was the following: What attributes of innovation increase the rate and extent of adoption? Tornatzky and Klein constructed a methodological profile of the studies and noted that the scope and quality of the studies varied considerably. Ten attributes were mentioned most frequently. Less than 10% of the studies examined the relationship of innovation characteristics to adoption, and in over half the studies only one attribute was studied as the independent variable (Tornatzky & Klein, 1982). In more than half of the studies, the adopting unit was an individual, which reduced generalization of results to organizations. Overall, Tornatzky and Klein (1982) found only two innovation attributes—compatibility and relative advantage—that were positively related to adoption across all studies.

By the early 1990s, researchers had established that innovation within organizations was associated with leadership characteristics, as well as structural organizational features such as size, complexity, expertise, slack resources, networks, and decentralized control (Greenhalgh et al., 2005). The key studies in this tradition were well summarized by Damanpour in three meta-analyses.

Damanpour's first meta-analysis (1991) tested the hypothesized relationships between 14 organizational determinants and the rate of adoption of multiple innovations (see Appendix A, Table A4). Twenty-three empirical studies met the inclusion criteria for the meta-analysis. The study found a statistically significant ($p < .05$) association for 10 of the determinants and innovation, with nine positive associations and one negative association (Damanpour, 1991). Statistically, the strongest determinants of innovation were specialization, functional differentiation, and external communication. Damanpour also reviewed which dimensions of innovation effectively moderated the relationship between innovation and determinants. Damanpour identified seven moderators, which affected the strength of the association but did not change the direction of the relationship.

The second meta-analysis reviewed 20 primary sources that provided 36 independent estimates of the relationship between organizational size and innovation (Greenhalgh et al., 2005). Size emerged as a significant independent predictor of innovation.

The third meta-analysis, published in 1996, studied organizational complexity, organizational size, and the effect on innovation. Two indicators of structural complexity were utilized in the analysis: functional differentiation, measured by the total number of units below the CEO, and occupational differentiation, measured by the number of job titles. Twenty-one relevant studies were included in the third meta-analysis that related structural complexity to organizational innovation, and 36 additional comparisons correlated organizational size with innovation (Damanpour, 1996). Innovation was measured by the number of innovations adopted within a given period of time. Damanpour concluded that both structural complexity and organizational size are positively related to organizational innovation and explain about 15% and 12% of variation, respectively (Damanpour, 1996; Greenhalgh et al., 2005).

Damanpour also considered the impact of 14 contingency factors on the association between structural complexity, size, and innovation. These factors were grouped into three categories: commonly cited factors such as environmental uncertainty and organizational size, industrial sectors such as profit status, and dimensions of innovation including types of innovation and stages of adoption. Four contingency factors were common, including environmental uncertainty, use of service organizations, focus on technical innovation, and focus on product innovation (Damanpour, 1996; Greenhalgh et al., 2005).

Kimberly and Evanisko examined the combined effects of individual, organizational, and contextual variables on hospital adoption of technical and administrative innovations. They studied both individual characteristics (job tenure, leadership title, and educational background) and organizational characteristics such as specialization, size, functional differentiation, and external linkage. The contextual factors studied included competition, size of the city, and age of the hospital. Each of the variables was significantly and positively associated with adoption of innovation. Four organizational variables (centralization, specialization, size, and functional differentiation) and one contextual variable (age of hospital) explained the most variance in adoption behavior. The authors concluded that organizational-level variables are better predictors of technical and administrative innovations than either individual variables or contextual factors. They also concluded that adoption of technical innovations, and administrative innovations to a lesser extent, tends to be most prevalent in organizations that are large, specialized, functionally differentiated, and decentralized (Kimberly & Evanisko, 1981; Greenhalgh et al., 2005).

The meta-analysis by Damanpour, the study by Meyer and Goes, and the research by Kimberly and Evanisko are considered quality studies (Greenhalgh et al., 2005). Additionally, 18 other studies external to healthcare and 15 studies within the healthcare sector were identified which made some contribution to organizational attributes and innovation. Six broad determinants (Greenhalgh et al., 2005) have been consistently found to have a positive and significant association with innovation:

- Organizational complexity, including specialization and functional differentiation
- Organizational size
- Slack resources
- Leadership
- Network linkage
- Hospital structural characteristics

Hospital structural characteristics were defined as hospital ownership, including for-profit or not-for-profit status, and whether or not a hospital is a teaching hospital. Both of these characteristics were included in a recent study by D'emilia et al. (2008) and were found to have a positive association with adoption of innovation.

The association between these key determinants and organizational innovation are moderated by other variables, which impact the strength but not the direction of association. The association between organizational complexity and innovation is strengthened when there is environmental complexity or when the adoption process takes place within a service organization (Greenhalgh et al., 2005).

Environmental Influence Factors on Adoption of Innovation

Environmental influence factors represent a category of variables that impact the organization from an external perspective. Organizations have little control over their environment and must respond or adapt to the environment as presented. The environment is the context from which the organization either emerged or began to successfully operate (Kimberly & Evanisko, 1981). Environmental complexity and competition were defined in chapter 1 and were identified by Kimberly and Evanisko as key contextual factors in their research. Critical mass refers to the “tipping point” relative to the number of adopters in place at a given point in time (Gladwell, 2000) that may enhance the legitimacy of the innovation for firms considering it. Community resources refer to the resources available to a firm to enhance understanding, knowledge, and learning related to innovation. Each factor is reviewed in more detail to demonstrate its usefulness as a variable in assessing the likelihood of adoption of innovation by adopter category. Eight studies were identified as part of the literature review and are summarized in Table A6 (Appendix A).

Environmental Complexity

Environmental complexity is linked with the concept of contingency theory (Shortell & Kaluzny, 2006). A less bureaucratic, more organic form of organization is likely to be more effective when the environment is complex. Organic organizations are better able to respond to the need for information, expertise, and flexibility. Contingency theorists view the process as a continuum instead of a fixed structure and recognize that different subunits of the organization may be organized differently depending on the environment and the innovation necessary (Shortell & Kaluzny, 2006). This thought is applicable to this study since nursing constitutes a large subunit in any hospital or health system. Theoretically, organizations in more dynamic environments would be more likely to adopt administrative innovations that facilitate flexibility, adaptation, and response to the environment. Furthermore, the more dynamic the environment, the more quickly an organization would presumably adopt an innovation to achieve competitive advantage.

Several empirical studies have considered substitutes for environmental complexity. Kimberly and Evanisko (1981) framed environmental complexity as a function of the size of the city in which the organization is located. The authors found that size of city was a significant positive predictor of technological innovation adopted by hospitals, but was not a significant predictor of administrative innovation. Dansky et al. (1996) framed environmental complexity based on location of a hospital in an urban or rural location and concluded that urban location was a significant positive predictor of entry into home care (defined as the innovation) by hospitals. Reviewing empirical studies of magnet-designated hospitals, Sanders (2007) found environmental complexity as a significant positive predictor of innovation (magnet designation) among hospitals.

In summary, environmental complexity has been measured as urbanism in several empirical studies with mixed results. No empirical literature has been identified that has studied the impact of environmental complexity on the rate of adoption of an administrative innovation.

Competition

Porter (1980, 1985) emphasized that the competitive environment of an industry has a strong influence on the performance of a business within that industry, and that successful firms deliberately choose a different set of activities to deliver a unique mix of value. This has direct application to this research study since innovation is widely perceived as a factor in differentiating successful organizations. Feldstein (1999) operationally defined competition as the number of organizations within a market area that attempt to acquire resource inputs to differentiate their company in the marketplace.

Competition is an environmental factor that has been studied in both health economics and health services research studies (Morrissey, 2008). Competitive pressure helps focus an organization to use resources constructively to maintain market position or risk competitive disadvantage. Greater competition motivates hospitals to adopt strategies to maintain competitive advantage (Ginter, Swayne, & Duncan, 2002). Theoretically, greater competition would be expected to promote innovation adoption, since knowledge of competitors' actions influences an organization to undertake initiatives to differentiate itself.

Empirical research regarding competition and its impact on innovation has been mixed. Kimberly and Evanisko (1981) measured the presence of other hospitals in a geographic area and found that the factor was a significant positive predictor of both administrative and technical innovation. D'emilia et al. (2008), in a study of factors influencing adoption of magnet programs in hospitals, found that the presence of competing nursing schools in a geographic region was a positive predictor of innovation among hospitals seeking magnet designation.

Several studies did not yield an association between competition and innovation. Ginn and Young (1992) used the Herfindahl index and market share as a measure of competition and found that neither variable was a significant predictor of proactive innovation. A study of nursing homes adopting total quality management programs found that the Herfindahl index was not significant in predicting adoption of innovation (Zinn et al., 1998). A study of diversification into subacute care revealed that competition, measured by number of hospitals within a geographic area, was not a significant predictor of adoption of this innovation (Wheeler et al., 1999).

In summary, competition has been studied as a factor influencing innovation in a number of empirical studies, and the results have been mixed. To date, no empirical research has been conducted that uses competition as a factor in predicting adoption of innovation by adopter category among hospitals.

Critical Mass

Critical mass refers to the number of adopters already in place and the resultant "tipping point" in adoption of an innovation (Kraut et al., 1998; Gladwell, 2000). According to Rogers, critical mass occurs when early adopters follow the innovators in adopting a new invention and then become the opinion leaders who convince the early majority of the value of the innovation until critical mass is achieved (Rogers, 2003; Gladwell, 2000). Once this point is achieved, contextual pressures push the late majority and laggards toward adoption or isolation from the social system (Greve, 1998). The pressure to conform can lead a potential adopter organization to pursue an innovation or "jump on the bandwagon" (Abrahamson, 1991; Abrahamson & Rosenkopf, 1993, 1997).

The more competitors that have adopted an innovation, the greater the pressure on nonadopters of the innovation to conform (Sanders, 2007). In theory, one could assume that the more hospitals that have adopted an innovation, the greater the likelihood of adoption by nonadopters.

Empirical research regarding this variable is very limited. Only two related studies were identified. 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 (Sanders, 2007). Jerome - D’emilia et al. (2008) studied the presence of other hospitals in the same city or region that had been designated as magnet hospitals and found this factor to be a significant positive predictor of adoption.

The literature is promising enough to warrant inclusion of this variable in the research study. With the exception of the innovators category, this variable can be studied across adopter categories. No empirical research has been identified that has studied critical mass as a predictor of speed of adoption of innovation. More research on this factor is needed.

Community Resources

Resource dependence theory positions the successful organization as one able to secure needed resources from its environment in order to survive (Shortell & Kaluzny, 2006). This perspective assumes that a hospital can influence its environment to procure necessary resources and reduce its dependence on the environment as well as increase its probability of success (Alexander & Morrisey, 1989; Shortell & Kaluzny, 2006). Human resources are a critical element for hospitals, and nurses are usually the top human resource priority. In order to enhance their probability of success, organizations attempt to protect their core resources from disruption and avoid increasing transaction costs (Thompson, 1967). Increased transaction costs for hospitals related to nursing resources include turnover and training costs. It is also plausible to consider transaction costs in the quality arena. Shortell and Kaluzny (2006) emphasized that resource dependence theory assumes that the acquisition of vital resources assists hospitals in demonstrating value through better outcomes. It was noted earlier in this chapter that Aiken has empirically demonstrated that magnet-designated hospitals have superior clinical outcomes. Aiken attributed a portion of the success to the retention of experienced nurses. Therefore, securing stable nursing resources is an objective for most if not all hospitals.

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 whatever action necessary to secure those resources (Sanders, 2007). Therefore, from a theoretical perspective, the need for nursing resources can be expected to increase the speed of adoption of innovation that might enhance a hospital’s likelihood of securing more of these valuable resources earlier and gaining a competitive advantage.

The empirical literature regarding this variable is indirect, with researchers using a variety of measures to approximate resources. Payer mix, family income, physician supply, and market share are the major variables of study for environmental resource availability. In a study of adoption of proactive business strategies by hospitals, Ginn and Young (1992) used average family income and physician supply as two of their variables and found that none were significant predictors. Zinn et al. (1998) found that community resource, as measured by Medicare market share, was a significant predictor of adoption of total quality management in nursing homes. Krein (1999), in a study of provider-based rural health clinics, used the number of physicians per 1,000 population as a measure of community resources and found that this was not a significant predictor of adoption. Jerome - D'emilia et al. (2008), in a study of adoption of magnet programs among hospitals, studied nursing schools per 100,000 population and found a significant positive association between this variable and adoption of magnet programs. Sanders (2007), using the definition of community resources described in this section, found that an abundance of community resources was a significant positive predictor of adoption of magnet programs by hospitals. No empirical research was identified that has studied the impact of community resources on the rate of adoption of magnet programs as articulated by Rogers. The evidence regarding community resources makes it worth investigating as a possible variable in the adoption of innovation.

Gaps in the Literature

One important weakness of the literature is the implicit assumption that the determinants of innovation can be treated as independent variables that can be isolated, measured, and independently quantified (Greenhalgh et al., 2005). Empirical studies on organizational size assume that results can be generalized to the population. More recent qualitative studies suggest that the different determinants of organizational innovation interact with each other (Greenhalgh et al., 2005).

It is apparent that no researcher has studied environmental and organizational factors and their influence (singularly or collectively) on the rate of adoption of innovation among firms in any sector. Thus, the current study enhances the literature and contributes to the knowledge of diffusion of innovation and speed of adoption by health systems.

Summary

A review of the literature has identified many useful variables regarding both environmental and organizational factors that could influence the rate of adoption of innovation in hospitals. The literature review identified very few references to the rate of adoption of innovation in general, and no studies that have examined organizational and environmental influences on the rate of adoption of innovation in healthcare organizations. Furthermore, no one has studied the five adopter categories as described by Everett Rogers in any healthcare setting. Using an outcome variable of rate of adoption, including the five adopter categories by Rogers, provides a new perspective and insights for the field.

CHAPTER 3:

METHODOLOGY

Introduction

This chapter reviews the research methods used to empirically test the model of whether environmental and/or organizational influences are associated with the rate of adoption of innovation. The first section describes the purpose of the research and the research questions. This section is followed by a presentation of hypotheses, which draw on the findings from the literature review. The final section details the research design, including sampling frame, data collection procedures, measurement and instrumentation, reliability and validity, and data analysis methods. The foundation for this research is a model developed by Sanders (2007).

The premise of this research study is based upon work from early sociologists, including Everett Rogers, who developed standard nomenclature to classify adopters of innovation. According to Rogers, the distribution of adopters of an innovation can be approximated by a normal distribution of the time of adoption (Rogers, 1995). Using the mean and standard deviation of the distribution as the method of segmentation, Rogers classified adopters of innovation into five categories: innovators, early adopters, early majority, late majority, and laggards. These categories are not fixed classifications but mathematically defined cut points for the adopters of any particular innovation by a specific population.

Research Objectives

The purpose of this study was to investigate the influence of environmental and organizational factors on early and late adoption of innovation to better understand strategic adaptation by healthcare organizations. An administrative innovation specific to nursing was selected: the magnet hospital concept. The concept was designed to facilitate recruitment and retention of nurses, and magnet certification refers to a hospital formally designated as a magnet hospital by the American Nurses Credentialing Center (ANCC) during the study period (1994 to 2010, corresponding to American Hospital Association [AHA] data years 1993 to 2009). This study tested a research model that related a set of environmental and organizational factors to adoption of magnet accreditation by healthcare organizations over the study period.

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

1. Do environmental factors influence the speed of adoption of innovation? If environmental factors do influence the speed of adoption, then which environmental factors significantly influence adoption?
2. Do organizational factors influence the speed of adoption of innovation? If organizational factors do influence the speed of adoption, then which organizational factors significantly influence adoption?
3. If environmental and organizational factors do influence the speed of adoption of innovation, is one set of factors more influential than the other? If one set of factors is more influential, what is the magnitude?

4. What, if any, influence do both environmental and organizational factors acting jointly have on speed of adoption of innovation?
5. If environmental and organizational factors significantly influence speed of adoption of innovation, which environmental and organizational factors are singularly significant?

Hypotheses

To answer these questions, hypotheses were developed based on findings from the literature consistent with the research model. Previous work by Sanders (Sanders, 2007) provided a foundation for this research. Sanders explored the influence between environmental and organizational factors and adoption of innovation. He studied both the singular and collective impact of these factors on adoption of magnet programs by hospitals. The focus of the current study is whether the influence of those factors, in addition to other factors identified in the literature, varies the speed of adoption among organizations. Therefore, each hypothesis posits whether or not a correlation exists for each factor based on speed of adoption of magnet programs. In other words, are environmental factors a significant influence for early versus late adopters? Are environmental factors a stronger influence than organizational factors for early adopters? Do any of these factors progressively delay the adoption of magnet programs in hospitals?

The section begins with a discussion of the dependent variable, speed of adoption of magnet programs as an innovation. Hypotheses related to environmental factors are presented, followed by hypotheses linked to organizational factors. Hypotheses are then presented that address the relative influence of each set of factors followed by the joint influence of these factors on the speed of adoption of innovation among early and late adopters.

Speed of Adoption

The dependent variable for this study is the time of adoption of magnet programs by hospitals. The literature review suggested that adoption of innovation is a process involving a series of steps and decisions and is not a single decision. Scholars have described the entire adoption process, but relatively few have studied the entire process because of the complexity, lack of clearly defined variables, and difficulty in measuring each step of the adoption process (Frambach & Schillewart, 2002; Wilson et al., 1999). Most scholars studied a single stage of the adoption cycle (Kimberly & Evanisko, 1981; Olshavasky & Spreng, 1996), and a few studied the implementation stage of adoption. Implementation is defined as the stage when an organization actually puts the innovation into use within the organization. Implementation is a widely used measure of adoption according to the literature (Glandon & Counte, 1995; Alexander et al., 1996; Zinn et al., 1998; Krein, 1999; Wheeler et al., 1999). Adoption of a magnet program by a hospital was selected as the innovation. Magnet certification refers to a hospital formally designated as a magnet hospital by the ANCC during the study period (1994-2010, corresponding to AHA data years 1993-2009). This measure was dichotomously coded as adoption = 1 and nonadoption = 0.

Environmental Influences Combined

Environmental influences refer to factors that characterize the external environment and are presumed to influence an organization's likelihood of adoption of an innovation (Kimberly & Evanisko, 1981). The context for environmental factors includes government regulation, competition, and the structure of the industry (Greenhalgh, 2005). Organizations are generally thought to have limited control over the environment and must adapt to the environment to survive (Shortell & Kaluzny, 2006). Based on the literature review, it was presumed that environmental factors would have a significant positive influence on adoption of innovation. Four factors were identified in the literature most often as environmental variables: environmental complexity, competition, critical mass, and community resources. It was also expected that the strength of the influence regarding environmental factors would vary the rate of adoption of magnet programs by hospitals. The variance in rate translates to the five adopter categories; as an example, progressively delaying adoption would move a hospital from an early adopter to a late adopter. In accordance with this expectation, the following hypothesis and the corresponding null hypothesis were developed:

> Hypothesis 1: There is a significant association between environmental factors (i.e., level of environmental complexity, competition, critical mass, community resources) and the rate at which organizations adopt innovation.
>
> Hypothesis 1o: There is no association between environmental influences (i.e., level of environmental complexity, competition, critical mass, community resources) and the rate at which organizations adopt innovation.

If there is a significant association between environmental factors and the rate of adoption of innovation, then the secondary research questions—Which (if any) environmental factors significantly influence the rate of adoption of innovation?

Environmental Factor 1: Environmental Complexity

Environmental complexity is defined as a host of environmental forces that create a strategic context for organizations. The environmental climate could range from stable to dynamic depending on the intensity and linkage of these forces (Mintzberg, 1979; Lawrence & Lorsch, 1969; Dansky et al., 1996; Kimberly & Evanisko, 1981). The greater the turbulence or dynamic nature of the environment, the less effective bureaucratic organizational models are and the greater the need for more flexible organizations that can adapt to the environment.

The literature supports the concept that hospitals functioning in urban areas operate in more complex environments than hospitals in rural areas (Kimberly & Evanisko, 1981). Hospital location is a widely used variable in health services research (Alexander et al., 1996; Dansky et al., 1996; Krein, 1999; Molinari, Alexander, Morlock, & Lyles, 1995). The preliminary analysis of data for magnet hospitals revealed that no adopters were located in rural areas. For the purposes of this study, more urban was defined as a population greater than 50,000, while less urban was defined as a core population of less than 50,000. The 2003 Office of Management and Budget classifications were used along with AHA annual survey data to complete the data set for this variable.

According to the literature, the more complex the environment, the stronger the association with adoption of innovation. In accordance with the literature, the following hypotheses were proposed:

> Hypothesis 1.1: There is a significant association between environmental complexity and the rate at which organizations adopt innovation.
>
> Hypothesis 1.1o: There is no association between environmental complexity and the rate at which organizations adopt innovation.

Environmental Factor 2: Competition

According to Porter, firms strive for a competitive advantage over rivals, and the intensity of rivalry varies across industries. Firms compete for resources, manpower, market share, and production within markets (Bernstein & Gauthier, 1998; Porter, 1980; Feldstein, 1999). The literature review was clear that competition forces organizations to adopt strategies to achieve competitive advantage (Porter, 1980; Ginter et al., 2002). Competition has been recognized as a primary factor motivating firms to consider adoption of innovation as a means of maintaining market position (Robertson & Gatignon, 1986; Gatignon & Robertson, 1989).

While a number of measures of competition are used in health services research, the Herfindahl index is a widely accepted measure of market concentration (Lynk & Morrisey, 1987; Ginn &Young, 1992; Tami, 1999; Trinh & O'Connor, 2000) that can be used to measure competition. The Herfindahl index is calculated as the sum of the squared shares of admissions for all acute care hospitals in a geographic area (city) where a hospital is located. Share is defined as market share and is calculated by dividing each hospital's admissions by the total number of admissions for the geographic unit (Ginn & Young, 1992). The Herfindahl index can range from 1 to 0, with a score of 1 defined as a solo provider or monopoly situation.

It has been empirically determined that markets with more hospitals tend to be more competitive (Ginn & Young, 1992). Therefore, the lower the Herfindahl index, the more competitive a hospital market. For purposes of this research, competition was defined as a hospital's Herfindahl index within its market (county). The Herfindahl index was calculated for each county using hospital admission data from the AHA annual survey for the year of adoption, between 1994 and 2010 for magnet hospitals.

The direction of the relationship between measures of the Herfindahl index and adoption of innovation would be negative in order to be consistent with a hypothesis of a positive relationship between competition and innovation. The following hypotheses were proposed:

> Hypothesis 1.2: There is a significant association between competition and the rate at which organizations adopt innovation.
>
> Hypothesis 1.2o: There is no association between competition and the rate at which organizations adopt innovation.

Environmental Factor 3: Critical Mass

A critical mass or tipping point exists when an innovation becomes an accepted part of a market or industry. Once this point is achieved, pressures push late majority and laggards toward either adoption or isolation from the social system (Greve, 1998). One study was identified that utilized this factor, and that study used the percentage of adopting competitors to measure network externality (Krein, 1999). For purposes of this research, critical mass was operationally defined as the presence of other adopters in a hospital's market area and was measured as the presence of competitors in the market that had already adopted the magnet hospital concept. The number of prior adopters was calculated for each market for the year prior to adoption for all magnet hospitals.

Based on findings in the literature, it was expected that knowledge of competitors' actions would motivate a healthcare organization to become magnet accredited. If another hospital in the immediate service area was magnet accredited, it was theorized that the adopting hospital would be more likely to become a magnet hospital.

> Hypothesis 1.3: There is a significant association between critical mass and the rate at which organizations adopt innovation.
>
> Hypothesis 1.3o: There is no association between critical mass and the rate at which organizations adopt innovation.

Environmental Factor 4: Community Resources

Organizations are dependent on their environment to secure the resources needed for survival (Pfeffer & Salancik, 1978). Organizations act to procure resources in order to increase their chances of success (Alexander & Morrisey, 1989). When a firm operates in an environment with abundant resources, it may not have to change in order to be sustainable. There is some evidence that when resources are scarce, a firm may have to change in order to survive. However, the preponderance of evidence in the literature is weighted toward more innovation with more resources.

A number of operational definitions have been used in the health services literature to study the availability of community resources. Physician supply per 1,000 population and registered nurses per 1,000 population are two of the more common metrics advanced in the literature (Alexander et al., 1996; Bigelow & Mahon, 1989; Krein, 1999; Zajac & Shortell, 1989). While registered nurses per 1,000 population would be a relevant metric, the data on the number of registered nurses by county was not uniformly available in previous studies (Sanders, 2007).

An alternative measure of community resources is the number of schools that educate nurses. The number of schools that educate registered nurses in a given county would impact the supply of the workforce. When more schools are available and more registered nurse graduates are available in a given county, the nursing shortage should be less acute. Therefore, it can be hypothesized that there could be a negative relationship between the number of nursing schools per 100,000 population and adoption of innovation.

Therefore, the following hypotheses were developed:

Hypothesis 1.4: There is a significant association between community resources and the rate at which organizations adopt innovation.

Hypothesis 1.4o: There is no association between community resources and the rate at which organizations adopt innovation.

Organizational Influences Combined

Organizational influences are factors believed to be significant in the likelihood of adoption of an innovation (Kimberly & Evanisko, 1981). Organizational influences are components of the visible organizational structure and the organizational culture. As discussed in the literature review, six broad determinants have been consistently found to have a positive and significant association with innovation: organizational complexity, organizational size, slack resources, external networks, control of domain, and hospital structural characteristics (not-for-profit status, teaching affiliation). Based on review of the literature, it was expected that organizational factors would have a significant influence overall on the speed of adoption of innovation by organizations. The following hypotheses were proposed:

> Hypothesis 2.0: There is a significant association between organizational factors (level of organizational complexity, size of organization, slack resources, external networks, control of domain, hospital structural characteristics (not-for-profit status, teaching affiliation) and the rate at which organizations adopt innovation.
>
> Hypothesis 2.0o: There is no association between organizational influences (level of organizational complexity, size of organization, slack resources, external networks, control of domain, hospital structural characteristics (not-for-profit status, teaching affiliation) and the rate at which organizations adopt innovation.

If there is a significant association between organizational factors and the rate of adoption of innovation, then the secondary research questions—Which (if any) organizational factors significantly influence rate of adoption of innovation? This question will be addressed.

Organizational Factor 1: Organizational Complexity

Organizational complexity seeks to capture the overall scope of an organization in term of its degree of specialization (Damanpour, 1991). In his studies, Damanpour employed two indicators of structural complexity: functional differentiation, measured by the total number of divisions or units below the CEO, and occupational differentiation, or role specialization measured by the total number of specialties or job titles. The empirical literature confirmed an association between functional differentiation and innovation (Aiken & Hage, 1971, Baldridge & Burnham, 1975). There are two reasons for the confidence in this association. First, a functionally differentiated organization often contains multiple interest groups with multiple demands for knowledge and new technology. Second, complex organizations have challenges relative to coordination and control, as they are divided into larger numbers of functional units, which increases the necessity for administrative innovations. In accordance with the literature, the following hypotheses were proposed:

> Hypothesis 2.1: There is a significant association between organizational complexity and the rate at which organizations adopt innovation.
>
> Hypothesis 2.1o: There is no association between organizational complexity and the rate at which organizations adopt innovation.

Organizational Factor 2: Organizational Size

One of the strongest relationships from the literature is the correlation between organizational size and adoption of innovation. Damanpour identified size as a major determinant of innovation. The preponderance of studies in the literature tested the relationship between organizational size and innovation over a period of time. Size had a positive relationship with innovation (Damanpour, 1991; Greenhalgh et al., 2005; Kimberly & Evanisko, 1981). Large, complex organizations are more likely to adopt innovations than small, simple organizations. One explanation is that larger size increases the likelihood that other predictors of innovation will be present, including the availability of other resources (Greenhalgh et al., 2005). Another possible explanation is that large companies stay innovative because efficient differentiation enables subunits to behave like small companies (Greenhalgh et al., 2005). However, no literature has uncovered the relationship between size and the speed of adoption of innovation by organizations over a period of time. Therefore, the following hypotheses were proposed:

Hypothesis 2.2: There is a significant association between organizational size and the rate at which organizations adopt innovation.

Hypothesis 2.2o: There is no association between organizational size and the rate at which organizations adopt innovation.

Organizational Factor 3: Slack Resources

Slack resources are defined as the resources available within an organization that could be utilized to implement innovations 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 & Evanisko, 1981). Slack resources have been cited as a critical success factor in analyzing strategic options available to organizations (Bigelow & Mahon, 1989).

Financial measures are often used as a precursor of slack resources since positive financial performance can lead to the accumulation of cash, which could be used to acquire resources for the implementation of innovation. Therefore, operating margin could also be used as a measure of slack resources.

The most common definition of slack resources as found in the literature is a measure of hospital occupancy or inpatient census (Provan, 1987; Glandon & Counte, 1995; Zinn et al., 1998; Krein, 1999). In the literature, slack resources were measured by percentage of hospital occupancy. Hospital occupancy was calculated from AHA annual survey data using hospital patient days for the year divided by the product of the number of beds available multiplied by 365 days. Hospital occupancy was calculated for the year of adoption for magnet hospitals (1994-2010). The premise of slack resources is that the lower the occupancy the more resources available for other uses. While the historical nature of hospital occupancy was correct, inpatient occupancy is not always a reliable measure of success.

It was expected that greater slack resources would enhance adoption of innovation. Empirical results are mixed but generally support slack resources as a factor in adoption of innovation. Therefore, the following hypotheses were proposed:

> Hypothesis 2.3: There is a significant association between slack resources and the rate at which organizations adopt innovation.
>
> Hypothesis 2.3o: There is no association between slack resources and the rate at which organizations adopt innovation.

Organizational Factor 4: External Networks

Network linkage between hospitals can be defined as a hospital's membership in a formal system of hospitals. The variable can be operationalized as membership in a multihospital system. The AHA annual survey includes a categorical indicator of whether a hospital is a member of a multihospital system. This indicator is used in health services research (Krein, 1999) to capture the impact of participation in a network.

Institutional theory suggests that organizations seek to conform to the norms, standards, and strategy of benchmark organizations or competing organizations. Organizations with extensive linkages are more likely to adopt innovations (DiMaggio & Powell, 1983; Meyer & Rowan, 1977). Empirical findings in the literature are supportive of this concept, and it has been inferred that the greater the degree of integration into a hospital network, the greater the likelihood that the hospital would conform to external expectations through adoption of innovations. Based upon the empirical findings, the following hypotheses were proposed:

> Hypothesis 2.4: There is a significant association between external networks and the rate at which organizations adopt innovation.
>
> Hypothesis 2.4o: There is no association between external networks and the rate at which organizations adopt innovation.

Organizational Factor 5: Control of Domain

Control of domain refers to the power of a professional group inside an organization in regard to decisions, activities, and outcomes. Power is exercised by the group to secure professional decision making (Flood & Scott, 1978, 1987). The greater the control of domain of a professional group, the greater the influence they exert over issues within their professional domain.

When a hospital employs more registered nurses relative to its scope of programs, these registered nurses could have greater potential to exert influence over their domain and more expertise to consider the adoption of innovation. The variable was defined as a hospital's nursing supply and was measured by the number of registered nurses per bed in operation in a hospital, similar to the way it has been captured in other studies (Sanders, 2007; Alexander et al., 1996; Wheeler et al., 1999). The number of registered nurses and the numbers of beds were obtained for each hospital from the AHA annual survey, and the ratio was calculated for the year of adoption, between 1994 and 2010.

This factor has not been studied extensively, but the empirical literature has produced mixed results and healthy discussion (Sanders, 2007). It can be argued that hospitals with fewer nurses might facilitate adoption of magnet programs through less bureaucracy and structural inertia, thus increasing the likelihood of adoption of magnet programs. Given the plausibility of reasoning both for and against control of domain, the hypothesis should be considered exploratory in nature.

Hypothesis 2.5: There is a significant association between control of domain and the rate at which organizations adopt innovation.

Hypothesis 2.5o: There is no association between control of domain and the rate at which organizations adopt innovation.

Organizational Factor 6: Hospital Structural Characteristics

At least one previous study of magnet programs identified hospital structural characteristics as significant factors in adoption of magnet programs (D'emilia et al., 2008). For purposes of this study, structural characteristics were defined as hospital ownership and teaching affiliation. Each of these factors merits a comprehensive review.

Hospital ownership. The mission of a hospital is critical for strategic focus, strategic adaptation, and development of vision. The literature is very clear on the importance of mission to the culture of an organization (Gapenski, 2008). Mission can be defined clearly in at least one context. For-profit hospitals identify the shareholder or stockholder as the primary driver of the organization. Shareholders invest in the organization and have expectations relative to investment returns and governance (Gapenski, 2008). Not-for-profit hospitals have a different mission, and the governing body is usually composed of laypeople that represent the community. The difference between not-for-profit hospitals and for-profit hospitals has been evident in metrics related to provision of charitable care, cost of care, quality, nurse staffing, and community benefit (Feldstein, 1999; Marsteller et al., 1998; Jones et al., 1987). The approach of a not-for-profit hospital toward the adoption of innovation is driven more by a desire to improve quality, while the approach of for-profit hospitals is to achieve market share and profitability (Feldstein, 1999; Marsteller et al., 1998; Jones et al., 1987).

Not-for-profit status was identified in a previous study of adoption of magnet programs as a significant variable (Jerome - D'emilia et al., 2008). The reasoning is that not-for-profit hospitals will have more registered nurses and greater ratios of nurses to patients than for-profit hospitals. The need to acquire more registered nurses for the future could be greater among not-for-profit hospitals than for-profit hospitals.

Hospital ownership is a variable identified in the AHA survey each year and is available for each year of the study (1994-2010). Hospital ownership can be dichotomously coded as not-for-profit and for-profit (Alexander et al., 1996; Trinh & O'Connor, 2000; Wheeler et al., 1999; Zajac & Shortell, 1989).

Teaching affiliation. Teaching hospitals have a commitment to the education of medical students, nursing students, or allied health professionals. Teaching hospitals usually identify education as a core element of the mission. It can be hypothesized that teaching hospitals are more likely to engage in new concepts, programs, and ideas. Teaching hospitals have a proclivity for innovation, and the engagement of students leads to new thinking. Teaching hospitals also have an interest in research. Therefore, teaching affiliation would be a factor to consider in the adoption of new innovations such as magnet programs.

Teaching affiliation can be dichotomously coded and is available each year through the AHA annual survey.

These two factors (ownership and teaching affiliation) represent the composition of the variable hospital structural characteristics. Therefore, the following hypotheses were proposed:

> Hypothesis 2.6: There is a significant association between hospital structural characteristics (hospital ownership defined as not-for-profit status and teaching affiliation) and the rate at which organizations adopt innovation.

Hypothesis 2.6o: There is no association between hospital structural characteristics (hospital ownership defined as not-for-profit status and teaching affiliation) and the rate at which organizations adopt innovation.

Environmental and Organizational Influences: Comparison and Joint Effects

In addition to the hypotheses related to each individual variable, the next logical question is whether one set of factors is more influential than the other if both sets of factors are found to significantly affect the speed of adoption by organizations. Organizations adapt strategically over a period of time in response to the environment (Shortell & Kaluzny, 2006), and it has been noted that the strategic position of the organization is shaped by the dual influences of the organization's environment and the organization's internal structure (Ansoff, 1987; Porter, 1980, 1985). Organizations demonstrate deliberate adaptive behavior in responding to the external environment using their internal capabilities (Oliver, 1991) and, therefore, environmental influences and strategic capabilities are fundamental to understanding and explaining strategic adaptation (Hrebniak & Joyee, 1985; Oliver, 1991).

Given the understanding that organizations choose to adapt to their environment, and that adoption of magnet programs represents a strategic choice, it was expected that environmental factors as a set of variables would have significantly more influence on adopter categories than organizational factors. On the other hand, at least one study concluded that environmental influences had half the effect of organizational factors. Since the literature is mixed, the following hypotheses were proposed:

Hypothesis 3: There is a significant difference between environmental influences and organizational influences and the rate at which organizations adopt innovation.

Hypothesis 3o: There is no difference between environmental influences and organizational influences and the rate at which organizations adopt innovation.

The final research question involves the significance of both environmental and organizational influences combined on adoption of innovation. What is the significance of both sets of factors together on the adoption of innovation? As previously noted, the strategic management literature illustrates the joint influence of both environmental factors and organizational factors in shaping an organization's future, utilizing adoption of innovation as a strategic choice in adapting to the environment. In accordance with this perspective, the following hypotheses were proposed:

Hypothesis 4: There is a significant association between environmental and organizational factors acting jointly on the rate at which organizations adopt innovation.

Hypothesis 4o: There is no association between environmental and organizational factors acting jointly on the rate at which organizations adopt innovation.

Figure 3 and Figure 4 illustrate how both environmental and organizational influences are associated with the decision to adopt an innovation.

Research Design

The research design for this study is described in this section. Sampling frame and method are first discussed, followed by data collection procedures. Measurement, instrumentation, reliability, validity, and data analysis methods are also reviewed.

Sampling Frame

The initial sampling frame for this study consisted of U.S. hospitals registered with the AHA. The timeframe for this study was the period 1994 through 2010 based on hospitals designated as magnet hospitals during this period. This timeframe corresponds to AHA annual surveys with publication dates of 1993 through 2009. Data in the AHA surveys lag publication date by at least 12 months. Therefore, the actual timeframe for the data in the AHA surveys is for hospital fiscal years 1993 through 2009. This was the most recent available data at the time of the study. The research design is similar to the design developed by Tom Sanders in his dissertation on adoption of innovation (Sanders, 2007).

A number of hospitals were dropped from the overall sampling frame consistent with the practice employed by Sanders (2007). First, hospitals that did not employ registered nurses were excluded from the sampling frame prior to sampling. This rationale seems self-evident. Second, hospitals not located in one of the 50 states were excluded since no magnet hospitals have been designated in U.S. territories and possessions. Third, federal hospitals were excluded since these hospitals do not routinely recruit in traditional labor markets. Fourth, any hospital that did not report data to the

AHA was excluded. Finally, rural hospitals were excluded since no magnet hospitals were located in designated rural areas during the study period.

Data Collection Procedures

Longitudinal data were collected for this study from three secondary sources. The ANCC website was consulted on December 15, 2011, to obtain the names, identifiers, and related information on hospitals that met designation or criteria as magnet hospitals through 2010. The AHA annual datasets for the study period (1993-2009) were used to obtain data for the adopters. Adopters were grouped by category using Rogers' classification of five adopter categories. Classification was completed using the year of adoption to designate which group of adopters each magnet hospital was routed into. Data from the Bureau of Health Professions was used to obtain environmental and demographic information related to each adopter. Data were extracted from the secondary data sources and cleaned and coded as necessary with new measures calculated as needed and ultimately merged into a new data file for statistical analysis.

Measurement and Instrumentation

The data for independent and control variables for each hospital in the database were obtained from secondary data sources. Table 2 illustrates the survey source definitions, including formulas for calculated measures and data sources.

Two measures were significantly impacted by changes that occurred during the study period. The definition of metropolitan statistical areas changed in 2003 from six categories to four. The four categories (rural, micropolitan, metropolitan, and metropolitan division) were consolidated to better reflect social integration patterns (Bureau of Health Professions, 2005). These different categories were mapped to each other to capture the environmental complexity variable.

The second measure involved organizational complexity. The number of hospital services offered in each hospital was used to measure organizational complexity in the AHA survey. The number of hospital services grew from 1994 to 2010 due to expansion of existing services or the addition of new service categories. If the new service categories were expansions of existing categories, then the service could be mapped back to the 1994 category.

Data associated with the dependent variable were obtained from the ANCC website. The data consisted of hospital name, address, and other identifiers along with the year of initial magnet designation. Year of adoption would normally be the year in which a hospital made the decision to apply for ANCC designation. According to the ANCC website, it normally takes a year for application preparation, review, and designation. Since the AHA data lag 12 months from publication date, this lag period serves to approximate adoption date.

Reliability and Validity

The reliability of a research instrument concerns the extent to which the instrument yields the same results on repeated trials. There will generally be a consistency in the output of a survey instrument administered at different times if it is reliable (Carmines & Zeller, 1979; Rindskopf, 2001). Scientific research often measures physical attributes that can be assigned a precise value. According to some scholars, the magnitude of imprecision in the measurement of mental attributes (e.g., employee satisfaction) is much greater than measurement of physical attributes such as organizational size (Willmott & Nuttall, 1975). Data from the AHA survey, which have been used for decades, generally relate to physical attributes and are considered very reliable.

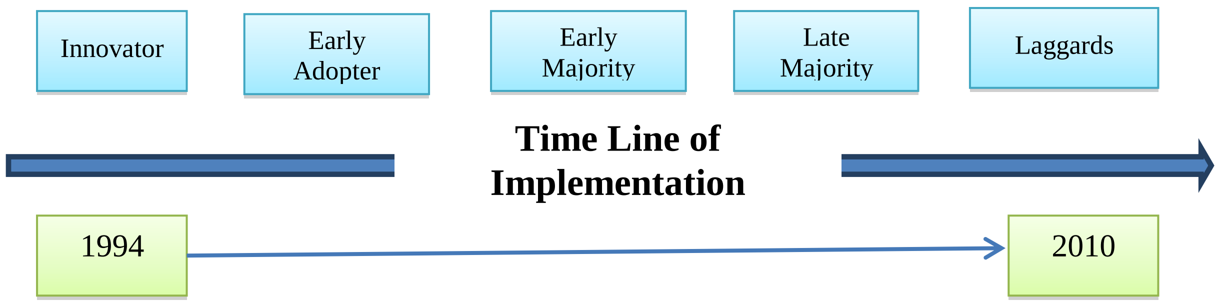
Validity refers to the degree to which a test measures what it is supposed to measure. Maximizing internal validity requires the elimination of plausible alternative explanations for any differences observed between groups. Maximizing external validity involves specifying the extent to which the study can be generalized to the population.

According to Mason and Bramble (1989), there are three basic approaches to the validity of measures: face validity, content validity, and criterion-based validity. Face validity refers to the extent to which the measurement instruments actually assess the environmental and organizational influences in question. All of the measures utilized have been perceived as valid by other users for similar research purposes, as noted in the literature (Sanders, 2007). Content validity refers to the extent to which the instruments assess the entire content in question (Trochim, 2001). The measures used in this study were drawn from the health services research literature and have been used for similar purposes. Their use in the literature reflects broad acceptance as suitable measures for research. Criterion-related validity is the extent to which the current measures of environmental and organizational influences produce results closely related to other independent measures of the same phenomena. Criterion validity is used to demonstrate the accuracy of a measure by comparing it with another measure already justified as valid. Overall, data from the AHA survey and area resource file have been used in scholarly research for decades and are accepted as reasonable evidence of validity for study purposes.

Data Analysis Methods

An extension of logistic regression referred to as ordinal regression was the primary statistical method employed to analyze data. Ordinal logistic regression takes into account any inherent ordering of the levels in the outcome variable, thus making more use of the ordinal information (Kleinbaum & Mitchel, 2002). The ordinal logistic model is sometimes referred to as the proportional odds model. The independent variables in ordinal regression can be measured either categorically or on a continuous scale. The logistic regression model overcomes the major disadvantages of the linear regression model for a dichotomous dependent variable (Aldrich & Nelson, 1984). Additionally, ordinal regression is more powerful than four separate logistic regression formulas because ordinal regression may detect subtle relationship differences between the independent variables and the rate of speed at which organizations adopt innovation.

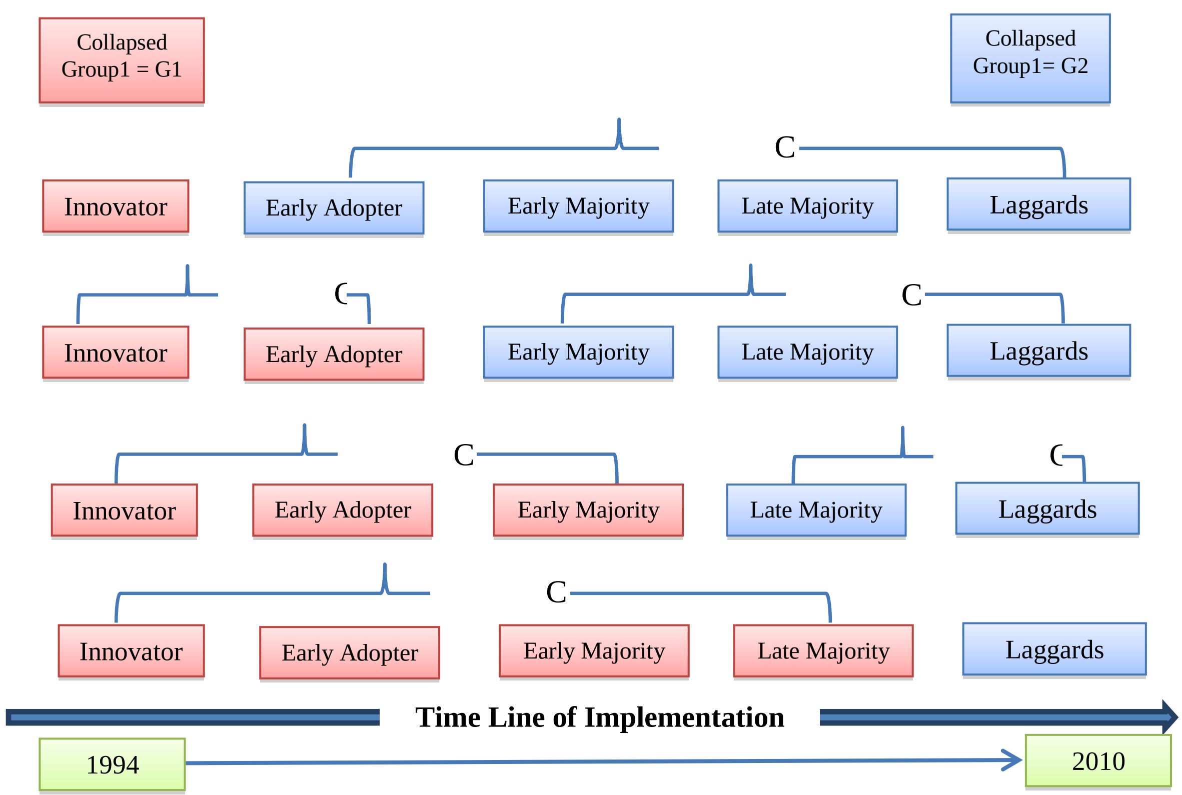
The dependent variable, the implementation of innovation, had five levels—innovator (IN), early adopter (EA), early majority (EM), late majority (LM), and laggards (LA). These levels have a distinct natural ordering. This type of variable is called an ordinal variable. To investigate which independent variables predicted the rate (speed) of implementation of innovation, ordinal logistic regression was utilized with a proportional odds model (cumulative logit model).



Binary logistic regression was used to compare the following ordered collapsed categories:

1. (IN) to (EA, EM, LM, and LA) or
2. (IN and EA) to (EM, LM, and LA) or
3. (IN, EA, and EM) to (LM and LA) or
4. (IN, EA, EM, and LM) to (LA)

The following figure illustrates the collapsing of categories:



The odds of collapsed Group 1 (G1) is

$$Odds(G1) = \frac{P(G1)}{P(G2)}$$

The proportional odds model makes an important assumption. Under this model, the odds ratio assessing the effect of a cofactor for any of these combinations will be the same regardless of the combination.

Categorical Variables

A nominal categorical variable (sometimes called a nominal variable) is one that has two or more categories, but there is no intrinsic ordering to the categories. For example, gender is a nominal categorical variable having two categories (male and female) and there is no intrinsic ordering to the categories.

Ordinal Variables

Ordinal variables have a clear ordering among the levels. For example, the variable of socioeconomic status could have three categories: low, medium, and high. In addition to being able to classify people into these three categories, you can order the categories as low, medium, and high. A variable like educational experience can be ordered as elementary school, high school, some college, and college graduate, but even after arranging these from lowest to highest, the spacing between the values may not be the same across the levels of the variables. Say we assign scores 1, 2, 3, and 4 to these four levels of educational experience and compare the difference in education between categories 1 and 2 with the difference in educational experience between categories 2 and

3, or the difference between categories 3 and 4. It might be argued that the difference between categories 1 and 2 (elementary and high school) is much bigger than the difference between categories 2 and 3 (high school and some college). In this example, we can order the people by level of educational experience but the sizes of the differences between categories are inconsistent (because the spacing between categories 1 and 2 is bigger than that between categories 2 and 3). If these categories were equally spaced, then the variable would be an interval variable.

Methods of Comparison

The five adopter categories (innovators, early adopters, early majority, late majority, and laggards) lend themselves to additional regression analysis. The adopter classification system is not symmetrical, according to Rogers, and one solution would be to combine adopter categories into larger groups, but their quite different characteristics suggest that there are distinct adopter categories (Rogers, 2003). Predicted probabilities of the observed outcomes can be presented, discrete changes in probabilities can be examined, and the model can be interpreted in terms of odds ratios. The Wald test can determine if beta coefficients are nonzero, and the Wald chi-square can test for nonzero coefficients for individual variables. The Wald test can be used to test the true value of the parameter based on the sample estimate. The null hypothesis is that the intercept is equal to zero.

Three statistical tests were executed and analyzed. First, each of the variables was tested individually through univariate tests for its impact on speed of adoption of innovation. Second, environmental variables were compared with organizational variables to determine which set was more predictive of speed of adoption of innovation. The third statistical test was a “global” test in which all variables were analyzed at the same time for any relationship relative to speed of adoption of innovation.

Summary

The data for this study were derived primarily from the AHA annual database. The survey is reliable and valid and has been used for research for many years. Hospitals that have adopted magnet programs were considered the sampling frame, and hospitals were classified into five categories of adoption modeled after the research of Everett Rogers on adoption of innovation. The time of adoption, i.e., the date of designation of magnet status, was gathered from the ANCC.

CHAPTER 4:

ANALYSIS AND PRESENTATION OF FINDINGS

Introduction

The purpose of this chapter is to provide an analysis of the information used to assess the study hypotheses and to present the findings from the research. A description of the sampling methodology is first reviewed. This chapter explores the descriptive statistics of the study population accompanied by a review of research questions. Results and findings specific to each hypothesis are then presented for observation. A summary of the findings completes the chapter.

Sampling Methodology

The sampling frame for this study consisted of all U.S. hospitals registered with the American Hospital Association (AHA) from 1994 through 2010. There were 6,591 hospitals registered in the AHA database in 1994. The timeframe of 1994 to 2010 corresponds with all hospitals designated as magnet hospitals by the American Nurses Credentialing Center (ANCC) from inception through the end of all public reporting periods. In other words, the timeframe included the first designated hospital and all hospitals designated during a 17-year period for which data from the AHA was available.

There were 392 ANCC-designated organizations from 1994 through 2010. A total of 68 facilities were excluded from the study population for a variety of reasons; many facilities were excluded because they shared the same identification numbers. The assumption was that those facilities were consolidated as a part of a larger system or were acquired by another organization. Twenty-one magnet facilities were designated during 2011-2012, and they were excluded from the study since AHA survey data were not available due to the lag in reporting and collection of data. Veterans Administration hospitals were excluded since they have different organizational complexity and compete differently in the environment. A handful of facilities were excluded due to lack of information available within the AHA annual database. The total study population available for analysis was 324 hospitals after adjusting for the aforementioned factors.

Imputation of Missing Data

There were 204,000 data values in the dataset. When examining missing values, the initial estimate was that 19,872 values were missing, or nearly 9.7%. Therefore, an imputation process was created to resolve the missing data issue. The method for imputation was the following: (a) For a given hospital and variable, if at least 1 year had datum, that datum was carried backward or forward to fill the missing variable. In other words, if data were available for 2005 but were missing for 2004, the data for 2005 were carried backward to 2004. If data were missing for 2002 but were available for 2001, data were carried forward to fill 2002.

There were instances for a given hospital and variable where all years of data were missing for one variable. In this circumstance, the most frequent response for the same year for all hospitals in the study was used for dichotomous variables. For continuous variables, the mean of all other hospitals was used for the corresponding year.

The result of this process was that missing values dropped from 19,872, or nearly 10% of all values in the dataset, to 24 missing values, or less than 0.01%.

Redefining Competition

Competition was originally proposed as a Herfindahl index, which is defined as the total inpatient admissions of a hospital relative to the total admissions for the county or geographic area. In other words, competition was defined as market share of inpatient admissions for each magnet-designated hospital.

There were several problems with this approach. The assumption inherent in use of a Herfindahl index is that competition in a hospital's market would be mirrored in its labor market for health professional manpower. Using hospital inpatient admissions as a surrogate for health professional manpower is at best indirect. Product and service competition may not capture labor market dynamics (Sanders, 2007). Second, outpatient admissions have become a major portion of business activity for hospitals, and outpatient revenues are increasing every year. Furthermore, outpatient revenues are now the most profitable portion of a hospital's profit margin and constitute a major strategic focus for hospitals. Market share of inpatient admissions would therefore be an increasingly less important factor for most hospitals. Third, further compounding the problem was the definition of market. The definition of a market may not conform to actual medical trade areas or labor markets very closely. Finally, complete market share data for a 17-year period for 324 distinct markets was unavailable, resulting in an inability to adequately analyze the variables.

Therefore, the definition of competition was changed to more closely reflect labor market competition for manpower and, specifically, registered nurses. The assumption was that markets with lower nurse-to-population ratios would have a more scarce supply of registered nurses and would be more competitive markets for registered nurses. The inference was that hospitals in tight labor markets would be more amenable to innovative methods of recruitment and retention.

Data were available through the Bureau of Labor Statistics regarding the number of registered nurses by county, city, metropolitan statistical area (MSA), and micropolitan statistical area from 1997 through 2010. Using population statistics from the U.S. Census Bureau for corresponding years by MSA, a ratio of registered nurses per 1,000 population was calculated and used for analysis.

Information regarding registered nurses by MSA was lacking for only two of the 324 magnet facilities analyzed in this study. Both hospitals were designated between 1994 and 1995 by the ANCC. Population data by MSA was available for all years of the study (1994-2010). An approach for missing values for these two magnet facilities involved a bootstrapping approach of utilizing a ratio of registered nurses per 1000 population for 1997 and then adjusting the ratio for the population of the specific MSA for those two hospitals. The first hospital was designated in 1994, thus requiring a 3-year adjustment of the nurse per 1,000 population, while the other facility designated in 1995 required a 2-year adjustment. No hospitals were designated as magnet facilities in 1996.

The same methodology utilized to construct the nurse per 1,000 population statistic was used to build a health professional per 1,000 population ratio. Information was available through the Bureau of Labor Statistics regarding the number of health professionals by city, county, MSA, and micropolitan statistical area from 1997 to 2010. Using population statistics for the corresponding geographic area and the same period of time from the U.S. Census Bureau, a ratio of healthcare professionals per 1,000 population was designed and used for analysis. The same bootstrapping approach described above was utilized.

Discussion of Collapsed Categories

The foundation of Rogers' work was the classification of samples into adopter categories. As previously discussed, Rogers defined five groups, each constituting a specific percentage of adopters:

- Innovator, 2.5%
- Early adopter, 13.5%
- Early majority, 34.0%
- Late majority, 34.0%
- Laggards, 16.0%

Given the elapsed time frame (17 years), it was decided to keep all hospitals who achieved magnet designation in the same calendar year in the same category. There was no scientific basis for this method; it simply seemed illogical to categorize one hospital adopting in 2006 as early majority while another adopting 2 months later in 2006 as late majority. For the 324 magnet hospitals from 1994 through 2010 that comprised the study group, an effort was made to adhere as closely as possible to Rogers' percentages while also keeping calendar years together. The classification and how it compared to Rogers' work is illustrated below.

Category	Rogers' distribution	Study distribution	N	Calendar year
Innovator	2.5%	1.8%	6	1994-1997
Early adopter	13.5%	12.0%	40	1998-2002
Early majority	34.0%	33.0%	106	2003-2005
Late majority	34.0%	31.0%	101	2006-2008
Laggards	16.0%	22.0%	71	2009-2010

The small sample size of hospitals in the innovator category (1.8%) was problematic, because it would result in some cells of analysis having less than five observations, violating the chi square approximation test condition. As mentioned earlier in this study, a minimum of five observations per cell was expected for multilevel ordinal logistic regression. Without combining innovator and early adopter categories, some cells would be empty, which would cause model instability. Therefore, a decision was made to combine the innovator and early adopter categories into one group.

Descriptive Statistics

Descriptive statistics were analyzed for the database of 324 hospitals. Mean and standard deviation were calculated for the entire group of variables that were continuous. Six data elements were dichotomous and thus categorical variables; those six factors were coded as presence or absence of a condition (1, 0). Three of the six categorical variables included (1) whether or not a hospital was a cumulative adopter of magnet, (2) whether or not the hospital was for-profit or not-for-profit, and (3) whether or not there was a nursing school in the metropolitan area of the designated hospital. Those three variables were abstracted from data sources other than the AHA survey. The other three categorical variables were abstracted from the AHA survey: the presence or absence of a hospital-controlled nursing school, whether or not the hospital was a member of the Council of

Teaching Hospitals (a surrogate for being considered a teaching hospital), and whether or not the hospital was a member of a network. Two additional variables were calculated as a ratio during a fixed point in time: registered nurses per 1,000 population and healthcare professionals per 1,000 population in the specific MSA during the year of magnet designation for each hospital. These are referred to as discrete variables.

The descriptive statistics for the continuous variables were examined first. The mean number of hospital beds for magnet hospitals at designation was 388 with a standard deviation of 222. This is larger than the average number of beds for all hospitals in the United States. In previous studies of magnet hospitals (Sanders, 2007; Jerome - D'emilia et al., 2008), hospitals that were magnet hospitals were large, not-for-profit hospitals.

Other measures of size and activity were also analyzed in the descriptive statistics. Adjusted occupancy was a better reflection of work activity in a hospital than inpatient days or inpatient admissions. Adjusted occupancy includes a measure of outpatient activity (observation days, outpatient procedures and visits, and inpatient activity divided by total hospital beds). Adjusted occupancy had a mean of 434 with a standard deviation of 229. This also confirmed some of the findings of previous research that magnet-designated hospitals are busier and larger than other hospitals.

Registered nurses per 1,000 population and health professionals per 1,000 population were used as surrogates to measure labor competition among magnet-designated hospitals. The mean is an appropriate measure of central tendency when using ratios such as these. The mean number of registered nurses per 1,000 population for hospitals in this research was 10.23 with a standard deviation of 16. Health professionals per 1,000 population was a broader measure of labor force competition, and its mean was 29 with a standard deviation of 44.

Among the categorical variables, nearly a fourth (24.7%) of all the magnet hospitals were cumulative adopters of magnet programs. Nearly all of the magnet hospitals (97.5%) were not-for-profit hospitals, and a majority (70 %) were considered teaching hospitals. The presence of a nursing school within the MSA of the magnet hospitals was an intriguing element of study. Less than 7.5% of all magnet hospitals had such a resource (nursing school) in their MSA. The other nursing school element included in the study was whether or not the hospital had a controlled professional nursing school under its influence; 90 percent of all hospitals answered yes to that question. Being part of a system was a frequent characteristic of magnet hospitals; 43.5% of all magnet hospitals were part of a system or network.

Whether or not a hospital was located in a MSA was a significant factor noted in past research (Sanders, 2007; Jerome - D'emilia et al., 2008). Therefore, the population for the magnet-designated hospitals was also included in descriptive statistics. The mean MSA population for all hospitals was 3.04 million, with a standard deviation of 4.2 million. This mean population is the equivalent of about the 13th largest city in the U.S. Many magnet hospitals were geographically clustered on the East and West Coast, with an abundance of facilities in California, New York, and New Jersey.

Results and Findings

This research investigated four primary hypotheses and 10 secondary hypotheses to answer the five research questions. The five research questions were as follows:

1. Do environmental factors influence the speed of adoption of innovation? If environmental factors do influence the speed of adoption, then which environmental factors significantly influence adoption, and what is the direction of their influence?
2. Do organizational factors influence the speed of adoption of innovation? If organizational factors do influence the speed of adoption, then which organizational factors significantly influence adoption, and what is the direction of their influence?
3. If environmental and organizational factors do influence the speed of adoption of innovation, is one set of factors more influential than the other? If one set of factors is more influential, what is the direction of the influence and the magnitude?
4. What, if any, influence do both environmental and organizational factors acting jointly have on speed of adoption of innovation?
5. If environmental and organizational factors significantly influence speed of adoption of innovation, which environmental and organizational factors are singularly significant? What is the direction of the influence for each of those variables?

The following subsections present results and findings for each primary hypothesis and its associated secondary hypotheses. In accordance with the five categories of adopters outlined in chapter 3, binary logistic regression was used to compare four ordered collapsed groups.

Hypothesis 1.0: Environmental Influences and Speed of Adoption

The first primary hypothesis proposed that there is a significant positive influence between environmental factors (level of environmental complexity, competition, critical mass, community resources) and the rate at which organizations adopt innovation (designation as a magnet hospital). Tables 4 and 5 depict the ordinal regression results for this hypothesis and each variable, including each of the four ordered collapsed categories. Three of the four environmental factors had two variables each and critical mass had one variable, for a total of seven variables tested. The seven variables were MSA population, whether or not the hospital was located in a geographic area with a ranking in the top-100 cities, registered nurses per 1000 population, health professionals per 1000 population, whether or not the hospital was adopting magnet designation due to the presence of a magnet competitor in the same geographic area ("competitive adopter"), whether or not the hospital had a controlled professional nursing school, and whether the hospital was located in a community with an accredited nursing school with registered nurse programs.

The chi square statistic for the entire group comprising environmental influences was nearly 18 with a significance of 0.01 ($\chi^2 = 17.9$, $df = 7$, $p = .01$). For the entire group of seven variables, only one was significant: competitive adopters ($p < .01$). It is important to note that this model was unstable due to including the variable referred to as hospital controlled professional nursing schools (defined as MAPP6 in the AHA survey data). This variable (hospital controlled professional nursing school) made the variance covariance matrix singular, which resulted in an unstable model. We refitted the model without the MAPP6 with different outcomes. The chi square statistic for the refitted group (six variables) comprising environmental influences was different (x^2 = 17.9, df=6, p=.00). Two variables were significant in the refitted model; competitive adopters (p=.00) and health professionals per 1000 population (p=.04).

Given the chi square statistic and the fact that the *p* value was significant, the revised group of six variables and the results support rejection of the null hypothesis in favor of the alternative hypothesis that the environmental factors as a group were significantly related to speed of adoption of innovation. The secondary hypotheses for each factor were then examined.

Hypothesis 1.1: Environmental Complexity

The first secondary hypothesis stated that there is a significant influence between environmental complexity and the rate at which organizations adopt innovation. Environmental complexity was generally defined as location in an urban area. Environmental complexity was measured both categorically and through the use of a continuous variable. The primary data element was MSA population for every magnet hospital by location. The secondary data element was captured from the AHA annual survey, which identified hospitals located in cities with population greater than 100,000. Table 6 presents the ordinal regression results for both components of environmental complexity.

For the MSA population, the mean population was greatest among the innovator and early adopter category. This group had a mean population of 4.1 million (standard deviation [SD], 6.1 million), while the early majority had a mean population of 2.8 million (SD, 3.99 million); the late majority, 2.5 million (SD, 3.6 million); and laggards, 3.4 million (SD, 3.7 million) (Table 3). Table 6 depicts the ordinal regression results for both factors in this category, MSA and city rank. The chi square statistic was 3.9; however, the relationship was not significant (p = .14).

These findings necessitate a failure to reject the null hypothesis. There was no significant relationship (p = .14) between environmental complexity and rate of adoption of innovation based upon the results from two variables.

Hypothesis 1.2: Competition

The second hypothesis for environmental factors presumed that there is a significant influence between competition and the rate at which organizations adopt adoption. The definition of competition was changed to accurately portray labor market competition. This involved the application of two discrete variables: nurses per 1,000 population and health professionals per 1,000 population for each market where a magnet-designated hospital was located.

Table 3 and Table 7 provide the mean statistics and ordinal regression results. Overall, there were 10 nurses per 1,000 population (SD, 16) and 29 healthcare professionals per 1,000 population (SD 44). There was some variability by adopter category for both variables. For the adopter category of innovator and early adopter, there were 27 health professionals per 1000 (SD, 26); for early majority, 35 (SD, 73); and for late majority, 26 health professionals per 1000 population (SD, 9) (Table 3).

The results of the statistical analysis were that the variable was not significant (χ^2 = 4.8, df = 2, p = .09) in influencing the rate of adoption of innovation, even though one subcomponent (health professionals per 1,000) was significant ($\chi^2 = 4.2$, $df = 1$, $p = .04$). The findings resulted in failure to reject the null hypothesis.

Hypothesis 1.3: Critical Mass

The third hypothesis within the framework of environmental factors stated that there is a significant influence between critical mass and the rate at which organizations adopt innovation. One distinct data element available for study was the presence of competitors in the local market who were already magnet facilities. This phenomenon is referred to as cumulative adopters for this study. Empirical literature has been conducted on the changes in definition of market competition among large hospitals. Hospitals are forming networks using product lines as a method of expanding geographic reach (Pedigo & Odoi, 2010; Shi, 1994). A study of all freestanding children's hospitals in 1991 revealed that 72 percent of the hospitals developed a pediatric network, and 58 percent developed a relationship with an adult health care organization in response to a perceived increase in competition (Yee et al., 2001). Additional confirmation of the influence of competitors in the market included a sample of 187 hospitals whose results indicated that market focused strategies are chosen by hospitals that perceive greater environmental instability (Kumar et al, 2002). Tropello concluded that hospital organizations can strategically capture market share while insuring best practice if they adopt the magnet model (Tropello, 2003).

A competitive adopter of magnet designation was defined as a competitor within 90 miles of the study hospital who had achieved magnet designation by the time the study hospital was designated. Data from the ANCC provided the year of designation for every magnet facility, and facilities designated in the same year in the same geographical area (within 90 miles) were considered competitive adopters. The 90-mile range was used since hospitals consider market competitors on a regional or statewide basis (Bernstein & Gauthier, 1998). McHugh noted that magnet recognition is now an indicator for national hospital and quality rankings such as U.S. News and World report and Leapfrog rankings (McHugh et al, 2012).

For the critical mass hypothesis (Tables 3-4, 8), the number of competitive adopters was 80 (25%), with a chi square statistic of 10.18 and a significant relationship ($\chi^2 = 10.2$, $df = 1$, $p < .01$) between the percentage of competitors in a given market who were magnet designated and the speed of adoption of hospitals seeking magnet designation. The number of competitive adopters decreased across adopter categories over a period of time (Table 3). The innovator and early adopter group had 18 competitive adopters (40%); the early majority group had 29 (28%); the late majority group had 24 (24%); and the laggard group had 9 hospitals (13%). For the critical mass hypothesis, the null hypothesis was rejected in support of the alternative hypothesis that there is a significant, positive association between rate of adoption and the presence of another competitor in the market who was a magnet adopter, defined as critical mass.

Hypothesis 1.4: Community Resources

The fourth hypothesis for environmental factors stated that there is a significant positive influence between community resources and the rate at which organizations adopt innovation. Two specific data elements were studied: the number of accredited nursing schools in each market in which a magnet-designated hospital was located and whether or not the hospital had a controlled professional nursing school.

Tables 3 and Table 9 provide the descriptive statistics and depict the ordinal regression results for this hypothesis for the study population of 324 hospitals. Data for the first variable were supplied by the American Association of Colleges of Nursing. The description of this variable is the number of accredited nursing schools in the geographic region. There were a total of 24 magnet hospitals (7%) that had an accredited nursing school in the community. An examination by adopter category revealed that the number of nursing schools for the innovator and early adopter category was seven (4%). The early majority group had nine schools in the community (8%), while the late majority group had five schools (5%) and the laggard group had a total of eight schools (11%) (Table 3).

Data for the hospital-controlled professional nursing school variable was available through the AHA index. The total number of schools for the second variable was 291 (90%), which was consistent across all groups (Table 3). The data does not seem correct and the application of the data in the model rendered the model unstable. Beyond the inclusion of the variable in the analysis below, the variable was dropped in the combined environmental influences and the combined environmental and organizational influences.

The subcomponents of the variable were consolidated into one statistical test. The variable was not significant ($\chi^2 = .82$, $df = 2$, $p = .66$). Neither of the individual variables was significant. Therefore, the null hypothesis that there is no significant influence between community resources and the rate of adoption of innovation by organizations cannot be rejected.

Hypothesis 2.0: Organizational Influence and Speed of Adoption

The second primary hypothesis proposed that is was a significant positive influence between organizational influence (level of organizational complexity, size of organization, slack resources, external networks, control of domain, and type of hospital) and the rate at which organizations adopt innovation (designation as a magnet hospital). Tables 3, 4, and Table 10 depict ordinal regression results for this hypothesis for the study population (N = 324).

There were a total of eight variables: level of organizational complexity, size of organization, slack resources, and external network had one variable each, while control of domain and hospital structural characteristics each had two variables. The first variable was the organizational complexity rate, or the number of programs and services each hospital possessed at the time of designation. The remaining seven variables included number of hospital beds, hospital occupancy (adjusted patient days divided by hospital beds), full-time registered nurses per adjusted patient day, full-time registered nurses per general hospital bed, participation in an external network or hospital system, for-profit versus not-for-profit status, and membership in the Council of Teaching Hospitals.

The chi square statistic for the entire group comprising organizational influences was 78 with a significance of <.01 ($\chi^2 = 77.9$, $df = 8$, $p = .00$). Several variables contributed to the significant influence of organizational influence on rate of adoption. The organizational complexity rate, hospital occupancy (adjusted patient days/hospital beds), control of domain (full-time registered nurses/adjusted patient days), not-for-profit status, and membership in the Council of Teaching Hospitals demonstrated significance in the combined model. The model was a good fit since almost 75 percent of the area was represented by the early adopter categories (.74, see table 10) in this model.

These results support rejection of the null hypothesis in favor of the alternative hypothesis that organizational influences as a group are significantly related to the rate of adoption of innovation. The secondary hypotheses for each organizational factor were then analyzed.

Hypothesis 2.1: Organizational Complexity

The first hypothesis for organization influences states that there is a significant positive influence between organizational complexity and the rate at which organizations adopt innovation. In general terms, is the rate of organizational complexity a clinically and statistically significant predictor of early adopters of innovation?

The measure for organizational complexity in this study involved programs, services, and types of beds offered by hospitals over the entire time period. This variable had the greatest change over the study period due to the explosion of technology, innovation, and research and the market availability of programs and services in small hospital markets. There were approximately 50 programs and services within hospitals that met the definition of organizational complexity in 1994. The number of services actually went down from 1995 until 1999. However, by 2005 the number had increased to 73 programs and services, and by 2010, to 85. Each program, service, and specialty bed designation was mapped from its beginning throughout the study period. Some programs and services were available for each of the 17 years of the study, while others were available for as little as 2 years. A tally of all programs and services meeting the organizational complexity definition were included, and a percentage of total organizational complexity was calculated to observe the range of complex services each hospital provided relative to the maximum number of complex services each year.

In addition to programs and services, the presence of specialty beds in a hospital was used as a surrogate for organizational complexity. The logic surrounding the inclusion of specialty beds of any type is twofold. First, the presence of specialty beds would provide evidence of a functionally differentiated organization and represent a challenge in coordination and control. This was a significant finding from the meta-analysis of organizational complexity (Damanpour, 1991). Second, it is conceivable for a hospital to contain specialty beds without the corresponding program. In other words, a hospital could have neonatal intensive care beds but not have a labor and delivery unit or a postpartum unit. A more likely example would be the presence of cardiac intensive care beds without having a diagnostic cardiac catheterization lab. Many hospitals have successfully operated a cardiac emergency program through the use of thrombolytics and intensive care beds. If only programs and services were included to the exclusion of specialty beds, some hospitals could be excluded from the study.

The identification of organizational complexity factors was limited to hospital-provided services only. The AHA annual survey has multiple questions related to each program and service, ranging from hospital-provided service only to contract services or purchased services. For purposes of this study, only hospital-provided services were included. Each service was counted equally; in other words, a sleep center and a stroke service were given the same value. In the same fashion, the presence or absence of specialty beds was counted the same way regardless of the number of specialty beds. The presence of coronary intensive care beds or a coronary intensive care unit was scored the same way as a sleep center or a pain management center. The rationale behind this scoring methodology was to avoid giving disproportionate weight to beds over services.

The studied factor included the percentage of organizational complexity for each magnet hospital relative to the total potential complexity available during each year of the AHA survey. This variable was referred to as organizational complexity rate. The chi square statistic combined with a significance ($\chi^2 = 7.0$, $df = 1$, $p = .00$) demonstrate an influence on adoption of innovation (Table 11). Further examination by adopter category (Table 3) provides more knowledge. The mean score for the organizational complexity rate for innovators and early adopters was 57 (SD 31), compared with 61(SD 29) for the early majority group, 50 (SD 24)for the late majority group, and 51 for laggards (SD 25).

The analysis illustrated that organizational complexity is a significant influence on adoption of innovation as a singular variable ($p = .00$). Therefore, the null hypothesis is rejected in support of the alternate hypothesis that there is a significant influence between organizational complexity and the rate at which organizations adopt innovation (magnet programs by hospitals).

Hypothesis 2.2: Size

It was hypothesized that there is a significant influence between organizational size and the rate at which organizations adopt innovation. In studies of innovation involving organizational influence, size has been the most prevalent variable studied. Size has also produced the greatest "yield" of empirical evidence related to innovation and organizational influence. For purposes of this study, size was measured as number of beds in operation. The data were available in the AHA annual survey of hospitals.

The chi square statistic combined with a significance ($\chi^2 = 4.7$, $df = 1$, $p = .03$) resulted in the probability of influence on adoption of innovation (Table 4, Table 12). The mean number of hospital beds decreased by adopter category (see Table 3), with 421(SD 215, SD 251) for the innovator and early adopter category and the early majority category, 356 (SD 187) for the late majority category, and 364 for the laggards (SD 221). The overall mean number of beds across all categories was 388 (SD 223).

In summary, the number of hospital beds as a singular variable was significant, leading to a rejection of the null hypothesis in favor of the proposed hypothesis.

Hypothesis 2.3: Slack Resources

It was hypothesized that there is a significant influence between slack resources and the rate at which organizations adopt innovation. The measure of slack resources for this study was adjusted hospital occupancy. Early definitions of hospital occupancy focused on inpatient activity such as inpatient days or inpatient census. This reflected the dominance of inpatient care in a hospital. Over the last 15 years, a more refined measure of hospital occupancy has emerged that includes an adjustment for outpatient activity such as outpatient procedures, outpatient surgery, and patients who are observed over a 23-hour period and then discharged. Outpatient activity in a hospital consumes resources and, therefore, it stands to reason that outpatient activity should be reflected in any measure of resource activity. For purposes of this study, adjusted patient day was utilized to portray the total activity in a hospital, and the adjusted measures were used in a ratio to measure slack resources.

All information was obtained from the AHA annual survey. The equation utilized to test for slack resources (adjusted patient days / number of hospital beds) was significant with a chi square statistic of 19 ($\chi^2 = 19.5$, $df = 1$, $p = .00$) (Table 4, Table 13). The means for each adopter category illustrated an increasing occupancy over time: the mean for the innovator and early adopter category was 357 (SD 113); early majority hospitals, 424 (SD 104); late majority hospitals, 430 (SD 120); and laggard hospitals, 507 (SD 433) (Table 3).

The significant ($p < .00$) and strengthening influence combined with the percentage of area covered (.72) supports the rejection of the null hypothesis in favor of the proposed hypothesis that slack resources is a significant influence on the rate of adoption of innovation (magnet designation) by hospitals.

Hypothesis 2.4: External Networks

It was hypothesized that there is a significant association between external networks and the rate at which organizations adopt innovation. The measure for external networks was a question posed in the AHA annual hospital survey that asked whether or not the hospital was a part of a system, alliance, or network. Data were available for the entire study period, and the variable was a simple yes/no response.

The total number of magnet hospitals that indicated they were a member of an external network was 141 (44%). The number of hospitals for each adopter group ranged from 22 (innovators and early adopters (48%); early majority, 52 (49%) ; late majority,38

(38%) ; laggards, 29 (41%) (Table 3). The chi square statistic for the variable (Table 14) identified no significant association ($\chi^2 = 2.0$, $df = 1$, $p = .16$). The statistics for each adopter category were mixed.

The results of the analysis led to a failure to reject the null hypothesis that there is not a significant influence between hospitals in a network and the rate of adoption of innovation in hospitals.

Hypothesis 2.5: Control of Domain

The theory behind control of domain was that the more nurses in a hospital and the greater their concentration, the greater influence nurses would have regarding interest and participation in programs of excellence such as nurse magnet programs. It was hypothesized that there is a significant influence between control of domain and the rate at which organizations adopt innovation. The measure related to control of domain was the number of registered nurses per hospital bed, a simple ratio of daily registered nurse staffing to the number of hospital beds in operation on a given day. Beds in operation refer to beds staffed by nurses and available for patient care.

As previously discussed, outpatient activity has evolved into an important aspect of hospital activity, revenues, and strategic importance. A significant portion of hospital operating margin is generated from outpatient services, and the shift from inpatient care to outpatient care has been a decade-long trend. Nursing is a vital component of outpatient services. Therefore, it made sense to seek measures of nurse staffing that would encompass outpatient activity.

Because of the rich data available through the AHA survey, a ratio of registered nurses per bed as well as a ratio of registered nurses per adjusted patient day was used to capture the amount of outpatient activity in a given hospital measured against the number of full-time equivalent registered nurses practicing on any given day. Two equations were used: first, the number of full-time registered nurses divided by the number of adjusted patient days in a given hospital, and second, the number of full-time registered nurses divided by the number of total hospital beds. The control of domain variable was significant (x^2=32.7, df 2, p=.00); however, only one variable resulted in the outcome.

The mean scores for the second equation (full-time registered nurses divided by the number of hospital beds) illustrated a linear relationship: from a low of 1.39 (SD .62) for the innovator and early adopter category to 1.7 (SD .64) for early majority and further increasing to 1.8 (SD .59) and 2.1(SD .78) for late majority and laggards, respectively (Table 3). The first equation (number of full-time registered nurses divided by the number of adjusted patient days) did not generate the same linear relationship but stayed at 0.004 (SD .001) for all categories except the laggard group which was 0.005 (SD .002).

The chi square result for the second equation was significant ($\chi^2 = 19.5$, df 1, $p <$ .00) (Tables 4 and 15), resulting in rejection of the null hypothesis in support of the hypothesis that control of domain is a significant influence on the rate of adoption of innovation by organizations and specifically adoption of magnet programs.

Hypothesis 2.6: Hospital Structural Characteristics

It was hypothesized that there is a significant influence between hospital structural characteristics (hospital ownership defined as not-for-profit status and teaching affiliation) and the rate of adoption of innovation by organizations. Both data elements were dichotomous variables. The total number of for-profit hospitals was eight (3%) and the number for each adopter category ranged from zero to four (Table 3). The hospitals studied were predominantly not-for-profit.

The second data element involved a question from the AHA annual survey about membership in the Council of Teaching Hospitals, a national organization of academic hospitals. The total number of magnet hospitals that indicated they were teaching hospitals was 227 (70%); the first two categories (innovator and early adopter, early majority) had 28 (60%) and 64 hospitals (60%) respectively that were teaching hospitals and the two remaining adopter categories (late majority, laggard) had 71 (70%) and 50 (70%) hospitals respectively that were teaching hospitals.

The analysis was conducted using both variables in one combined test (Table 16). The outcome was significant (χ^2 = 6.6, *df* = 2, *p* = .04). However, it is important to note that only not for profit status demonstrated significance (x^2=4.8, df =1, *p* = .03). The product of the analysis results in rejection of the null hypothesis, meaning there is a significant influence between hospital structural characteristics (hospital ownership defined as not-for-profit status and teaching affiliation) and the rate at which organizations adopt innovation. This association is present due to the significant influence relative to not-for-profit status, a subcomponent of the variable, since teaching status did not reflect a significant association with the dependent variable.

Hypothesis 3.0: Differences Between Environmental and Organizational Influences

It was hypothesized that there is a significant difference between environmental influences and organizational influences and the rate at which organizations adopt innovation. An assessment of the variables within the environmental influence group (Table 4) (level of environmental complexity, competition, critical mass, community resources) revealed that there was a significant influence (χ^2 = 17.9, *df* = 7, *p* = .00) from environmental factors on the rate at which organizations adopt innovation. Only one singular variable (critical mass defined as cumulative adopters) was deemed significant in the analysis of environmental influences. The area covered under the model for early adopters was .58 which does not represent a good fit of the model to the variables.

Organizational influences did have a significant positive influence on the rate at which organizations adopt innovation. The level of organizational complexity, slack resources, control of domain, and hospital structural characteristics were each significant components of organizational influence (Table 4). External networks were not significant. For the entire set of organizational influences, there was a significant positive (χ^2 = 77.9, *df* = 8, *p* = .00) influence between organizational influences and the rate at which organizations adopt innovation. The area represented under the model for early adopters was .74 meaning that the model was a good fit.

Four variables within the set of organizational influences were significant compared with one variable in the environmental services set. Additionally, there was a difference in significance (organizational influence, *p* = .0001, environmental influence, *p* = .0064) between the two groups.

Therefore, there is a significant difference between environmental influences and organizational influences and the rate at which organizations adopt innovation which leads to the rejection of the null hypothesis in favor of the proposed hypothesis.

Hypothesis 4.0: Environmental and Organizational Joint Influence

All variables demonstrating singular or group significance were grouped into one cohort and analysis applied accordingly. The final outcome (Table 17) demonstrated the significant influence ($\chi^2 = 83$, $df = 6$, $p = .0001$) of five variables on the rate of adoption of innovation. The five variables were critical mass (competitive adopters), hospital structural characteristics (not-for-profit status), organizational complexity, control of domain (full-time registered nurses per hospital bed), and slack resources (adjusted patient days divided by hospital beds) (Table 17).

Therefore, there is a significant influence between environmental and organizational factors acting jointly on the rate at which organizations adopt innovation. The null hypothesis is rejected in support of the alternate hypothesis that environmental and organizational factors acting together significantly influence the rate of adoption of innovation by organizations.

Summary of Results

Table 19 and Figure 5 summarize the findings in support of each hypothesis. The conclusions and implications of these findings are discussed in the next chapter.

CHAPTER 5:

DISCUSSION AND CONCLUSIONS

Introduction

The purpose of this chapter is to discuss the findings from this study and their implications for advancing knowledge. Findings related to the primary and secondary hypothesis and explanations of these findings will be considered. Second, implications of the findings relative to advancing scholarly understanding and professional practice will be discussed. Third, limitations of the study are reviewed. Finally, recommendations for future research are discussed. This section concludes with an overall summary of the research, findings, and conclusions.

Conclusions by Hypothesis and Explanation of Findings

The purpose of this study was to study why particular innovations in health care are adopted more rapidly by some organizations than others. Environmental and organizational influences were studied for predictive influence regarding adoption of the magnet hospital concept representing an administrative innovation. A research model was tested that related a set of environmental and organizational factors to the rate of adoption of innovation by organizations. Five research questions were posed to guide this research. The research questions concerned the influence of selected environmental factors as a group and singularly on the rate of adoption of innovation, the influence of selected organizational factors as a group and singularly on the rate of adoption of innovation, the relative influence of each of these distinct groups on rate of adoption of innovation, and the joint influence of both groups as well as all individual factors on rate of adoption of innovation.

Environmental Influences and Rate of Adoption

The first research question posed whether environmental factors influence the speed of adoption of innovation and if environmental factors as a group are influential, which environmental factors significantly influence the rate of adoption and what is the direction of the influence. Analysis supported the first primary hypothesis that there is a significant influence between environmental factors as a group and the rate at which organizations adopt innovation. Early adopters of innovation have more of these characteristics than late adopters. This finding supports the strategic management perspective (Porter, 1980, 1985, Shortell & Zajac, 1990, Shortell & Kaluzny, 2006) that environmental forces influence the strategic choices by organizations.

The second part of the research question considered which environmental factors were influential and what was the direction of their influence. The secondary hypothesis addressed this question for each of the seven environmental factors. Environmental complexity was not found to be statistically significant. There were two variables (MSA population, rank in top 100 cities) examined.

The lack of a significant finding for the variable may have application to a previous finding from other research that a possible curvilinear relationship exists between urban location and adoption of innovation since both lower density (micropolitan) and very high density (metropolitan) locations were not significantly associated with adoption of magnet programs (Sanders, 2007).

Competition was refined to focus on labor market competition for this research. Labor market competition included registered nurses and health professionals. A ratio was derived to assess nurses per 1,000 population and health professionals per 1,000 population as leading indicators of labor force competition. The lower the ratio the greater the perceived competition, and therefore the greater perceived value of magnet designation. In light of the findings, this assumption should be questioned. Competition was not found to be related to adoption. This finding suggests that additional thought and study needs to be conducted regarding its role in influencing innovation or perhaps in the measure or operationalization of the term competition.

The inference regarding critical mass is that there is a tipping point that accelerates adoption of innovation. For purposes of this research, the tipping point was identified as the presence of another competitor hospital with magnet designation within 90 miles. The competitor hospital was referred to as a competitive adopter. Critical mass was significantly associated with the rate of adoption of innovation. The findings from this research align with theoretical assumptions based on institutional theory. Isomorphism or the concept that conformity helps organizations receive recognition, status, and legitimacy is particularly relevant to the findings regarding this hypothesis. It is conceivable to suggest that the driving force of competition may persuade some hospitals to adopt innovation to maintain status, power, or image. These findings shed light on new knowledge that can be utilized to advance understanding relative to early adoption of innovation.

The definition of community resources focused on the presence of nursing schools in the community and hospital controlled professional nursing programs. The premise was that the greater the number of community resources the greater influence on adoption of magnet programs since the presence of a nursing school would generate awareness and interest in seeking greater professional development. The conclusion from the analysis was that community resources were not found to be statistically significant for either community nursing schools or hospital controlled nursing schools.

Organizational Influences and Rate of Adoption

The second research question asked whether organizational attributes as a group influence the rate of adoption of innovation, and if so which factors singularly influence the rate of adoption and what is the direction of the influence. The second primary hypothesis proposed that there was a significant association between the selected organizational factors and the rate of adoption of innovation by organizations. Analysis supported this hypothesis; the entire organizational factors regression model was statistically significant and a majority of the variables tested were significant for early adopter hospitals. These results support strategic management theory and to some extent contingency theory from the perspective that organizations attempting to increase agility mature into more organic and decentralized program designs. The growth of programs and services as one aspect of organizational influence could be construed as organic hospital growth. These results also support the strategic management theory that internal characteristics and capabilities of an organization are critical influences on the strategic choices that leaders make for organizations.

The next section will discuss which organizational attributes were influential and what was the direction of their influence through the secondary hypothesis encompassing the eight organizational factors comprising the group.

Organizational complexity was significantly associated with the rate of adoption of innovation. For every additional service a magnet hospital provided, the possibility exists of that service being included in an early adopter hospital's portfolio. These findings are consistent with other empirical studies in the literature that identified a positive relationship between organizational complexity and adoption of innovation; one study suggested that magnet designation likely signified organizational complexity and a willingness to undertake organizational innovation (McHugh et al, 2012). The finding of a significant association may suggest that more complex organizations have more experience at strategic adaptation. In other words, complex organizations may have developed a core competency in adopting a number of innovations and have more experience in process for adoption of new programs including better skills, flexibility, organizational structure, and change management (Sanders, 2007, Hamel & Prahalad, 1994). This variable had the strongest relationship with adoption of innovation for this study. The results also support previous literature including over thirty empirical studies (Greenhalgh, et al, 2005) that identified organizational complexity as a factor of significance in adopting innovation. Organizational complexity supports several management theories; strategic adaptation, the resource based approach to management, and contingency theory.

Size was found to be a statistically significant influence on the rate of adoption of innovation by organizations. Size of hospital was measured as total number of beds. The findings from this study are consistent with the empirical literature that size has a positive relationship on adoption of innovation. An interesting anecdote: the mean number of beds decreased over all time periods by adopters. Early adopters were larger organizations (bed size) and may have theorized a competitive advantage from magnet adoption. Early adopters may have "proven the concept" while late adopters seeking competitive parity attempted to mimic early adopters. This could explain the dichotomy between the significant statistical association of size on adoption and the reduction over time in the mean number of beds.

Of all the variables studied in the literature, size has been the most often researched; however, size has never been studied in relation to rate of adoption of innovation. Size can be linked to the strategic management perspective and contingency theory since size often results in decentralized management structures and greater ability to marshal resources to adapt to the environment. The result of this hypothesis advances knowledge in the field, and adds one more empirical confirmation of size and the influence on innovation.

Slack resources defined as adjusted hospital occupancy, was a statistically significant influence on the rate of adoption of innovation by hospitals. The concept of slack resources aligns well with strategic management given the fact that organizations utilize resources to make strategic choices to advance their vision for their organization. Early adopters had more slack resources than late adopters and were able to focus more resources on a select innovation. The finding was consistent with Damanpour's (1991) work regarding the association between organizational complexity within an organization and the adoption of an administrative innovation. This research adds to the empirical literature and provides additional scientific evidence of an association between resources and innovation.

The presence of an external network was not found to be statistically significant. The literature review suggested that this variable had been utilized to define external linkage. However, given the plethora of communication vehicles at our disposal, this definition may not have been broad enough to capture an array of options for leaders in hospitals to gain knowledge, benchmark, and make decisions regarding new innovation. In summary, a more comprehensive measure might capture these linkages more effectively. This may serve as launching point for future research on methods of linkage among hospitals.

Control of domain was significantly associated with the rate of adoption of innovation by hospitals. There were two factors studied; full time registered nurses per hospital bed, and full time registered nurse per adjusted patient day. The second ratio was designed to include the importance of outpatient and observation services in a hospital. Of the two variables studied, only full time nurses per hospital bed was statistically significant.

The overall finding is consistent with Flood and Scott's conclusions (1978, 1987) that control of a profession over its domain is a factor in influencing organizational goals. Aiken (2002) proposed that patient staffing levels were important to protect patients and create the professional practice environment embraced by the American Nurse Credentialing Center.

The utilization of nurse per hospital bed as a control of domain variable represents a conundrum in relation to explaining the linkage to organizational theory. It is certainly logical to infer that a hospital with fewer nurses per bed is at a competitive disadvantage in terms of quality, patient satisfaction, and outcomes if the evidence from the literature is correct (McHugh et al, 2012). A hospital in some form of competitive disadvantage may be more motivated to seek innovation such as magnet designation to achieve competitive advantage. On the other hand, it is also logical to assume that hospitals with more nurses per bed have more collective influence over the care model and therefore could exert more influence on the organization to adopt innovation. As discussed in the previous chapter, the conclusion regarding this variable should be considered exploratory in nature; that control of domain had a significant association on the early adoption of magnet programs in hospitals.

Future research should focus on experience and education relative to control of domain; an abundance of young nurses or a higher mix of bachelor degree nurses could be statistically different in the exercise of control of domain; a more experienced or more educated workforce could have a different level of influence. The impact of nursing leadership on control of domain should also be studied. Nursing leaders' especially chief nursing officers (CNO) usually have access to the chief executive and the governing board of an organization and could wield substantial influence on adoption of innovation.

Hospital structural characteristics included both profit status and teaching affiliation. The combination of the data elements was significant regarding the association of the variable with the rate of adoption of innovation. However, the individual measures were mixed. Profit status was positively and significantly associated with the rate of adoption of innovation while teaching affiliation was not significant.

The literature indicated mixed results regarding profit status with some inference that for profit hospitals are more likely to adopt innovation that results in clear operating profits. As discussed in the literature review, economic benefits may not be a primary factor in adopting a magnet strategy. The literature review also revealed that the not for profit hospitals are more focused on quality and community benefit to fulfill their mission. Teaching affiliation seems to be inextricably linked to the not for profit world. The lack of a statistically significant association between teaching status and innovation negates the use of this component for further study.

Joint and Severable Influence on Adoption of Innovation

It was clear from the results that organizational influences and environmental influences had a differing and more significant influence on rate of adoption of innovation. Four variables in the organizational influence group were significant compared to one variable from the environmental influence group. The assessment of both organizational and environmental influences combined demonstrates that there is a statistically significant influence on rate of adoption with five variables illustrating a significant influence on early adoption of innovation within organizations.

Implications for the Future

This research contributed to the literature by providing an empirical test of diffusion of innovation theory and strategic management of organizations. Specifically, theory driven hypotheses were used to explore characteristics of organizations that could have an association with the rate of adoption of innovation among those organizations.

The innovation in question was ANCC magnet designation of hospitals, a designation designed to identify hospitals that are successful in attracting and retaining nurses.

Given the new knowledge about the combined influence of organizational and environmental factors on the rate of adoption of innovation, one could expect to find these five characteristics in early adopter organizations who are innovators. This new information could lead to further research studying these five factors in organizations. Additionally, if organizations were seeking counsel on how to become more innovative, one method of assistance would be to assess organizational competency relative to these five variables. The potential exists to use these variables for potential study within healthcare organizations for the study of innovation.

Impact on Scholarly Understanding and Theory Building

The findings in this study are generally consistent with theoretical foundations expressed by scholars across a wide spectrum of business literature. The theoretical framework for this study was the diffusion of innovation concept advanced by Rogers' (Rogers, 2003) and the strategic management perspective advanced by Shortell (Shortell & Kaluzny, 2006). These theories focus on the interaction between the environment, the organization, and strategy involved in disseminating new innovation throughout an organization. Once an idea has been created and adopted by one organization how is the innovation adopted throughout other organizations? The primary hypothesis explored the potential impact of both the external environment and the internal environment on adoption. Organizational influences were found to be more salient than environmental influences in adoption of administrative innovations. The outcomes of this research support the resource based view (Hamel & Prahalad, 1994) of organizations suggesting that organizational characteristics and organizational competencies are more influential than market based approaches (Porter, 1980; Porter, 1985; Shortell & Kaluzny, 2006) which emphasizes that environmental forces are dominant. For organizations seeking to differentiate themselves in the marketplace and sustain competitive advantage, the research suggests that focus on organizational characteristics, clinical programs, and services will lead to more success than focus on the external environment.

Conversely, the one significant finding among the environmental characteristics was the impact of being a cumulative adopter in the market. The concept of competition and the presence of a strong competitor in the market may result in organizations either improving their ability to innovate or falling behind in the marketplace. A competitor in the market who is readily able to adopt innovation will cause a competitive organization to “up its game”.

The findings from this study with regard to the control of domain hypothesis support scholars (Aiken, 2002; Flood and Scott, 1978; Flood and Scott, 1987) work regarding professional practice environments that attract and retain nurses. The concept of control of domain empowers clinicians to continually adopt innovation to support professional development that contributes to satisfaction with the internal work environment thus creating a cycle of enhancement of culture through innovation that improves recruitment and retention.

Generally, the research has contributed to the literature by identifying characteristics of organizations that lead to early adoption of innovation. If we consider the current length of time to diffuse evidence based medicine throughout the national health system, any improvement to shorten innovation adoption cycles could save lives. In an era of scarce national resources, better understanding of where to focus health dollars could improve the cost benefit ratio of expenditures on clinical services.

Implications for Professional Practice and Decision-Making

The findings from this research contribute to the knowledge base of practicing nurse executives regarding those characteristics that are most closely linked with successful adoption of the magnet concept. Hospitals that are competitive and have a worthy competitor in their market area will more often choose to adopt magnet programs than hospitals in less competitive markets. Additionally, hospitals that provide additional complex programs, have higher ratios of registered nurses per bed, hospitals that are larger and not for profit are organizationally in a better competitive position to successfully adopt innovation and specifically to adopt magnet programs. Those hospitals that have both the organizational characteristics and a worthy competitor in their marketplace will have the greatest chance of success in adopting and implementing innovation.

Health care managers can use this information to evaluate their organizations and their marketplace to determine their potential success in adoption of new innovation and specifically the magnet hospital concept. There are still multiple opportunities to be an early adopter of the magnet hospital concept and obtain first or early mover advantages (Porter, 1980). Organizationally, primary consideration should focus on the scope of services offered (more complex the better), nurse staffing per bed or nursing resources.

Lack of membership in a multihospital system should not be considered an impediment to successful adoption.

Organizations located in small markets or hospitals that are very small, with limited ability to improve nurse staffing ratios, limited ability to add more complex services, and hospitals that are not very competitive may find it difficult to successfully adopt the magnet hospital concept.

Limitations of the Study

There are a number of limitations that should be considered relative to this research. First, this is not an experimental design and is subject to limitations related to uncontrolled variables that could be relevant to the study. The ability to manipulate variables and establish complete experimental controls was not possible. Second, the results may not be generalizable to the entire business sector since this study focused on an administrative innovation unique to hospitals. Third, there may have been hospitals that implemented magnet practices that did not seek ANCC designation; the exclusion of these hospitals could impact whether findings can be generalized to non – magnet hospitals. McHugh (McHugh et al. 2012) noted that there are some non- magnet hospitals that look similar to magnet hospitals in terms of measured nursing characteristics.

Additionally, it is important to note that hospitals designated in 2011 and 2012 were excluded due to lack of survey data from the American Hospital Association. Fourth, the measures used for environmental and organizational influences were based on theoretical considerations from previous health services research. There is potential that the variables and their measures do not adequately capture the constructs; more specifically, since only a limited number of variables were utilized to operationalize each construct, the potential exists for other variables that could offer more robust research design. Fifth, the issue of missing data and data reliability was discussed previously and is a subject for consideration. There was no opportunity to verify the accuracy of the input, processing, or consistency of the raw information provided in the reported data. Given the longitudinal nature of the data (17 years), this is a concern. Additionally, there was no consideration of concurrent innovations that could have also influenced the magnet hospital concept. Finally, no measure of the impact of nursing leadership on variables such as control of domain was available in the study.

Future Research

While this study has contributed to the body of scientific knowledge regarding diffusion of innovation and early adopters of innovation, this study provides justification for further research. This research could be broad in terms of the study of adoption of innovation in hospitals, or narrow in further study of administrative innovation such as the magnet concept. Future research on early adopters should be conducted in other industries, sectors, settings, and multiple types of organizations to support the generalizability of these findings. Investigation of the strategic mindset (Miles & Snow, 1978, Porter, 1980, Sanders, 2007) and strategic orientation as well as the influence on adoption of innovation is warranted.

This study investigated the role of a limited set of environmental and organizational influences that were supported through the literature to capture the constructs and answer the hypothesis. Future research should also address the limitations in this research, namely to include a number of potential attributes identified in the literature such as the impact of leadership. Research involving upper echelon theory and the impact of Chief Nursing Officers and Chief Executive Officers on early adoption of innovation would be a worthy subject. Additionally, there may be alternative variables that may capture the constructs more precisely. For example, organizational complexity might be better captured as a measure of acuity or case mix intensity (Sanders, 2007). Operating margin, net income, or cash reserves might serve as a better measure of slack resources. Control of domain might benefit from a broader measure that captures all of the resources under nursing control (Sanders, 2007). A sensitivity analysis exploring the organizational complexity elements to determine which services are most significant in influencing the rate of adoption of innovation would be productive.

Future research on geographic location of magnet hospitals is justified. There are still states that have no magnet hospitals and the evidence is overwhelming that magnet hospitals are not located in rural areas. Study of geography and its impact on adoption of the magnet concept may be valuable. Attributes of organizations and characteristics of organizations may vary based upon geography or regional health delivery systems.

Finally, this research was conducted at a given point in time. We do not know if the magnet hospital concept is barely in the early adopter phase (Sanders, 2007) or another stage of diffusion. Continuing analysis of the influence of organizational and environmental attributes on subsequent adoption of innovation is warranted. There were over 20 hospitals designated in 2011 – 2012 and future research of these organizations may yield additional discoveries.

Summary

This study reviewed the literature regarding diffusion of innovation and characteristics that accelerate early adoption of innovation. This research utilized strategic management theory, contingency theory, institutional theory, bureaucratic theory, and resource dependence theory to explore how complex adaptive organizations adopt innovation. Particular emphasis was placed on Everett Rogers work and his diffusion of innovation theory was used to develop an applied research framework for empirically assessing the characteristics and attributes of organizations and environments to identify those characteristics that accelerate the early adoption of administrative innovation. Rogers' adopter categories were utilized to segregate all magnet hospitals from 1994- 2010 into four adopter categories. This research focused on identification of environmental and organizational variables that influence the rate of adoption of administrative innovation in organizations, and specifically hospitals that have adopted the magnet hospital concept. Secondary data from the American Hospital Association, American Nurse Credentialing Center, American Association of Accredited Nursing Schools, Bureau of Labor Statistics, and the U.S. Census Bureau were used as the basis to conduct the analysis.

The study identified both organizational and environmental factors as statistically significant. Organizational influences were stronger than environmental influences in determining the rate of adoption of innovation in hospitals and organizational influences were statistically significant and present among early adopters of magnet programs in hospitals. Organizational complexity, size, slack resources, control of domain, and the presence of a competitor with magnet designation were the factors associated with the rate of innovation among hospitals and specifically influencing the early adoption of innovation among hospitals. The combination of both organizational and environmental factors had a significant influence on the rate of early adoption of nurse magnet programs within hospitals.

Table 1

*Forces of Magnetism**

Force	**Description**
1: Quality of Nursing Leadership	Knowledgeable, strong, risk-taking nurse leaders follow a well-articulated, strategic and visionary philosophy in the day-to-day operations of nursing services. Nursing leaders, at all organizational levels, convey a strong sense of advocacy and support for the staff and for the patient. The results of quality leadership are evident in nursing practice at the patient's side.
2: Organizational Structure	Organizational structures are generally flat, rather than tall, and decentralized decision-making prevails. The organizational structure is dynamic and responsive to change. Strong nursing representation is evident in the organizational committee structure. Executive-level nursing leaders serve at the executive level of the organization. The Chief Nursing Officer typically reports directly to the Chief Executive Officer. The organization has a functioning and productive system of shared decision-making.
3: Management Style	Health care organization and nursing leaders create an environment supporting participation. Feedback is encouraged, valued and incorporated from the staff at all levels. Nurses serving in leadership positions are visible, accessible and committed to effective communication
4: Personnel Policies and Programs	Salaries and benefits are competitive. Creative and flexible staffing models that support a safe and healthy work environment are used. Personnel policies are created with direct care nurse involvement. Significant opportunities for professional growth exist in administrative and clinical tracks. Personnel policies and programs support professional nursing practice, work/life balance, and the delivery of quality care.
5: Professional Models of Care	There are models of care that give nurses responsibility and authority for the provision of direct patient care. Nurses are accountable for their own practice as well as the coordination of care. The models of care (i.e., primary nursing, case management, family-centered, district, and wholistic) provide for the continuity of care across the continuum. The models take into consideration patients' unique needs and provide skilled nurses and adequate resources to accomplish desired outcomes.
6: Quality of Care	Quality is the systematic driving force for nursing and the organization. Nurses serving in leadership positions are responsible for providing an environment that positively

Force	Description
	influences patient outcomes. There is a pervasive perception among nurses that they provide high quality care to patients.
7: Quality Improvement	The organization possesses structures and processes for the measurement of quality and programs for improving the quality of care and services within the organization.
8: Consultation and Resources	The health care organization provides adequate resources, support and opportunities for the utilization of experts, particularly advanced practice nurses. The organization promotes involvement of nurses in professional organizations and among peers in the community.
9: Autonomy	Autonomous nursing care is the ability of a nurse to assess and provide nursing actions as appropriate for patient care based on competence, professional expertise and knowledge. The nurse is expected to practice autonomously, consistent with professional standards. Independent judgment is expected within the context of interdisciplinary and multidisciplinary approaches to patient/resident/client care.
10: Community and the Health Care Organization	Relationships are established within and among all types of health care organizations and other community organizations, to develop strong partnerships that support improved client outcomes and the health of the communities they serve.
11: Nurses as Teachers	Professional nurses are involved in educational activities within the organization and community. Students from a variety of academic programs are welcomed and supported in the organization; contractual arrangements are mutually beneficial. There is a development and mentoring program for staff preceptors for all levels of students (including students, new graduates, experienced nurses, etc.). In all positions, staff serve as faculty and preceptors for students from a variety of academic programs. There is a patient education program that meets the diverse needs of patients in all of the care settings of the organization.
12: Image of Nursing	The services provided by nurses are characterized as essential by other members of the health care team. Nurses are viewed as integral to the health care organization's ability to provide patient care. Nursing effectively influences system-wide processes.
13: Interdisciplinary Relationships	Collaborative working relationships within and among the disciplines are valued. Mutual respect is based on the premise that all members of the health care team make essential and meaningful contributions in the achievement of clinical outcomes.

Force	Description
	Conflict management strategies are in place and are used effectively, when indicated.
14: Professional Development	The health care organization values and supports the personal and professional growth and development of staff. In addition to quality orientation and in-service education addressed earlier in Force 11, Nurses as Teachers, emphasis is placed on career development services. Programs that promote formal education, professional certification, and career development are evident. Competency-based clinical and leadership/management development is promoted and adequate human and fiscal resources for all professional development programs are provided.

*The original Magnet® research study conducted in 1983 identified 14 characteristics that differentiated organizations best able to recruit and retain nurses during the nursing shortages of the 1970s and 1980s. These characteristics remain known as the ANCC Forces of Magnetism that provide the conceptual framework for the Magnet appraisal process. Described as the heart of the Magnet Recognition Program®, the Forces of Magnetism are attributes or outcomes that exemplify nursing excellence. The full expression of the Forces of Magnetism is required to achieve Magnet designation and embodies a professional environment guided by a strong and visionary nursing leader who advocates and supports excellence in nursing practice.

Table 2
Operationalization of Variables

Influence Categories	Variable	Measure	Definition	Data Source
Environmental Influences	Environmental complexity	Location	Metro MSA = 1 Suburban/Micro MSA = 0 Rank among 100 largest cities	Census Bureau of the United States AHA Annual Index
	Competition	Health workforce supply in market	Calculated as a ratio of nurses per 1,000 population and health professionals per 1,000 population. Market defined as metropolitan statistical area (MSA)	Census Bureau of the United States, Bureau of Labor Statistics
	Critical mass	Competitive adopters in market	Calculated as presence of competitors adopting magnet hospital concept in market. Market is defined as 90-mile geographic limit.	ANCC website
		RN schools per community	Number of accredited RN schools in MSA	American Association of Colleges of Nursing
		RN schools per hospital	Hospital-controlled nursing school – Y/N	AHA Annual Survey
Organizational Influence	Organizational complexity	Number of services	Number of hospital services reported	AHA Annual Survey
	Size	Number of beds	Number of acute beds in operation	AHA Annual Survey

Influence Categories	Variable	Measure	Definition	Data Source
	Slack resources	Percentage of hospital occupancy	Hospital occupancy reported. Calculated as adjusted patient days/(beds available *365).	AHA Annual Survey
	External network	System membership	Coded as of network – Y/N	AHA Annual Survey
	Control of domain	RN staffing	Calculated as number of FTE RNs/hospital bed and number of FTE RNs per adjusted patient day	AHA Annual Survey
	Hospital Structural Characteristics	Ownership Teaching	Not-for-profit = 1; For-profit = 0 Council of Teaching Hospitals – Y/N	AHA Annual Survey
Innovation Adoption	Adoption of Magnet hospital concept	ANCC designation as Magnet hospital	Designated = Adopter = 1 Not designated = Nonadopter = 0	ANCC Data

Note: ANCC indicates American Nurses Credentialing Center; AHA, American Hospital Association; FTE, full-time equivalent.

Table 3

Descriptive Statistics by Adopter Category

	Mean ± SD						
	1. Innovators & Early Adopter 46	**3. Early Majority 106**	**4. Late Majority 101**	**5. Laggards 71**	**Overall 324**	**N**	***P* value**
Population (MSA)	4,124,161.027 ± 6,154,785.150	2,826,351.733 ± 3,990,854.874	2,544,996.269 ± 3,642,627.532	3,357,251.960 ± 3,650,716.554	3,035,882.484 ± 4,203,127.527	323	0.48
City Rank	8.761 ± 19.509	13.594 ± 23.176	16.485 ± 26.270	17.254 ± 28.100	14.611 ± 24.905	324	0.06
Nurse Per 1,000	8.835 ± 6.010	12.542 ± 27.716	9.256 ± 3.847	9.058 ± 3.710	10.232 ± 16.299	323	0.06
Professional Per 1,000	27.441 ± 26.246	34.910 ± 73.546	25.941 ± 9.134	24.409 ± 8.516	28.786 ± 44.116	316	0.04
Competitive Adopters	18 (39%)	29 (28%)	24 (24%)	9 (13%)	80 (25%)	324	0.01
Hospital Nursing School	41 (90%)	95 (90%)	91 (90%)	64(90%)	291(90%)	324	0.87
Community Nursing School	7 (4%)	9 (8%)	5 (5%)	8(11%)	24(7%)	324	0.37
Org Complexity Rate	57.039 ± 31.203	61.493 ± 28.874	49.723 ± 24.227	50.835 ± 25.119	54.856 ± 27.423	324	0.00
Hospital Bed	421.146 ± 215.186	421.094 ± 251.744	356.485 ± 186.798	363.761 ± 221.222	388.397 ± 222.300	324	0.03
Adjusted Occupancy	356.756 ± 113.456	423.834 ± 104.958	430.133 ± 120.391	507.086 ± 433.189	434.518 ± 229.329	324	0.00
Nurse Per Adjusted Pt Day	0.004 ± 0.001	0.004 ± 0.001	0.004 ± 0.001	0.005 ± 0.002	0.004 ± 0.002	324	0.43
Nurse Per Hospital Bed	1.393 ± 0.621	1.672 ± 0.645	1.761 ± 0.595	2.100 ± 0.784	1.754 ± 0.692	324	0.00
External Network	22 (48%)	52 (49%)	38 (38%)	29 (41%)	141 (44%)	324	0.16
Ownership/For-Profit/NFP	0 (0%)	1 (1%)	3 (3%)	4 (6%)	8 (3%)	324	0.03
Teaching Status	28 (60%	64 (60%)	71 (70%)	50 (70%)	227 (70%)	324	0.21

Highlight = Categorical variables. Number represents actual number of hospitals with presence of condition; percentage refers to percent of hospitals by category.

Table 4

Chi Square and Significance for Each Hypothesis and Adopter Category

		x^2	P	Area
1.0	Environmental Influences	17.9**	.00	.58
1.1	Environmental Complexity	3.9	.14	.60
	MSA	.03	.48	
	City Rank	3.4	.06	
1.2	Competition	4.8	.09	.43
	Nurse per 1,000	3.5	.06	
	Health Professional per 1,000	4.2*	.04	
1.3	Critical Mass/Competitive Adopter	10.2**	.01	.58
1.4	Community Resources	.82	.66	.54
	Community Nursing School	.79	.37	
	Hospital Nursing School	.03	.87	
2.0	Organizational Influences	77.9**	.00	.74
2.1	Organizational Complexity	7.0**	.00	.55
2.2	Size/Hospital Beds	4.7*	.03	.56
2.3	Slack Resources/Adjusted (Adjusted Occupancy)	19.5**	.00	.72
2.4	External Networks	2.0	.16	.52
2.5	Control of Domain	32.7**	.00	.69
	Nurse per Adjusted Patient	.6	.43	
	Day	19.5**	.00	
	Nurse per Hospital Bed			
2.6	Hospital Structural	6.6*	.04	.54
	Characteristics	4.8*	.03	
	For-Profit	1.5	.21	
	Teaching Status			
4.0	Environmental & Organizational Influences combined	82.7**	.00	.75
3.0	Environmental Influences	17.9**	.00	.58
3.0	Organizational Influences	77.9**	.00.	.74

Significant at .05*
Significant at .01**

Table 5

*Environmental Influences**

Whole Model Test

Model	-Log Likelihood	DF	Chi Square	Prob > ChiSq
Difference	8.96933	6	17.93867	0.0122*
Full	408.51494			
Reduced	417.48428			

RSquare (U)	0.0215
AICc	835.618
BIC	868.832
Observations (or Sum Wgts)	316

Measure	Training	Definition
Entropy RSquare	0.0215	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.0594	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	1.2928	∑ -Log(ρ[j])/n
RMSE	0.7134	√ ∑(y[j]-ρ[j])²/n
Mean Abs Dev	0.7079	∑ |y[j]-ρ[j]|/n
Misclassification Rate	0.6424	∑ (ρ[j]≠ρMax)/n
N	316	n

Lack of Fit

Source	DF	-Log Likelihood	Chi Square
Lack of Fit	837	408.51494	817.0299
Saturated	843	0.00000	**Prob>ChiSq**
Fitted	6	408.51494	0.6829

Parameter Estimates

Term	Estimate	Std Error	Chi Square	Prob > Chi Sq	Lower 95%	Upper 95%
Intercept[1.Innovators & Early Adapter]	-2.1772727	0.2424065	80.67	<.0001*	.	.
Intercept[3. Early Majority]	-0.2989075	0.1871823	2.55	0.1103	.	.
Intercept[4. Late Majority]	1.16866809	0.1967148	35.29	<.0001*	.	.
MSA	-1.3351e-8	2.7414e-8	0.24	0.6262	-6.801e-8	4.06241e-8
CITYRK	-0.0072515	0.0043631	2.76	0.0965	-0.0153848	0.00084995
RN_PER_K_MSA_ POPULATION	-0.0530849	0.0332852	2.54	0.1107	-0.1347442	0.00352964
HP__PER_K_MSA_ POPULATION	0.0220911	0.0125908	3.08	0.0793	0.00084554	0.05290832
COMPETITIVE_ ADOPTERS[1-0]	0.79088423	0.2965724	7.11	0.0077*	0.30467834	1.28345064
NS[1-0]	-0.3324181	0.3905428	0.72	0.3947	-1.1168945	0.44462793

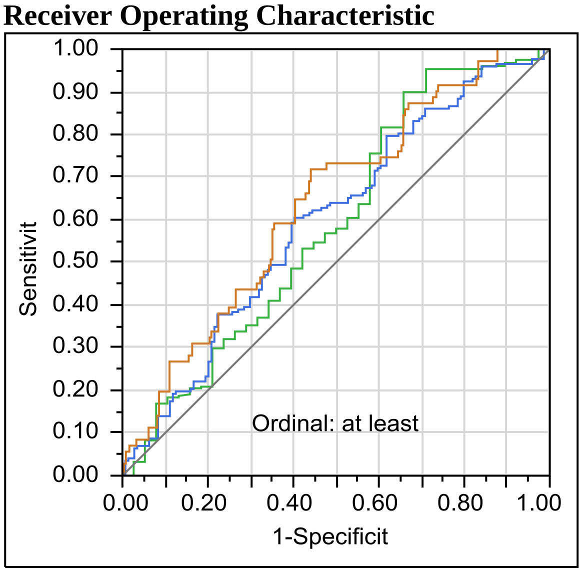
Effect Wald Tests

Source	Nparm	DF	Wald Chi Square	Prob> ChiSq	
MSA	1	0	0	.	LostDFs
CITYRK	1	1	2.76223859	0.0965	
RN_PER_K_MSA_POPULATION	1	1	2.54354105	0.1107	
HP__PER_K_MSA_POPULATION	1	1	3.07840872	0.0793	
COMPETITIVE_ADOPTERS	1	1	7.11155173	0.0077*	
NS	1	1	0.7244894	0.3947	

Effect Likelihood Ratio Tests

Source	Nparm	DF	L-R Chi Square	Prob> ChiSq
MSA	1	0	0.23389112	.
CITYRK	1	1	3.07796152	0.0794
RN_PER_K_MSA_POPULATION	1	1	3.3838791	0.0658
HP__PER_K_MSA_POPULATION	1	1	4.1443961	0.0418*
COMPETITIVE_ADOPTERS	1	1	10.1889004	0.0014*
NS	1	1	0.70381744	0.4015

Receiver Operating Characteristic



Magnet status 3	Area
1. Innovators & Early Adapter	.
3. Early Majority	0.5880
4. Late Majority	0.5981
5. Laggards	0.6379

**Note:* MSA indicates metropolitan statistical area population; CITYRK, whether or not the hospital was located in a geographic area with a ranking in the top 100 cities; RN per K per population, registered nurses per 1000 population; HP per K per population, health professionals per 1000 population; cumulative adopters, whether or not the hospital was adopting magnet designation due to the presence of a magnet competitor in the same geographic area; MAPP6, whether or not the hospital had a controlled professional nursing school; NS, whether the hospital was located in a community with an accredited nursing school with registered nurse programs.

Table 6

Environmental Complexity

Whole Model Test

Model	-Log Likelihood	DF	Chi Square	Prob > ChiSq
Difference	1.96100	2	3.922006	0.1407
Full	429.81890			
Reduced	431.77990			

RSquare (U)	0.0045
AICc	869.827
BIC	888.526
Observations (or Sum Wgts)	323

Measure	Training	Definition
Entropy RSquare	0.0045	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.0130	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	1.3307	∑ -Log(ρ[j])/n
RMSE	0.7279	√ ∑(y[j]-ρ[j])²/n
Mean Abs Dev	0.7244	∑ |y[j]-ρ[j]|/n
Misclassification Rate	0.6811	∑ (ρ[j]≠ρMax)/n
N	323	N

Lack of Fit

Source	DF	-Log Likelihood	Chi Square
Lack of Fit	838	429.81890	859.6378
Saturated	840	0.00000	**Prob > ChiSq**
Fitted	2	429.81890	0.2945

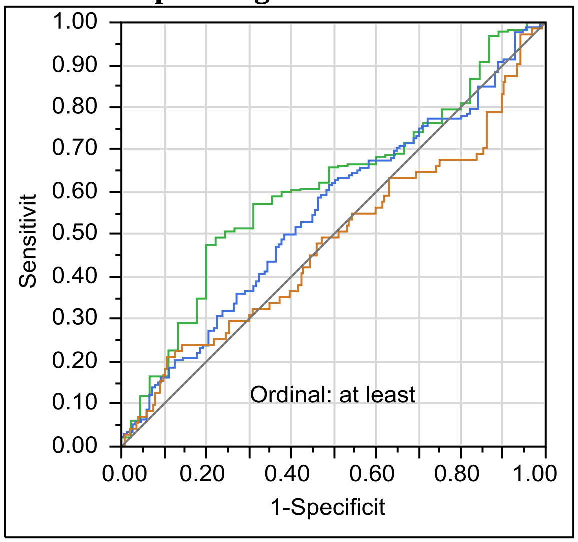
Parameter Estimates

Term	Estimate	Std Error	Chi Square	Prob > ChiSq	Lower 95%	Upper 95%
Intercept[1. Innovators & Early Adapter]	-1.7645914	0.1689178	109.13	< .0001*	.	.
Intercept[3. Early Majority]	-0.0586304	0.1269333	0.21	0.6442	.	.
Intercept[4. Late Majority]	1.34833227	0.151668	79.03	< .0001*	.	.
MSA	1.4135e-8	2.0124e-8	0.49	0.4824	-3.5671e-8	6.33581e-8
CITYRK	-0.0074569	0.0042094	3.14	0.0765	-0.0154215	0.00044237

Effect Likelihood Ratio Tests

Source	Nparm	DF	L-R Chi Square	Prob > ChiSq
MSA	1	0	0.31524124	.
CITYRK	1	1	3.42349216	0.0643

Receiver Operating Characteristic



Magnet Status 3	Area
1. Innovators & Early Adapter	.
3. Early Majority	0.6092
4. Late Majority	0.5506
5. Laggards	0.4821

Table 7

Competition

Whole Model Test

Model	-Log Likelihood	DF	Chi Square	Prob > ChiSq
Difference	2.39210	2	4.784206	0.0914
Full	415.09217			
Reduced	417.48428			

RSquare (U)	0.0057
AICc	840.378
BIC	858.963
Observations (or Sum Wgts)	316

Measure	Training	Definition
Entropy RSquare	0.0057	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.0162	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	1.3136	∑ -Log(ρ[j])/n
RMSE	0.7211	√ ∑(y[j]-ρ[j])²/n
Mean Abs Dev	0.7166	∑ |y[j]-ρ[j]|/n
Misclassification Rate	0.6582	∑ (ρ[j]≠ρMax)/n
N	316	N

Lack of Fit

Source	DF	-Log Likelihood	Chi Square
Lack of Fit	751	415.09217	830.1843
Saturated	753	0.00000	**Prob > ChiSq**
Fitted	2	415.09217	0.0232*

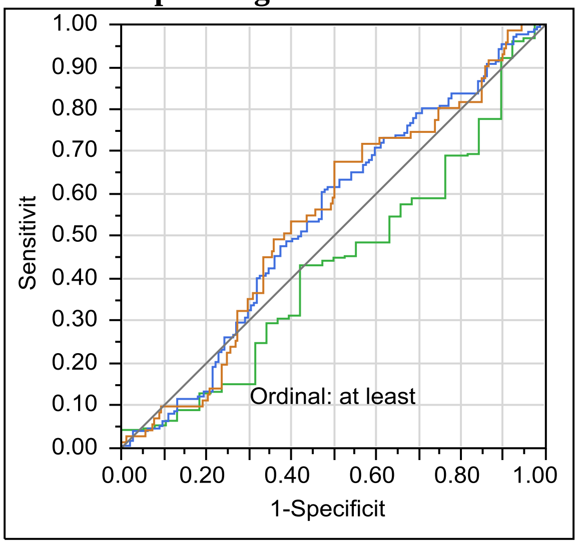
Parameter Estimates

Term	Estimate	Std Error	Chi Square	Prob > ChiSq	Lower 95%	Upper 95%
Intercept [1. Innovators & Early Adapter]	-2.0984852	0.1910505	120.65	< .0001*	.	.
Intercept [3. Early Majority]	-0.2646562	0.1320566	4.02	0.0451*	.	.
Intercept[4. Late Majority]	1.16171136	0.1498154	60.13	< .0001*	.	.
RN_PER_K_MSA_ POPULATION	-0.0535336	0.0334643	2.56	0.1097	-0.1336015	0.00237431
HP__PER_K_MSA_ POPULATION	0.02198532	0.0125553	3.07	0.0799	0.00104439	0.05216797

Effect Likelihood Ratio Tests

Source	Nparm	DF	L-R Chi Square	Prob > ChiSq
RN_PER_K_MSA_POPULATION	1	1	3.52466614	0.0605
HP__PER_K_MSA_POPULATION	1	1	4.22639197	0.0398*

Receiver Operating Characteristic



Magnet Status 3	Area
1. Innovators & Early Adapter	.
3. Early Majority	0.4301
4. Late Majority	0.5403
5. Laggards	0.5406

Table 8

Critical Mass: Competitive Adopters

Contingency Analysis of Magnet Status 3 By COMPETITIVE_ADOPTERS

Count Total % Col % Row %	1. Innovators & Early Adapter	3. Early Majority	4. Late Majority	5. Laggards	
0	28	77	77	62	244
	8.64	23.77	23.77	19.14	75.31
	60.87	72.64	76.24	87.32	
	11.48	31.56	31.56	25.41	
1	18	29	24	9	80
	5.56	8.95	7.41	2.78	24.69
	39.13	27.36	23.76	12.68	
	22.50	36.25	30.00	11.25	
	46	106	101	71	324
	14.20	32.72	31.17	21.91	

Tests

N	DF	-LogLike	RSquare (U)
324	3	5.7269066	0.0132

Test	Chi Square	Prob > ChiSq
Likelihood Ratio	11.454	0.0095*
Pearson	11.122	0.0111*

Ordinal Logistic Fit for Magnet Status 3
Whole Model Test

Model	-Log Likelihood	DF	Chi Square	Prob > ChiSq
Difference	5.09080	1	10.1816	0.0014*
Full	428.65061			
Reduced	433.74141			

RSquare (U)	0.0117
AICc	865.427
BIC	880.424
Observations (or Sum Wgts)	324

Measure	Training	Definition
Entropy RSquare	0.0117	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.0332	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	1.3230	∑ -Log(ρ[j])/n
RMSE	0.7253	√ ∑(y[j]-ρ[j])²/n
Mean Abs Dev	0.7218	∑ |y[j]-ρ[j]|/n
Misclassification Rate	0.6728	∑ (ρ[j]≠ρMax)/n
N	324	n

Lack of Fit

Source	DF	-Log Likelihood	Chi Square
Lack of Fit	2	0.63610	1.272209
Saturated	3	428.01450	**Prob > ChiSq**
Fitted	1	428.65061	0.5294

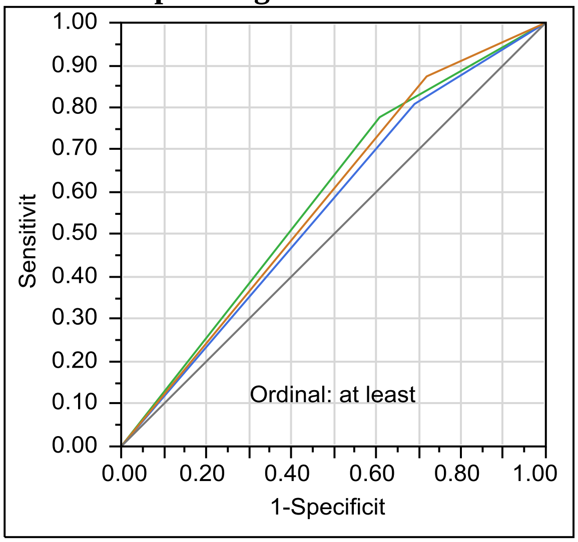
Parameter Estimates

Term	Estimate	Std Error	Chi Square	Prob > ChiSq	Lower 95%	Upper 95%
Intercept[1. Innovators & Early Adapter]	-2.0200065	0.1773131	129.78	< .0001*	.	.
Intercept [3. Early Majority]	-0.310797	0.126637	6.02	0.0141*	.	.
Intercept[4. Late Majority]	1.11103892	0.1425296	60.76	< .0001*	.	.
COMPETITIVE_ ADOPTERS[1-0]	0.74626893	0.236543	9.95	0.0016*	0.28700808	1.21120695

Effect Likelihood Ratio Tests

Source	Nparm	DF	L-R Chi Square	Prob > ChiSq
COMPETIIVE_ADOPTERS	1	1	10.1816043	0.0014*

Receiver Operating Characteristic



Magnet Status 3	Area
1. Innovators & Early Adapter	.
3. Early Majority	0.5841
4. Late Majority	0.5587
5. Laggards	0.5769

Table 9

Community Resources
Community Accredited Nursing School
Hospital-Controlled Nursing School

Whole Model Test

Model	-Log Likelihood	DF	Chi Square	Prob > ChiSq
Difference	0.41134	2	0.822677	0.6628
Full	433.33007			
Reduced	433.74141			

RSquare (U)	0.0009
AICc	876.849
BIC	895.564
Observations (or Sum Wgts)	324

Measure	Training	Definition
Entropy RSquare	0.0009	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.0027	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	1.3374	∑ -Log(ρ[j])/n
RMSE	0.7304	√ ∑(y[j]-ρ[j])²/n
Mean Abs Dev	0.7273	∑ |y[j]-ρ[j]|/n
Misclassification Rate	0.6852	∑ (ρ[j]≠ρMax)/n
N	324	n

Lack of Fit

Source	DF	-Log Likelihood	Chi Square
Lack of Fit	7	4.26132	8.522636
Saturated	9	429.06875	**Prob > ChiSq**
Fitted	2	433.33007	0.2888

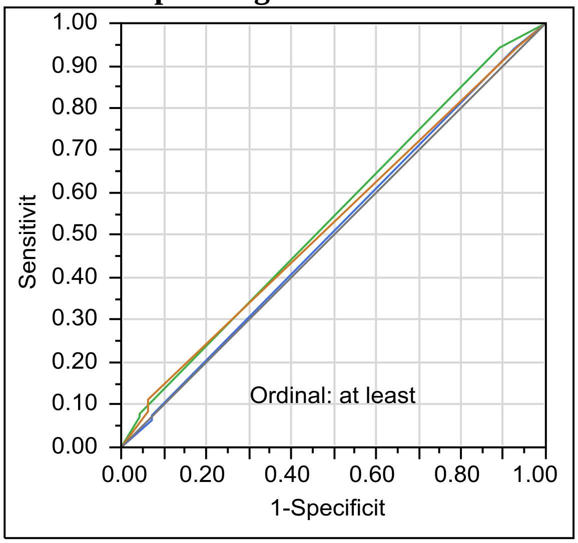
Parameter Estimates

Term	Estimate	Std Error	Chi Square	Prob > ChiSq	Lower 95%	Upper 95%
Intercept [1. Innovators & Early Adapter]	-1.711927	0.396481	18.64	<.0001*	.	.
Intercept [3. Early Majority]	-0.0355418	0.3808687	0.01	0.9257	.	.
Intercept [4. Late Majority]	1.36037069	0.3892036	12.22	0.0005*	.	.
NS[1-0]	-0.348295	0.3838119	0.82	0.3642	-1.1272177	0.41929399
MAPP6[1-0]	-0.0681225	0.390533	0.03	0.8615	-0.871868	0.73281673

Effect Likelihood Ratio Tests

Source	Nparm	DF	L-R Chi Square	Prob > ChiSq
NS	1	1	0.79050727	0.3739
MAPP6	1	1	0.0278856	0.8674

Receiver Operating Characteristic



Magnet Status 3	Area
1. Innovators & Early Adapter	.
3. Early Majority	0.5402
4. Late Majority	0.5077
5. Laggards	0.5273

Table 10

Organizational Influences

Organizational Influence (without Org. Comp)
Whole Model Test

Model	**-Log Likelihood**	**DF**	**Chi Square**	**Prob > ChiSq**
Difference	38.97328	8	77.94656	< .0001*
Full	394.76813			
Reduced	433.74141			

RSquare (U)	0.0899
AICc	812.382
BIC	853.124
Observations (or Sum Wgts)	324

Measure	**Training**	**Definition**
Entropy RSquare	0.0899	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.2296	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean –Log p	1.2184	∑ -Log(ρ[j])/n
RMSE	0.6846	√ ∑(y[j]-ρ[j])²/n
Mean Abs Dev	0.6708	∑ |y[j]-ρ[j]|/n
Misclassification Rate	0.5957	∑ (ρ[j]≠ρMax)/n
N	324	N

Lack of Fit

Source	**DF**	**-Log Likelihood**	**Chi Square**
Lack of Fit	958	394.76813	789.5363
Saturated	966	0.00000	**Prob > ChiSq**
Fitted	8	394.76813	1.0000

Parameter Estimates

Term	**Estimate**	**Std Error**	**Chi Square**	**Prob >ChiSq**	**Lower 95%**	**Upper 95%**
Intercept[1.Innovators & Early Adapter]	2.23440742	0.9796468	5.20	0.0226*	.	.
Intercept[3.Early Majority]	4.17252335	0.9977745	17.49	<.0001*	.	.
Intercept[4.LateMajority]	5.82078654	1.0197713	32.58	<.0001*	.	.
ORG_COMP_Rate	0.01917344	0.0044926	18.21	<.0001*	0.0100725	0.02847902
HOSPBD	-0.0009756	0.0005974	2.67	0.1024	-0.0021634	0.00019234
ADJPD_HOSPBD	-0.0057063	0.0018959	9.06	0.0026*	-0.0097897	-0.0020341
FTERN_ADJPD	-461.05002	208.60482	4.88	0.0271*	-894.45422	-61.820116
FTERN_HOSPBD	-0.1469513	0.4885442	0.09	0.7636	-1.0980459	0.86195231
NETWRK[1-0]	0.18682724	0.2101459	0.79	0.3740	-0.2260233	0.60087932
FOR_PROFIT[1-0]	-1.5883684	0.711145	4.99	0.0255*	-3.0175233	-0.2925524
MAPP8[1-0]	-0.6522266	0.26623	6.00	0.0143*	-1.1769845	-0.1334745

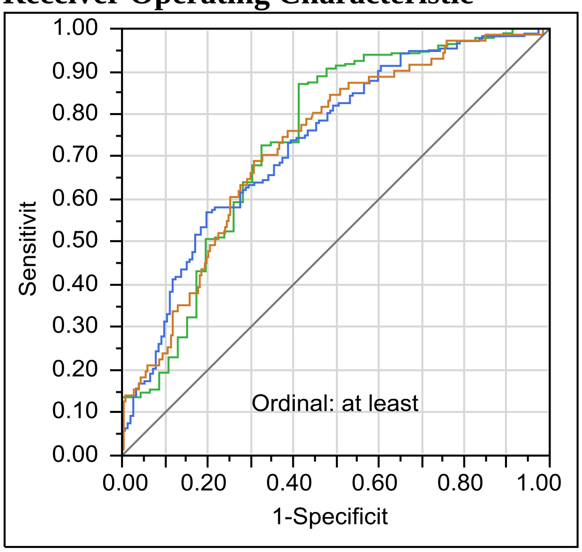
Effect Wald Tests

Source	Nparm	DF	Wald ChiSquare	Prob>ChiSq
ORG_COMP_Rate	1	1	18.2143169	<.0001*
HOSPBD	1	1	2.66744816	0.1024
ADJPD_HOSPBD	1	1	9.0591533	0.0026*
FTERN_ADJPD	1	1	4.88480709	0.0271*
FTERN_HOSPBD	1	1	0.09047717	0.7636
NETWRK	1	1	0.79038447	0.3740
FOR_PROFIT	1	1	4.98868584	0.0255*
MAPP8	1	1	6.00182283	0.0143*

Effect Likelihood Ratio Tests

Source	Nparm	DF	L-R ChiSquare	Prob>ChiSq
ORG_COMP_Rate	1	1	17.2719545	<.0001*
HOSPBD	1	1	2.67501709	0.1019
ADJPD_HOSPBD	1	1	11.6824531	0.0006*
FTERN_ADJPD	1	1	5.11399879	0.0237*
FTERN_HOSPBD	1	1	0.08835594	0.7663
NETWRK	1	1	0.78621445	0.3752
FOR_PROFIT	1	1	5.79001364	0.0161*
MAPP8	1	1	6.07777263	0.0137*

Receiver Operating Characteristic

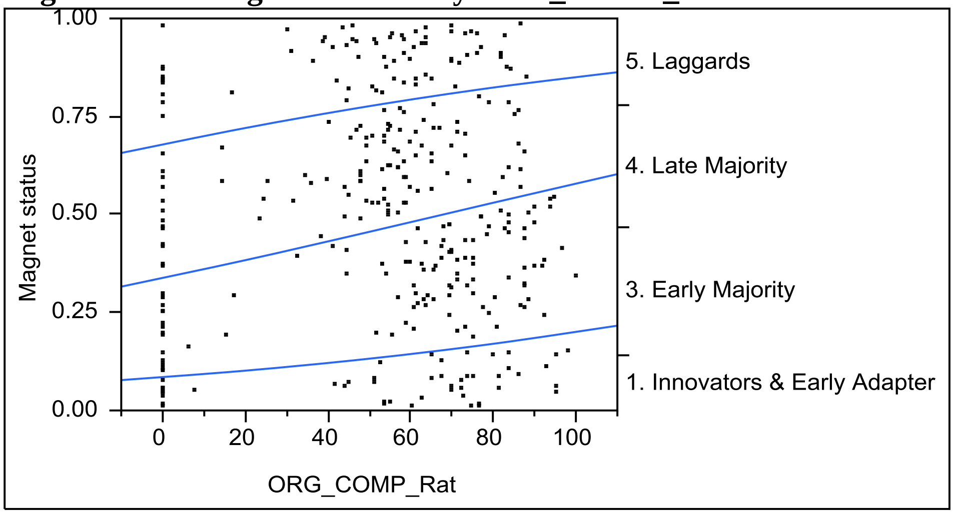


Magnet status 3	Area
1. Innovators & Early Adapter	.
3. Early Majority	0.7401
4. Late Majority	0.7342
5. Laggards	0.7292

Table 11

Organizational Complexity Rate

Logistic Fit of Magnet Status 3 By ORG_COMP_Rate



Whole Model Test

Model	-Log Likelihood	DF	Chi Square	Prob > ChiSq
Difference	3.51389	1	7.027788	0.0080*
Full	430.22751			
Reduced	433.74141			

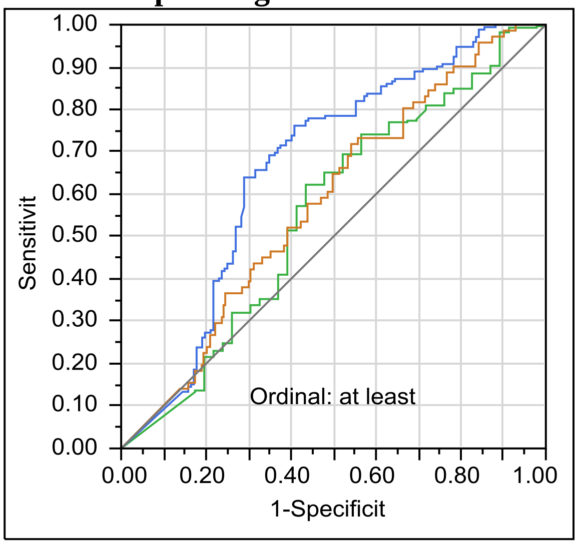
RSquare (U)	0.0081
AICc	868.58
BIC	883.578
Observations (or Sum Wgts)	324

Measure	Training	Definition
Entropy RSquare	0.0081	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.0230	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	1.3279	∑ -Log(ρ[j])/n
RMSE	0.7255	√ ∑(y[j]-ρ[j])²/n
Mean Abs Dev	0.7214	∑ |y[j]-ρ[j]|/n
Misclassification Rate	0.6296	∑ (ρ[j]≠ρMax)/n
N	324	N

Parameter Estimates

Term	Estimate	Std Error	Chi Square	Prob > ChiSq
Intercept[1. Innovators & Early Adapter]	-2.3784143	0.2692448	78.03	< .0001*
Intercept[3. Early Majority]	-0.6736586	0.2339099	8.29	0.0040*
Intercept[4. Late Majority]	0.74840516	0.2353877	10.11	0.0015*
ORG_COMP_Rate	0.00992033	0.0037085	7.16	0.0075*

Receiver Operating Characteristic

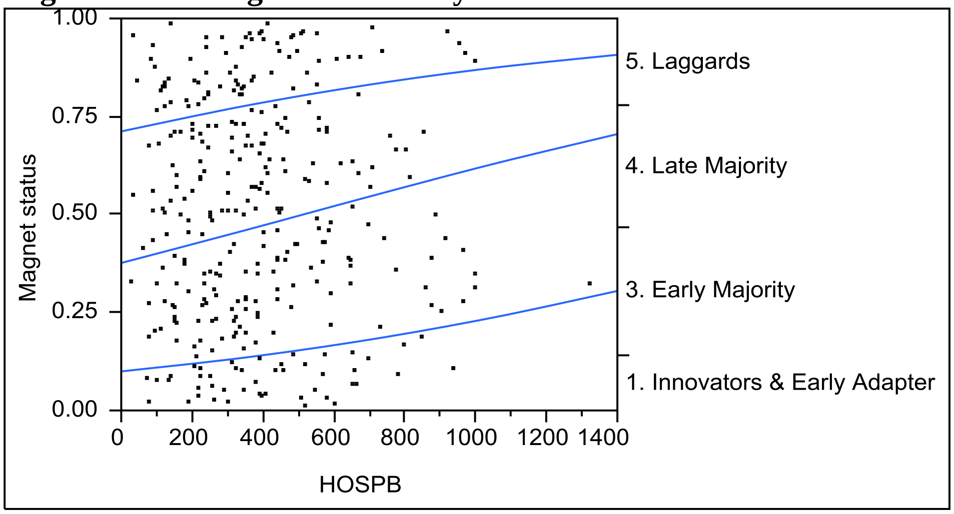


Magnet Status 3	Area
1. Innovators & Early Adapter	.
3. Early Majority	0.5562
4. Late Majority	0.6652
5. Laggards	0.5808

Table 12

Hospital Beds

Logistic Fit of Magnet Status 3 By HOSPBD



Whole Model Test

Model	-Log Likelihood	DF	Chi Square	Prob > ChiSq
Difference	2.36866	1	4.737319	0.0295*
Full	431.37275			
Reduced	433.74141			

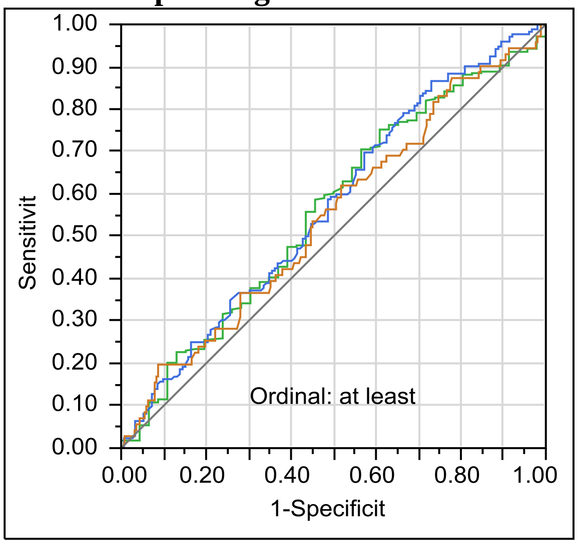
RSquare (U)	0.0055
AICc	870.871
BIC	885.868
Observations (or Sum Wgts)	324

Measure	Training	Definition
Entropy RSquare	0.0055	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.0156	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	1.3314	∑ -Log(ρ[j])/n
RMSE	0.7276	√ ∑(y[j]-ρ[j])²/n
Mean Abs Dev	0.7240	∑ |y[j]-ρ[j]|/n
Misclassification Rate	0.6605	∑ (ρ[j]≠ρMax)/n
N	324	N

Parameter Estimates

Term	Estimate	Std Error	Chi Square	Prob > ChiSq
Intercept[1. Innovators & Early Adapter]	-2.2011045	0.2471024	79.35	< .0001*
Intercept[3. Early Majority]	-0.5055186	0.2096459	5.81	0.0159*
Intercept[4. Late Majority]	0.90459791	0.2158585	17.56	< .0001*
HOSPBD	0.0009834	0.0004557	4.66	0.0309*

Receiver Operating Characteristic

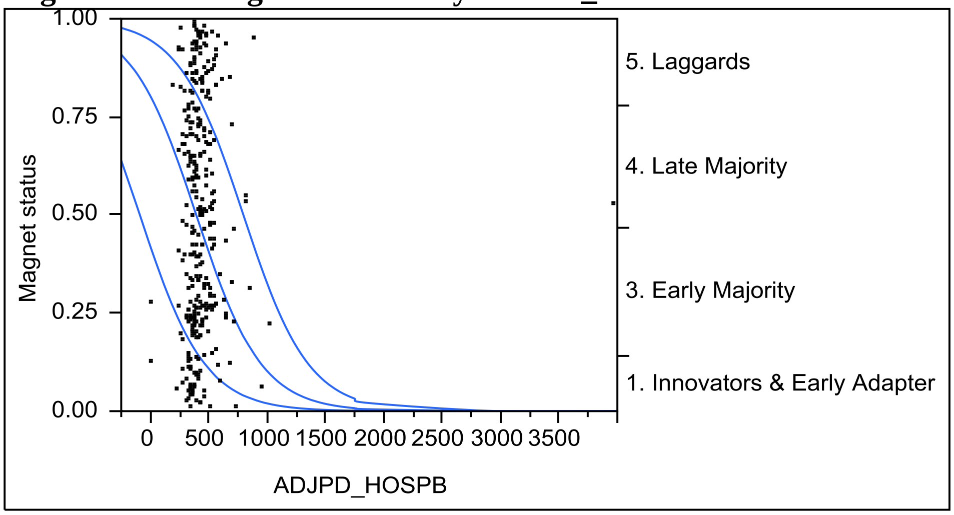


Magnet Status 3	Area
1. Innovators & Early Adapter	.
3. Early Majority	0.5598
4. Late Majority	0.5683
5. Laggards	0.5449

Table 13

Slack Resources: Adjusted Hospital Occupancy

Logistic Fit of Magnet Status 3 By ADJPD_HOSPBD



Whole Model Test

Model	-Log Likelihood	DF	Chi Square	Prob > ChiSq
Difference	9.76332	1	19.52665	< .0001*
Full	423.97808			
Reduced	433.74141			

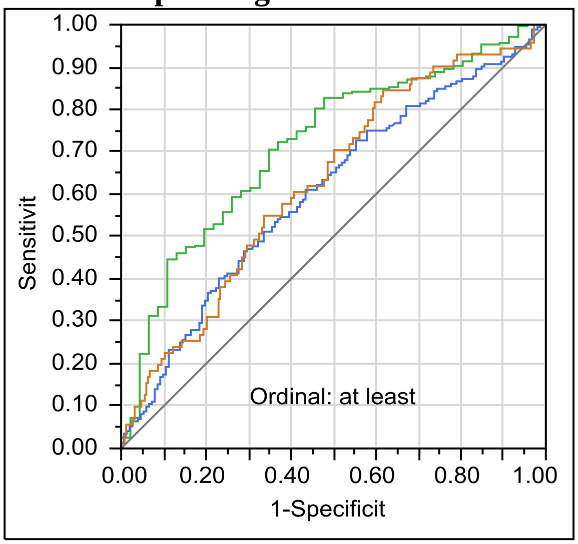
RSquare (U)	0.0225
AICc	856.082
BIC	871.079
Observations (or Sum Wgts)	324

Measure	Training	Definition
Entropy RSquare	0.0225	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.0628	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	1.3086	∑ -Log(ρ[j])/n
RMSE	0.7209	√ ∑(y[j]-ρ[j])²/n
Mean Abs Dev	0.7154	∑ |y[j]-ρ[j]|/n
Misclassification Rate	0.6481	∑ (ρ[j]≠ρMax)/n
N	324	N

Parameter Estimates

Term	Estimate	Std Error	Chi Square	Prob > ChiSq
Intercept[1. Innovators & Early Adapter]	-0.3246084	0.3931625	0.68	0.4090
Intercept[3. Early Majority]	1.40432425	0.3918408	12.84	0.0003*
Intercept[4. Late Majority]	2.84926897	0.4167398	46.75	< .0001*
ADJPD_HOSPBD	-0.0035777	0.0008941	16.01	< .0001*

Receiver Operating Characteristic



Magnet Status 3	Area
1. Innovators & Early Adapter	.
3. Early Majority	0.7162
4. Late Majority	0.6047
5. Laggards	0.6273

Table 14

Hospital Networks

Contingency Analysis of Magnet Status 3 By NETWRK

Count Total % Col % Row %	1. Innovators & Early Adapter	3. Early Majority	4. Late Majority	5. Laggards	
0	24	54	63	42	183
	7.41	16.67	19.44	12.96	56.48
	52.17	50.94	62.38	59.15	
	13.11	29.51	34.43	22.95	
1	22	52	38	29	141
	6.79	16.05	11.73	8.95	43.52
	47.83	49.06	37.62	40.85	
	15.60	36.88	26.95	20.57	
	46	106	101	71	324
	14.20	32.72	31.17	21.91	

Tests

N	DF	-LogLike	RSquare (U)
324	3	1.6557996	0.0038

Test	Chi Square	Prob > ChiSq
Likelihood Ratio	3.312	0.3460
Pearson	3.304	0.3471

Ordinal Logistic Fit for Magnet Status 3
Whole Model Test

Model	-Log Likelihood	DF	Chi Square	Prob > ChiSq
Difference	0.99336	1	1.986725	0.1587
Full	432.74804			
Reduced	433.74141			

RSquare (U)	0.0023
AICc	873.621
BIC	888.619
Observations (or Sum Wgts)	324

Measure	Training	Definition
Entropy RSquare	0.0023	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.0066	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	1.3356	∑ -Log(ρ[j])/n
RMSE	0.7293	√ ∑(y[j]-ρ[j])²/n
Mean Abs Dev	0.7260	∑ |y[j]-ρ[j]|/n
Misclassification Rate	0.6451	∑ (ρ[j]≠ρMax)/n
N	324	n

Lack of Fit

Source	DF	-Log Likelihood	Chi Square
Lack of Fit	2	0.66244	1.324874
Saturated	3	432.08561	**Prob > ChiSq**
Fitted	1	432.74804	0.5156

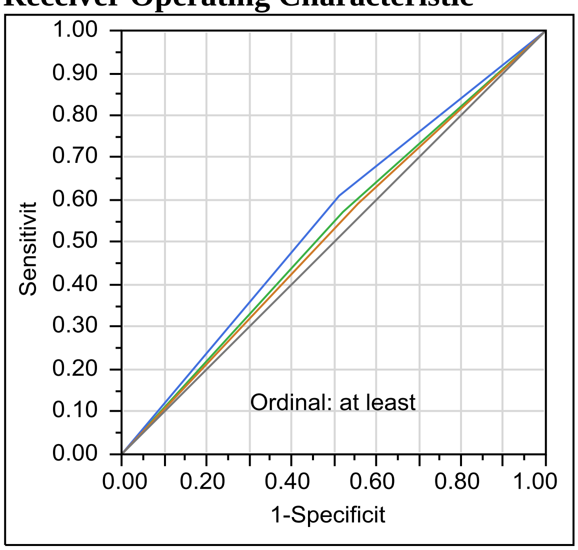
Parameter Estimates

Term	Estimate	Std Error	Chi Square	Prol > ChiS(	Lower 95%	Upper 95%
Intercept[1. Innovators & Early Adapter]	-1.9314924	0.1857725	108.10	< .0001*	.	.
Intercept [3. Early Majority]	-0.2474179	0.1425433	3.01	0.0826	.	.
Intercept [4. Late Majority]	1.15406848	0.1579571	53.38	< .0001*	.	.
NETWRK[1-0]	0.28594316	0.2028132	1.99	0.1586	-0.1115622	0.68521489

Effect Likelihood Ratio Tests

Source	Nparm	DF	L-R Chi Square	Prob > ChiSq
NETWRK	1	1	1.98672534	0.1587

Receiver Operating Characteristic



Magnet Status 3	**Area**
1. Innovators & Early Adapter	.
3. Early Majority	0.5251
4. Late Majority	0.5487
5. Laggards	0.5171

Table 15

Control of Domain

Whole Model Test

Model	-Log Likelihood	DF	Chi Square	Prob > ChiSq
Difference	16.38780	2	32.77561	< .0001*
Full	417.35360			
Reduced	433.74141			

RSquare (U)	0.0378
AICc	844.896
BIC	863.611
Observations (or Sum Wgts)	324

Measure	Training	Definition
Entropy RSquare	0.0378	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.1033	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	1.2881	∑ -Log(ρ[j])/n
RMSE	0.7120	√ ∑(y[j]-ρ[j])²/n
Mean Abs Dev	0.7052	∑ |y[j]-ρ[j]|/n
Misclassification Rate	0.6327	∑ (ρ[j]≠ρMax)/n
N	324	n

Lack of Fit

Source	DF	-Log Likelihood	Chi Square
Lack of Fit	952	412.60225	825.2045
Saturated	954	4.75135	**Prob > ChiSq**
Fitted	2	417.35360	0.9988

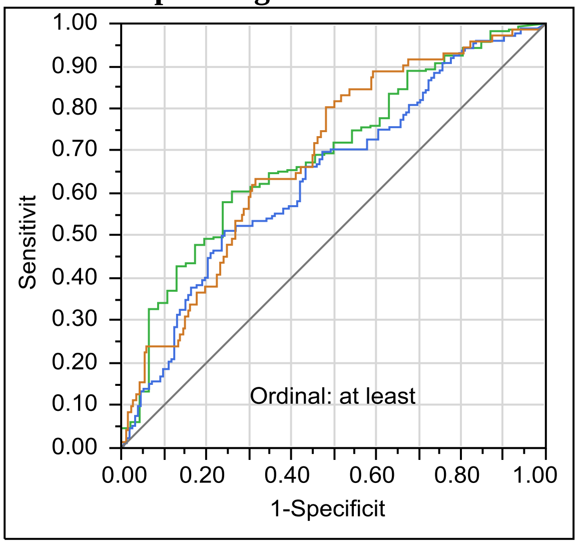
Parameter Estimates

Term	Estimate	Std Error	Chi Square	Prob > ChiSq	Lower 95%	Upper 95%
Intercept[1. Innovators | & Early Adapter]	-0.4594747	0.322575	2.03	0.1543	.	.
Intercept[3. Early Majority]	1.30981958	0.3219348	16.55	< .0001*	.	.
Intercept [4. Late Majority]	2.80487635	0.3509674	63.87	< .0001*	.	.
FTERN_ADJPD	81.7192126	103.36033	0.63	0.4292	-122.34351	293.432604
FTERN_HOSPBD	-1.023484	0.2378494	18.52	< .0001*	-1.5066172	-0.561457

Effect Likelihood Ratio Tests

Source	Nparm	DF	L-R Ch iSquare	Prob > ChiSq
FTERN_ADJPD	1	1	0.6074365	0.4358
FTERN_HOSPBD	1	1	19.4696973	< .0001*

Receiver Operating Characteristic



Magnet Status 3	Area
1. Innovators & Early Adapter	.
3. Early Majority	0.6885
4. Late Majority	0.6404
5. Laggards	0.6852

Table 16

Hospital Structural Characteristics

Whole Model Test

Model	-Log Likelihood	DF	Chi Square	Prob > ChiSq
Difference	3.30205	2	6.604105	0.0368*
Full	430.43935			
Reduced	433.74141			

RSquare (U)	0.0076
AICc	871.067
BIC	889.782
Observations (or Sum Wgts)	324

Measure	Training	Definition
Entropy RSquare	0.0076	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.0217	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	1.3285	∑ -Log(ρ[j])/n
RMSE	0.7268	√ ∑(y[j]-ρ[j])²/n
Mean Abs Dev	0.7228	∑ |y[j]-ρ[j]|/n
Misclassification Rate	0.6636	∑ (ρ[j]≠ρMax)/n
N	324	N

Lack of Fit

Source	DF	-Log Likelihood	Chi Square
Lack of Fit	7	3.40986	6.819724
Saturated	9	427.02949	**Prob > ChiSq**
Fitted	2	430.43935	0.4479

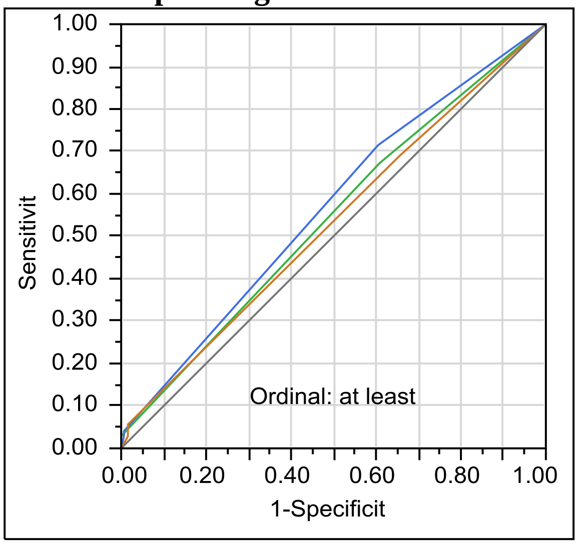
Parameter Estimates

Term	Estimate	Std Error	Chi Square	Prob > ChiSq	Lower 95%	Upper 95%
Intercept[1. Innovators & Early Adapter]	-1.6115928	0.2075794	60.28	< .0001*	.	.
Intercept [3. Early Majority]	0.08235552	0.1787039	0.21	0.6449	.	.
Intercept[4. Late Majority]	1.5001927	0.1991071	56.77	< .0001*	.	.
FOR_PROFIT[1-0]	-1.4290843	0.6863754	4.34	0.0373*	-2.8316149	-0.1524033
MAPP8[1-0]	-0.2620926	0.212164	1.53	0.2167	-0.6814727	0.15568402

Effect Likelihood Ratio Tests

Source	Nparm	DF	L-R Chi Square	Prob > ChiSq
FOR_PROFIT	1	1	4.81366966	0.0282*
MAPP8	1	1	1.5114001	0.2189

Receiver Operating Characteristic



Magnet Status 3	Area
1. Innovators & Early Adapter	.
3. Early Majority	0.5407
4. Late Majority	0.5649
5. Laggards	0.5298

Table 17

Combined Organizational and Environmental Influences

Whole Model Test

Model	**-LogLikelihood**	**DF**	**ChiSquare**	**Prob>ChiSq**
Difference	41.39046	6	82.78091	<.0001*
Full	392.35095			
Reduced	433.74141			

RSquare (U)	0.0954
AICc	803.275
BIC	836.729
Observations (or Sum Wgts)	324

Measure	**Training**	**Definition**
Entropy RSquare	0.0954	1-Loglike(model)/Loglike(0)
Generalized RSquare	0.2421	(1-(L(0)/L(model))^(2/n))/(1-L(0)^(2/n))
Mean -Log p	1.2110	∑ -Log(ρ[j])/n
RMSE	0.6821	√ ∑(y[j]-ρ[j])²/n
Mean Abs Dev	0.6677	∑ |y[j]-ρ[j]|/n
Misclassification Rate	0.5926	∑ (ρ[j]≠ρMax)/n
N	324	n

Lack Of Fit

Source	**DF**	**-LogLikelihood**	**ChiSquare**
Lack Of Fit	960	392.35095	784.7019
Saturated	966	0.00000	**Prob>ChiSq**
Fitted	6	392.35095	1.0000

Parameter Estimates

Term	**Estimate**	**Std Error**	**Chi Square**	**Prob> Chi Sq**	**Lower 95%**	**Upper 95%**
Intercept[1.Innovators & Early Adapter]	1.81232854	0.6480353	7.82	0.0052*	.	.
Intercept[3.Early Majority]	3.76491235	0.6671853	31.84	<.0001*	.	.
Intercept[4.Late Majority]	5.42554713	0.7013203	59.85	<.0001*	.	.
ORG_COMP_Rate	0.0138775	0.0041102	11.40	0.0007*	0.00565239	0.02224504
ADJPD_HOSPBD	-0.0058303	0.0010019	33.86	<.0001*	-0.0078935	-0.0038798
FTERN_ADJPD	-493.11299	82.25749	35.94	<.0001*	-660.62722	-333.61729
FOR_PROFIT[1-0]	-1.6294244	0.7103916	5.26	0.0218*	-3.073047	-0.3277874
MAPP8[1-0]	-0.4140802	0.234895	3.11	0.0779	-0.889929	0.05726124
COMPETITIVE_ ADOPTERS[1-0]	0.70901624	0.2480616	8.17	0.0043*	0.22473646	1.19846413

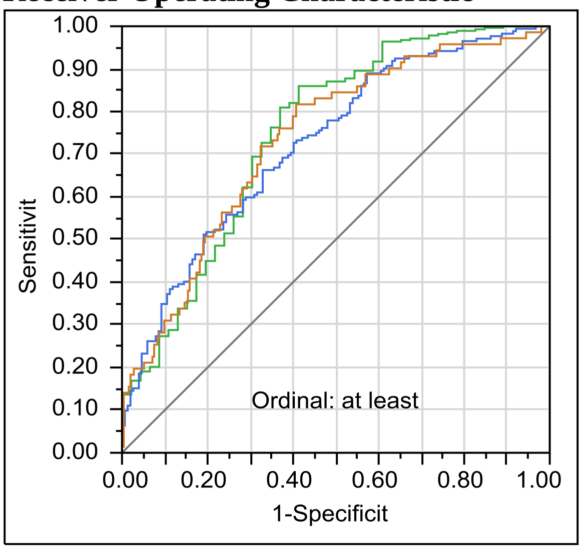
Effect Wald Tests

Source	Nparm	DF	Wald ChiSquare	Prob>ChiSq
ORG_COMP_Rate	1	1	11.3996338	0.0007*
ADJPD_HOSPBD	1	1	33.8642871	<.0001*
FTERN_ADJPD	1	1	35.9370139	<.0001*
FOR_PROFIT	1	1	5.26105445	0.0218*
MAPP8	1	1	3.10757503	0.0779
COMPETITIVE_ADOPTERS	1	1	8.16945832	0.0043*

Effect Likelihood Ratio Tests

Source	Nparm	DF	L-R ChiSquare	Prob>ChiSq
ORG_COMP_Rate	1	1	11.001845	0.0009*
ADJPD_HOSPBD	1	1	42.0905153	<.0001*
FTERN_ADJPD	1	1	38.692754	<.0001*
FOR_PROFIT	1	1	6.04655605	0.0139*
MAPP8	1	1	2.96129703	0.0853
COMPETITIVE_ADOPTERS	1	1	8.25166119	0.0041*

Receiver Operating Characteristic



Magnet status 3	Area
1. Innovators & Early Adapter	.
3. Early Majority	0.7492
4. Late Majority	0.7248
5. Laggards	0.7348

Table 18

Pairwise Correlations

Multivariate

Pairwise Correlations

Variable	by Variable	Correlation	Count	Lower 95%	Upper 95%	Signif Prob	Plot Corr
ORG_COMP_Rate	ORG_COMP	0.8707	324	0.8416	0.8948	<.0001*	
FTERN_HOSPBD	FTERN_ADJPD	0.7491	324	0.6971	0.7933	<.0001*	
FTERN_HOSPBD	FTERN_GENBD	0.4903	324	0.4029	0.5689	<.0001*	
MAPP8	HOSPBD	-0.4650	324	-0.5463	-0.3750	<.0001*	
FTERN_GENBD	FTERN_ADJPD	0.4260	324	0.3325	0.5113	<.0001*	
HOSPBD	ORG_COMP_Rate	0.4225	324	0.3287	0.5081	<.0001*	
FTERN_HOSPBD	ORG_COMP	0.3687	324	0.2707	0.4593	<.0001*	
HOSPBD	ORG_COMP	0.3428	324	0.2429	0.4355	<.0001*	
MAPP8	FTERN_HOSPBD	-0.3174	324	-0.4121	-0.2159	<.0001*	
MAPP8	FTERN_ADJPD	-0.3015	324	-0.3974	-0.1991	<.0001*	
FTERN_ADJPD	ORG_COMP	0.2528	324	0.1479	0.3521	<.0001*	
MAPP8	ORG_COMP_Rate	-0.2512	324	-0.3505	-0.1462	<.0001*	
FTERN_GENBD	ORG_COMP	0.2485	324	0.1434	0.3480	<.0001*	
FTERN_HOSPBD	ORG_COMP_Rate	0.2409	324	0.1355	0.3409	<.0001*	
MAPP8	ORG_COMP	-0.2079	324	-0.3098	-0.1012	0.0002*	
MAPP8	FTERN_GENBD	-0.1778	324	-0.2813	-0.0702	0.0013*	
FTERN_ADJPD	ORG_COMP_Rate	0.1753	324	0.0676	0.2789	0.0015*	
FTERN_GENBD	ORG_COMP_Rate	0.1733	324	0.0656	0.2770	0.0017*	
NETWRK	ORG_COMP_Rate	0.1218	324	0.0130	0.2277	0.0284*	
NETWRK	HOSPBD	0.0981	324	-0.0109	0.2049	0.0777	
NETWRK	FTERN_ADJPD	0.0935	324	-0.0157	0.2004	0.0931	
FTERN_ADJPD	HOSPBD	0.0896	324	-0.0195	0.1967	0.1074	
MAPP8	NETWRK	-0.0878	324	-0.1949	0.0213	0.1147	
NETWRK	FTERN_GENBD	0.0853	324	-0.0239	0.1925	0.1256	
FTERN_GENBD	HOSPBD	0.0788	324	-0.0304	0.1862	0.1569	
FOR_PROFIT	HOSPBD	-0.0711	324	-0.1787	0.0382	0.2020	
NETWRK	ORG_COMP	0.0649	324	-0.0444	0.1726	0.2442	
FOR_PROFIT	FTERN_ADJPD	0.0611	324	-0.0481	0.1690	0.2725	
FOR_PROFIT	FTERN_GENBD	0.0482	324	-0.0611	0.1563	0.3873	
FOR_PROFIT	ORG_COMP	0.0454	324	-0.0638	0.1536	0.4149	
MAPP8	FOR_PROFIT	0.0310	324	-0.0782	0.1395	0.5777	
NETWRK	FTERN_HOSPBD	0.0280	324	-0.0812	0.1366	0.6155	
FOR_PROFIT	FTERN_HOSPBD	0.0258	324	-0.0834	0.1344	0.6432	
FOR_PROFIT	NETWRK	-0.0193	324	-0.1280	0.0898	0.7291	
FTERN_HOSPBD	HOSPBD	-0.0126	324	-0.1214	0.0965	0.8216	
FOR_PROFIT	ORG_COMP_Rate	0.0018	324	-0.1072	0.1108	0.9740	

Table 19

Summary of Findings by Hypothesis

	Hypotheses	Hypothesis Supported*
1.0	**There is a significant positive influence between environmental factors and the rate at which organizations adopt innovation.**	YES*
1.1	There is a significant positive influence between environmental complexity and the rate at which organizations adopt innovation.	NO
1.2	There is a significant positive influence between competition and the rate at which organizations adopt innovation.	NO
1.3	There is a significant positive influence between critical mass and the rate at which organizations adopt innovation.	YES*
1.4	There is a significant positive influence between community resources and the rate at which organizations adopt innovation.	NO
2.0	**There is a significant positive influence between organizational factors and the rate at which organizations adopt innovation.**	YES*
2.1	There is a significant positive influence between organizational complexity and the rate at which organizations adopt innovation.	YES*
2.2	There is a significant positive influence between organizational size and the rate at which organizations adopt innovation.	YES*
2.3	There is a significant positive influence between slack resources and the rate at which organizations adopt innovation.	YES*
2.4	There is a significant positive influence between external networks and the rate at which organizations adopt innovation.	NO
2.5	There is a significant positive influence between control of domain and the rate at which organizations adopt innovation.	YES*
2.6	There is a significant positive influence between hospital structural characteristics (hospital ownership defined as not-for-profit status and teaching affiliation) and the rate at which organizations adopt innovation.	YES*
3.0	**There is a significant difference between environmental influences and organizational influences and the rate at which organizations adopt innovation.**	YES*
4.0	**There is a significant positive influence between environmental and organizational factors acting jointly on the rate at which organizations adopt innovation.**	YES*

*$p < .05$.

Figure 1

Rogers' Framework of Adoption

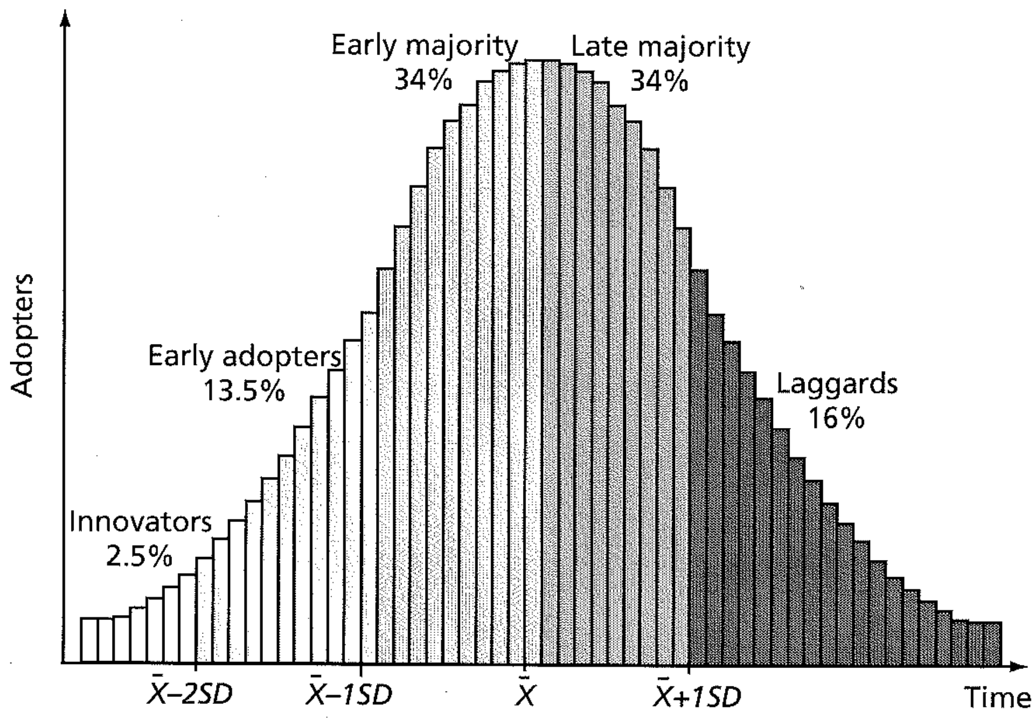
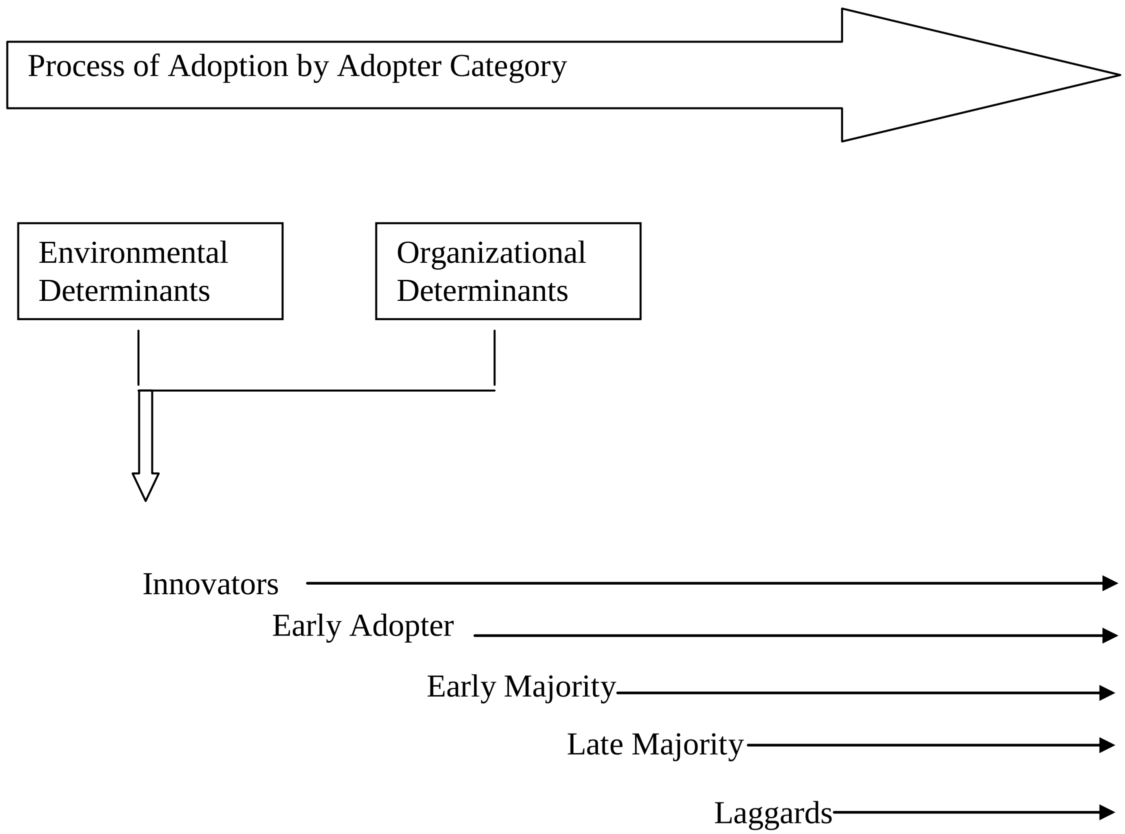


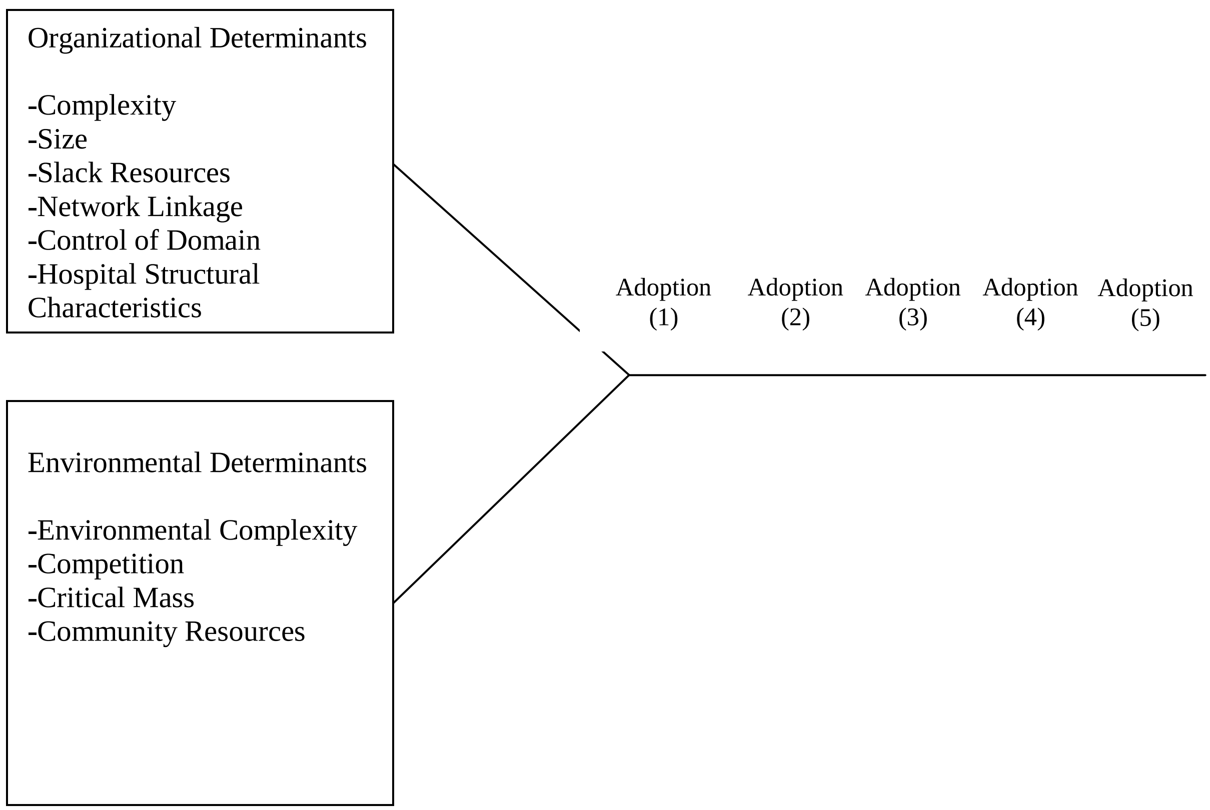
Figure 2



Process of Adoption by Adopter Category
Environmental Determinants
Organizational Determinants
Innovators
Early Adopter
Early Majority
Late Majority
Laggards

Figure 3

A Conceptual Framework of Innovation Adoption by Organizations



Adoption 1 = Innovation

Adoption 2 = Early Adopter

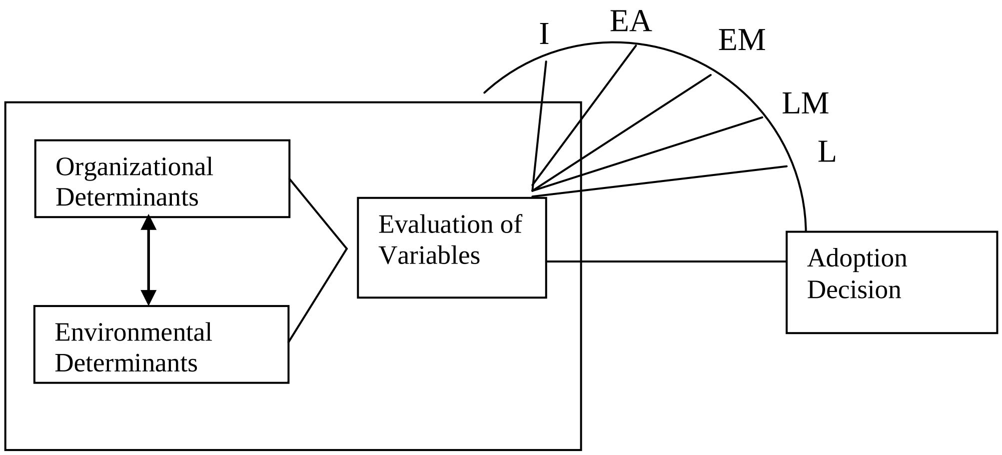
Adoption 3 = Early Majority

Adoption 4 = Late Majority

Adoption 5 = Laggards

Figure 4

A Conceptual Model of Innovation Adoption by Adopter Category



I = Innovators

EA = Early Adopter

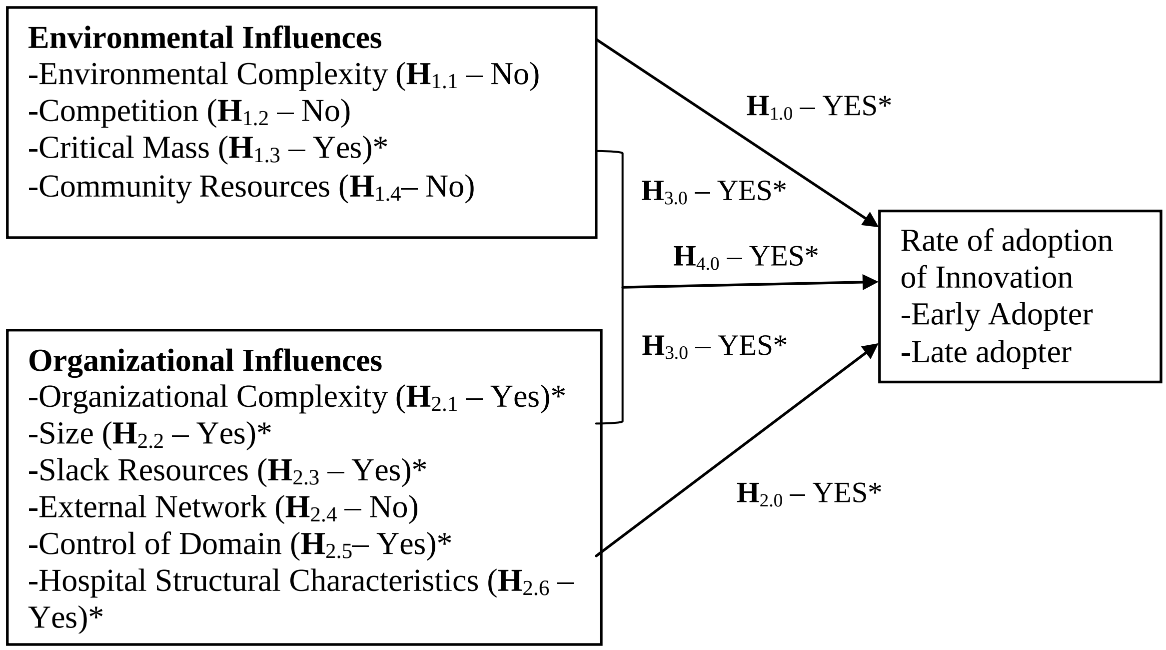
EM = Early Majority

LM = Late Majority

L = Laggards

Figure 5

Summary of Findings on Support for Hypotheses



*Statistically significant at $p < 0.05$, in hypothesized direction.

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APPENDIX A:

SUMMARY OF RELEVANT STUDIES

These tables have been reprinted, with permission, from Greenhalgh and colleagues' (2005) extensive study, *Diffusion of Innovations in Service Organizations: Systematic Review and Recommendations*, as commissioned by the government of the United Kingdom. The tables summarize key sources in the field, including narrative overviews (Table A1), empirical studies of attributes of healthcare innovations in the organizational setting (Table A2), empirical studies that focused on the process of adoption in healthcare organizations (Table A3), meta-analyses that addressed the impact of the organizational context on adoption of innovations (Table A4), empirical studies of organizational determinants of innovation in health care organizations (Table A5), and empirical studies of impact of environmental factors on innovation in healthcare organizations and selected other examples (Table A6).

Table A1
Narrative Overviews Used as Key Sources in This Review

Author/year	Field of study	Scope of review	Method used	Comment
Rogers 1995[3]	Sociology	Focuses primarily on the 'classical diffusion theory' – i.e. spread of ideas and practices between individuals via social networks, with an emphasis on the author's own field (rural sociology). Provides limited discussion of organizational research.	Narrative review. Falls short of formal systematic review.	Scholarly summary by the acknowledged 'world authority' on classical diffusion
Wolfe 1994[174]	Organization and management	A broad overview of innovation research in the organization and management literature. Empirical work in this tradition in the 1980s and 1990s, e.g. identified 1299 journal articles and 351 dissertations and addressing 'organizational innovation'.	No clear search strategy but highly systematic framework for analysis.	Useful source regarding key theoretical influences in organizational research
Strang and Soule 1998[124]	Sociology	An overview of literature similar to that covered by Rogers – classical diffusion from a sociological perspective – but also includes a critical analysis of a wider body of literature relevant to diffusion of innovations in organizations.	Narrative review. Quality criteria are not given.	A sound and readable review whose strength is its scholarly and creative commentary
Meyers et al. 1999[91]	Organization and management	Reviews a large, fragmented body of work on implementation in organizations, including process engineering, information technology, human resource management and marketing. Synthesizes findings to develop a conceptual framework and derives propositions about effects of key factors on implementation.	Narrative review. Search strategy was not given and inclusion and quality criteria were implicit rather than explicit.	Well-written review
Gustafason 2003[89]	Change management	Review of primary studies from the change management literature relevant to implementation of innovations, linked to some empirical work.	Search strategy not given in detail. Authoritative but not comprehensive overview of a vast and disparate literature.	Mainstream change management
Ellsworth 2003[432]	Education	Provides overview of the educational sociology literature, based on a wealth of primary studies, on a range of whole-systems approach with different linked interventions at different levels.	Search strategy not given in detail. Appears comprehensive in relation to the education literature.	In-depth overview of education
Wejnert 2003[41]	Social and political sciences	Reviews the literature on diffusion of innovations in fields relatively distant from health literature (political science, social movements, geography, environmental studies). Creates a conceptual framework that groups independent variables into 3 components: (a) characteristics of the innovation; (b) charac-	Narrative review. Search strategy was not given and inclusion and quality criteria were implicit rather than explicit.	An up-to-date extensively referenced and theoretically robust narrative review`

Author/year	Field of study	Scope of review	Method used	Comment
		teristics of the actors/ adopters; (c) characteristics of the environmental context.		
Greenhalgh et al., 2005	Health service organizations	Reviews the literature on diffusion of innovations in health service organizations. Includes literature on adopters, adoption, and attributes of adopting organizations.	Meta-narrative review for sorting and evaluating 6,000 sources.	The most comprehensive review of currently available literature on innovation in health sector

Table A2

Empirical Studies of Attributes of Health Care Innovations in the Organizational Setting

Author/ year	Field of study	Innovation	Target adopter	Type of study and number of participants	Attributes tested	Attributes found to predict adoption	Comment
Marshall, 1990[30]	Information services	Electronic database searching	Doctors and nurses	Survey of 150 clinicians	Relative advantage, compatibility, complexity, trialability, observability	Relative advantage and complexity were significant predictors of current use.	This study was undertaken before widespread Internet access to these databases.
Grilli & Lomas, 1994[37]	Evidence-based practice	Clinical guidelines	Doctors	Survey of 23 studies involving 143 recommendations	Complexity, trialability, observability	Complexity, trialability, and observability together accounted for 47% of variance in adoption.	Attributes evaluated by authors; perceptions of potential adopters were not measured directly.
Dirksen et al., 1996[29]	Surgery	Six surgical endoscopic procedures, e.g. appendectomy	Surgeons in the Netherlands	Survey of 148 surgeons (82% response rate)	Perceptions of three attributes of the procedure	Different surgical procedures had very different adoption patterns, and different attributes had *different* impact depending on the procedure.	This was a retrospective attribution study whose predictive power is considered weak.
Meyer et al., 1997[31]	American public health (cancer prevention)	Three cancer prevention projects undertaken in an interorganizational cancer informa-tion network	Mainly managers	Survey of 89 professionals (96% response rate)	Innovation attributes (relative advantage, compatibility, complexity, trialability, observability,	Relative advantage, complexity, reinvention, riskiness. Observability and trialability were not related to	Authors suggest that impact of trialability may have been overshadowed by strategic inter-organiaational decision to adopt these innovations.

Author/ year	Field of study	Innovation	Target adopter	Type of study and number of participants	Attributes tested	Attributes found to predict adoption	Comment
					adaptability [intervention], riskiness, acceptance)	adoption. Compatibility proved impossible to measure accurately.	
Yetton et al., 1999[39]	Australian public health care system	IT system for human resource management	Managers	Survey of 133 potential users (67 usable replies)	Innovation attributes (task relevance, task usefulness) plus adopter charac-teristics and organizational variables	Only three factors were significant in the final model: task relevance, task usefulness	Conclude that organizational variables dominate at team level.
Lee, 2000[296]	Ambulatory care	Electronic medical record	Clinicians, managers, administrators	Survey of 115 individuals (83% response rate)	Compatibility, ease of use, image, relative advantage, results, trialability, visibility, voluntariness	Different groups rated different attributes differently. Doctors perceived the EMR significantly less favorably than nurses and nonclinical respondents.	Actual adoption was not measured, but the finding that perceived attributes differ between professional groups is important and possibly generalizable.
Dobbins et al., 2001[42]	Public health	Systematic reviews	Public health doctors	147 (96% response rate)	Relative advantage, ease of use, compatibility	Ease of use was the only attribute that proved significant in the final model.	Organizational attributes (size, differentiation, slack resources) did not influence use.

Table A3
Empirical Studies that Focused on the Process of Adoption in Healthcare Organizations

Author/ year	Context	Innovation	Study design	Size and scope	Hypotheses tested	Main findings	Comment
Meyer and Goes 1988[38]	US private (non-profit) community hospitals in 1980s	Health-related technologies (main focus was large pieces of equipment)	Comparative case study with over 300 interviews, and observation and surveys	12 innovations in 25 hospitals over 6 years; 300 potential adoption decisions	Assimilation of innovations by organizations is influenced by (a) equipment, organizational context and leadership; (b) attributes of the innovation and (c) interaction between the variables	Assimilation of innovations was a lengthy and complex process. Hypotheses were broadly confirmed. Innovation attributes explained 37% of variance.	The notion of 'assimilation' as a 9-stage process rather than an all-or-none event is a potentially useful framework for studying organizational adoption.
Gladwin and Wilson 2000[493]	A low-income African country	A health management information system	In-depth (ethnographic) case study	Innovation implemented nationally but extent of data collection not clear	Adoption of a high-technology health service innovation will be primarily by its degree of 'organizational fit'	Process of adoption was complex and barriers were identified at multiple levels. Many barriers were technological.	Compares diffusion of innovations theory and dynamic equilibrium organizational change theory as explanatory models.
Fitz-gerald et al. 2002[32]	UK health-care	8 'evidence into practice' initiatives	Comparative case study	8 case studies	How is complex evidence implemented at an organizational level?	The nature of diffusion is highly interactive. There is no single, all-or-none adoption decision.	Authors comment on the ambiguous, contested and socially mediated nature of new scientific knowledge.
Denis et al. 2002[33]	Canadian hospitals and primary care	4 innovations selected as a maximum-variety sample	Qualitative cross-case analysis	4 in-depth case studies	Adoption of complex innovations is determined by subtle and complex interactions between multiple variables	Hypothesis was confirmed.	The methodology of cross-case analysis is potentially very powerful if in-depth qualitative methods are used.

Table A4

Meta-analyses that Addressed the Impact of the Organizational Context on Adoption of Innovations

Author/year	Source of studies	Sample size	Aim of meta-analysis	Main findings	Comment
Damanpour 1991[14]	Sociological abstracts (1960-1988), plus references from recent review articles and other sources[a]	23 (21 papers and 2 books)	To test the hypothesis that the rate of adoption of multiple innovations (organizational innovativeness) is determined by particular organizational factors ('determinants'). In all, 14 structural, process, resource, and cultural variables were tested.	Statistically significant association between 10 of the 14 determinants and organizational innovativeness. The strongest and most significant determinants were specialization, functional differentiation and external communication.	Results suggest that relations between these determinants and innovation are stable across studies, casting doubt on previous assertions of their instability.
Damanpour 1992[15]	Sociological abstracts; psychological and economic abstracts (no date range supplied), plus other sources as above (footnote)	20 (18 papers and 2 books)	To specify the strength of the association between organizational size and organizational innovativeness, and to delineate the role of various moderators of this association.	Organizational size is positively related to innovation. Moderators included the type of organization (for-profit companies had a closer correlation between size and innovativeness), and stage in the innovation process ("more closely related to implementation than initiation), but not to the nature of the innovation.	Size was probably a proxy for other variables, e.g. slack, complexity (see subsequent study in row below).
Damanpour 1996[16]	Sociological, psychological and economic abstracts (1991); empirical studies (published 1960-1990) in English language	21 studies including 27 separate correlations on complexity and 36 correlations on size	To explore further the relationship between organizational complexity (independent variable) and innovativeness (independent variable). Two measures of complexity were used: (a) structural complexity and (b) organizational size. Also considered 14 'contingency factors' that mediated or moderated this relationship.	Both structural complexity and organizational size are positively related to organizational innovation and explain, about 15% and 12%, respectively, of variation in it. Contingency factors common to both indicators were: environmental uncertainty; use of service organizations; focus on technical innovations; and focus on product innovations.	The demonstrated impact of organizational factors on innovativeness appears stable and challenges previously held views that the empirical literature is inconsistent.

Table A5

Empirical Studies of Organizational Determinants of Innovation in Healthcare Organizations

Author/ year	Innovation and context	Study design and size	Factors hypothesized to affect innovations	Significant associations actually demonstrated	Comment
Castle 2001[73]	Special and sub-acute care units in nursing homes in USA (1992-1997)	Analysis of national data-set	Organizations with (a) larger size; (b) membership of a chain; (c) for-profit and (d) greater proportion of private patients will adopt the innovation more rapidly	Size, chain membership and proportion of private patients were all significantly associated with earlier adoption	Findings may not be generalized beyond the US healthcare setting
Fitzgerald et al. 2002[32]	UK NHS (1995-1999): 8 case studies (5 technological and 3 organizational)	In-depth comparative case studies (4 in acute sector, 4 in primary)	(a) Organizational context; (b) absorptive capacity (i.e. underlying capacity of organizations to absorb new knowledge)	Diffusion influenced by interplay of (a) credibility of evidence; (b) characteristics of the multiple groups of actors; (c) features of the organization; (d) context	Various factors interact in a complex way to influence diffusion
Nystrom et al. 2002[76]	Medical imaging diagnostic technologies in US hospitals	Postal questionnaire survey of 70 hospitals	Organizational size and slack, moderated by aspects of organizational climate (risk orientation and external orientation)	Organizational size and slack promotes innovation, and does so more strongly in organizations with a climate favoring risk-taking	Attempted to measure interaction between multiple variables
Burns & Wholey 1993[65]	Unit matrix management in US general hospitals	Retrospective and longitudinal questionnaire surveys (study specific and national data)	Several measures of organizational structure plus embedded in external networks and normative institutional pressures	(a) Diversification and scale (a measure of size); (b) sociometric location in network; (c) dissemination of information; (d) inter-organizational norms	Combination of organizational attributes and environmental factors were both found to be significant; no overall effect of organizational size, but small hospitals excluded from sample
Goes and Park 1997[68]	15 innovations in Californian acute care hospitals including 6 technical and 11 administrative	Prospective longitudinal study over 10 years; tracked year-to-year changes on 135 items	(a) Size; (b) interorganizational links ('enduring transactions, flows and linkages that occur among or between an organization, and one or more organizations in its environment')	Positive association was shown between (a) size and (b) interorganizational links and adoption of both technical and administrative innovations	Hospital exhibiting multiple and extensive interorganizational links were more likely to be large; large hospitals were consistently more innovative than small hospitals

Author/ year	Innovation and context	Study design and size	Factors hypothesized to affect innovations	Significant associations actually demonstrated	Comment
Anderson and West 1998[69]	US hospitals; any product or process judged as an innovation by staff	Postal survey of management teams in 27 hospitals – total sample of 155 managers	An 'organizational climate' scale with 4 subscales: vision, participant safety, task orientation, and support for innovation	Support for innovation was predicted on overall innovation score; participant safety predicted number of innovations and self-reported innovativeness	Interesting, but not relevant to this research
Wilson et al. 1999[74]	Medical imaging diagnostic technologies in US hospitals	Postal survey of 70 hospitals	Organizations with a greater risk-oriented climate are likely to (a) adopt innovations that are more radical and (b) adopt innovations with higher relative advantage	Risk-oriented organizations tend to adopt more radical innovations ($r = 0.22$, $p < 0.06$) and innovations that provide greater relative advantage ($r = 0.23$, $p < 0.05$)	Related analysis to Nystrom et al.
Baldridge and Burnham 1975[63]	Organizational innovations in US schools in the late 1960s	Qualitative interviews and questionnaires; 271 school districts	(a) Proportion of innovative individuals; (b) size and complexity; (c) changing environment	Size and complexity only	'Landmark' study that challenged previous assumptions that innovative individuals can make their organizations more innovative
Kimberly and Evanisko 1981[59]	Technological and administrative innovations in US hospitals in late 1970	Mixed methodology with questionnaires, described in a separate article,[498] number of hospitals not given	(a) Characteristics of individuals in authority; (b) organizational characteristics; (c) contextual factors	Size was most significantly and consistently associated with innovation; other organizational variables also impacted on technological, but not administrative, innovations	The variables tested were much better predictors of the adoption of new medical technologies than of administrative innovations
Meyer and Goes 1988[38]	12 organization-level medical innovations introduced into US community hospitals in late 1970s	Comparative case study over 6 years with over 300 interviews, and observation and surveys	Assimilation of innovations by organizations is influenced by (a) environment, organizational context and leadership; (b) attributes of the innovation and (c) interaction between these	Contextual factors accounted for only about 11% of the observed variation; environmental variables had little demonstrated impact	Results closely resemble those of Kimberly and Evanisko[59]

Author/ year	Innovation and context	Study design and size	Factors hypothesized to affect innovations	Significant associations actually demonstrated	Comment
Champagne et al. 1991[64]	Sessional fee remuneration for general practitioners in hospitals in Canada	Qualitative study of long-term care hospitals in Quebec, 1984-1985; 27 in main study	(a) Political factors including leaders' satisfaction with the organization's performance; (b) organizational factors including size; (c) urbanization	Political factors had a strong positive association, and size a small negative association, with implementation	A surprising negative association between size and implementation

Table A6

Empirical Studies of the Impact of Environmental Factors on Innovation in Healthcare Organizations and Selected Other Examples

Author/ year	Innovation and context	Study design and size	Environmental factors hypothesized to affect innovativeness	Significant associations actually demonstrated	Comment
Damanpour 1996[16]	Various	Meta-analysis of 21 studies	'Environmental uncertainty' considered as a contingency factor that mediates the relationship between organizational complexity innovativeness	Environmental uncertainty moderated the relationship between innovativeness and both (a) structural complexity and (b) organizational size	Explanation is in terms of varied external pressure on organizations leading to greater opportunities for innovation
Baldridge and Burnham 1975[63]	Organizational innovations in US schools in late 1960s	Qualitative interviews and questionnaires; 271 school districts	(a) Environmental complexity will increase organizational innovativeness; (b) a rapidly changing environment will also increase it	Environmental complexity was significantly associated with innovativeness; changing environment was not	Size and complexity were key variables of influence
Kimberly and Evanisko 1981[59]	Technological and administrative innovations in US hospitals in late 1970s	Mixed methodology with questionnaires described in separate paper;[498] number of hospitals not given	3 'contextual' [environmental] variables – competition; size of city; age of hospital	Age of hospital showed small but significant association with adoption of technological innovation; competition and size of city not significant	Inner attributes dominant
Meyer and Goes 1988[38]	12 organization-level medical innovations introduced into US community hospitals in late 1970s	Comparative case study for 6 years with 300 interviews, and observation and surveys	3 environmental variables – urbanization, affluence, federal health insurance	Environmental variables had little demonstrable impact	Intraorganizational variables were dominant
Fennell and Warnecke 1988[36]	(a) Multi-disciplinary interventions and shared decision-making in head and neck cancer, and (b) linking primary care physicians and community hospitals with research	Descriptive 6-year retrospective case study of each network and a comparative analysis based on in-depth interviews with a range of key informants	(a) Environmental factors affect the extent of diffusion and the form of diffusion channel through which the process occurs; and (b) 'fit' between environmental factors and the form of diffusion network will affect network performance	(a) Linkage history (density and stability) combined with resource capacity and organizational compatibility to influence the network forms to emerge; (b) interpersonal networks did not leave a discernible structure after their termination; the	Combines environmental factors with form for diffusion with form of diffusion channel (network) in healthcare system and assesses impact of network type on sustainability of organizational innovations

Author/ year	Innovation and context	Study design and size	Environmental factors hypothesized to affect innovativeness	Significant associations actually demonstrated	Comment
	medicine in 7 IS network			interorganizational networks did lead to sustained innovations	
Champagne et al. 1991[64]	Session fee remuneration for general practitioners in long-term hospitals in Canada over a 15-month period	Multiple case studies with interviews and documentary analysis in 5 hospitals; data on the independent variables were collected by question-naires sent to the 27 study hospitals and 72 control hospitals	Urbanization (distance of the organization from a large urban centre)	The level of implementation of the innovation was positively and moderately associated with the level of urbanization ($\beta = 0.38$; $r^2 = 0.11$)	This study was of an atypical innovation (a change in how the doctors were paid), which may reduce the generalization of the findings
Castle 2001[73]	Special and sub-acute care units in nursing homes in USA (1992-1997)	Analysis of national data-set	7 environmental factors: (a) higher average income of residents; (b) beds per 100,000 population; (c) prospective reimbursement; (d) less competition; (e) state legislative policies with regard to building of new facilities; (f) age of population; and (g) availability of hospital-based services	Environmental variables positively associated with innovation were (a) and (b), plus membership of a chain of homes; those negatively associated with innovation were (c) and (d); the last 3 showed no association with innovation	Confirms environmental influence on innovation
Nystrom et al. 2002[76]	Medical imaging diagnostic technologies in US hospitals	Postal questionnaire survey of 70 hospitals	'External orientation': defined as those organizations with boundary spanning roles, focusing particularly on the nature of communication links between organizations and its patients/ community	External orientation interacted significantly but negatively with size ($p < 0.05$) to determine innovativeness; also a significant and positive relationship with organizational size ($p < 0.10$)	Surprising negative association between external orientation and size and combined effect on innovativeness