A Dissertation

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Linking Antecedents and Consequences of Value Density in the Healthcare Delivery Supply Chain

by

David D. Dobrzykowski

Submitted to the Graduate Faculty as partial fulfillment of the requirements for the Doctor of Philosophy Degree in Manufacturing and Technology Management

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An abstract of

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Unprecedented scientific and technological advancements now enable people to live longer, and with this increase in the aging population comes increased demand for healthcare services (IOM, 2001). These shifts have contributed to disturbing trends related to cost, quality, and even competition among healthcare providers. The Centers for Medicare and Medicaid Services is estimated to spend more than $2.5 trillion for healthcare services in 2009, or about $8,160 per U.S. resident compared to $75 billion, or $356 per resident in 1970 (Kaiser, 2009). Healthcare spending is estimated to represent 17.6% of gross domestic product (GDP) in 2009, compared with only 7.2% in 1970 (Kaiser, 2009). Concomitant to these cost increases has been a decrease in consumer confidence regarding access to quality care (Cogan et al., 2004). Such quality concerns have been substantiated by reports that each year nearly 2 million people acquire infections during hospital stays resulting in death for almost 99,000 patients (Klevens et al., 2007). Consequently, interest in improving cost, quality, and other outcomes has increased in recent years, highlighting the need for better operational coordination during

healthcare delivery (Gittell et al., 2000; Fredendall et al., 2009). As such, practitioners and scholars are directing their attention toward the benefits that can be realized by efficient and effective supply chain management in healthcare (Schneller and Smeltzer, 2006). However, while a fair amount of supply chain management research exists in the manufacturing context, generalizing these findings in healthcare has proven thorny (Smeltzer and Ramanathan, 2002). As such, researchers have identified the need for new studies exploring supply chain management in the uniquely decentralized context of healthcare delivery (Shah et al., 2008).

This research study conceptualizes the healthcare delivery supply chain focusing on the information and resource flows between admitting/attending physicians (e.g., surgeons) who make referrals to hospitals and deliver care to inpatients, and the internal clinical staff members (e.g., nurses and other allied health professionals) who coordinate and provide care to inpatients (Lambert and Cooper, 2000; Ford and Scanlon, 2007; Schneller and Smeltzer, 2006). Sinha and Kohnke (2009) refer to such a conceptualization from a macro level as the downstream, decentralized (Shah et al., 2008) portion of the healthcare supply chain.

Service-dominant logic (SDL), and its central theme of value co-creation, are employed to hypothesize that a partner relationship with admitting/attending physicians will serve as a coordination mechanism affecting a hospital's strategy for integrating information and resources during patient care, and also a hospital's culture or entrepreneurial orientation. An integrative information and resource strategy (Sabherwal and Chan, 2001; and Vonderembse et al., 2006) and entrepreneurial culture (Jambulingam et al., 2005) will affect the work practices/interactions among admitting/attending physicians and a hospital's clinical staff. These work practices are conceptualized herein as integrative supply chain practices. Value is co-created in this supply chain by the personalized interactions among patients, physicians, hospital employees, and other supply chain actors (Prahalad and Ramaswamy, 2004a; Prahalad and Krishnan, 2008). Thus, the focus of the hospital may be well served to shift from the *product/service* itself to the supply chain or *value creation system* which comprises these actors. Outcomes are enhanced when these actors work in a value dense environment comprised of the information, knowledge, and other resources needed during patient care (Normann and Ramirez, 1993). Value density, and consequently the performance of the healthcare delivery supply chain, are enhanced by integrative supply chain practices such as physician partnerships, patient relationships, information sharing, information quality, lean principles, and Information Systems (IS) enabled processes (Li et al., 2005; Shah et al., 2008; Rai et al., 2006). Finally, a value dense environment and the supply chain performance of the care delivery team are hypothesized to affect a hospital's healthcare delivery capability with regard to safety, effectiveness, patient-centeredness, timeliness, and efficiency (IOM, 2001).

In order to test these hypothesized relationships, instruments were developed or revalidated for seven major constructs and thirty-five subconstructs using pre-test, structured interviews, and Q-sort pilot testing procedures. Next, the proposed model was tested using Structural Equation Modeling (SEM) to analyze data collected from a large-scale survey of 190 acute care hospitals in the United States. The empirical results support eight out of nine hypothesized relationships with the exception of the link between a value dense environment and a hospital's healthcare delivery capability. A value dense environment is shown to influence healthcare delivery capability; however, this relationship is mediated by the supply chain performance of the care delivery team. Specifically, this study provides evidence of critical linkages between partner relationship and integrative information and resource strategy, partner relationship and entrepreneurial culture, integrative information and resource strategy and integrative supply chain practices, entrepreneurial culture and integrative supply chain practices, integrative supply chain practices and value dense environment, integrative supply chain practices and supply chain performance, value dense environment and supply chain performance, and finally supply chain performance and healthcare delivery capability.

To my loving wife, Sarah, and parents, Patricia and Daniel. Your support and encouragement throughout this process has enabled any contribution which will be realized as a result of this work. I look forward to enjoying the fruits of this labor with you. Thank you.

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CHAPTER 1: INTRODUCTION

The past 50 years have brought advancements in medical science and related technologies at unprecedented rates (IOM, 2001). These advancements, in part, have brought about an increased demand for medical care services in terms of volume as well as variety. Scientific and technological advancements now enable to people live longer and with this increase in the aging population comes increased demand for healthcare services (IOM, 2001). As a result, healthcare delivery has grown in complexity placing significant demands on providers to know more (knowledge), do more (work), manage more (activity), share more (information), and interact with more people (coordinate) than ever before (IOM, 2001).

These shifts have contributed to disturbing trends related to cost, quality, and even competition among healthcare providers. The Centers for Medicare and Medicaid Services (CMS) is estimated to spend more than $2.5 trillion for healthcare services in 2009, or about $8,160 per U.S. resident compared to $75 billion, or $356 per resident in 1970 (Kaiser, 2009). When compared to other nations, the U.S. spends considerably more on healthcare as a percentage of GDP. In 2006, healthcare expenditures account for 15.3% of GDP in the U.S., compared with Canada (10.0%), France (11.0%), Germany (10.6%), Japan (8.1%), and the United Kingdom (8.4%) (Kaiser, 2009). By 2009, healthcare spending was estimated to represent 17.6% of gross domestic product (GDP), compared with only 7.2% in 1970 (Kaiser, 2009). Not only is healthcare delivery expensive, but some studies show that around the globe "on an average, there seems to be a decline in the performance efficiencies of hospitals" (Ramanathan, 2005: p. 52). Not surprisingly, researchers now believe that "it is almost requisite that any discussion about the future of health care begin with a reference to the unsustainable growth rate of U.S. medical spending," (Hwang and Christensen, 2008: p. 1329).

Concomitant to these cost increases has been a decline in consumer confidence in the quality of healthcare delivery. Cogan et al. (2004) report that 67% of people responding to a survey expressed concern about access to the best medical treatment. Extant evidence supports such concerns over quality. For example, in analyzing data from the Center for Disease Control (CDC) Klevens et al. (2007) estimate that 1.7 million patients are treated for nosocomial infections, (which are infections acquired while in the hospital for an otherwise unrelated procedure), resulting in 99,000 deaths each year. Today, "the United States has the most expensive health care system in the world. In spite of that, health care is of inconsistent quality and leads to poorer health outcomes relative to other, similar nations," (IOM, 2009: p. 6).

Cost and quality concerns have, at least in part, led some patients/consumers to seek care abroad in international markets, opening up global competition. In some cases, procedures performed abroad can be provided for substantially less than the same procedure performed in developed countries such as the U.S. (Marek, 2009). As such Sinha and Kohnke (2009: p. 198) observe that "the costs of care and the waiting times for receiving care in developed countries have increased to a level that, notwithstanding the obvious risks, it is not uncommon for patients to travel to select health care delivery facilities in developing countries that have now established a reputation for providing high-quality, low-cost, and timely care, leading to the emergence of the phenomenon referred to as medical tourism (Economist, 2008; Einhorn and Arnst, 2008; Lagace, 2007)."

These trends are not unique to the healthcare industry. "Global competition, technological change and demanding customers are creating a more knowledge-intensive, turbulent, complex and uncertain environment," (Doll and Vonderembse, 1991; Huber, 1984; Jaikumar, 1986; Miles and Snow, 2007; Skinner, 1985; Vonderembse et al., 2006; Zhang et al., 2002: p. 561). This environment creates pressure on firms as they now face customers who demand more variety, better quality, lower cost, and more responsiveness (Vonderembse et al., 2006). In response, many firms, including healthcare providers, are pursuing a more integrative approach, referred to as supply chain management (SCM) from the field of operations management (OM), for managing activities along their entire value chain (Bechtel and Jayaram, 1997; Chan, et al., 2005; Childerhouse et al., 2002; McKone-Sweet et al., 2005; Tan, 2001; Vonderembse, 2002; Vonderembse et al., 2006).

SCM involves the use of information technologies (IT) (Vonderembse et al., 2006) and other practices which improve the management and coordination of relationships with suppliers and customers (Li et al., 2009). SCM has been suggested to improve cost, quality, flexibility, and responsiveness (Chen and Paulraj, 2004). Given these changes in the environment and the benefits of SCM, many scholars suggest that competition no longer occurs just among firms (or hospitals), but instead has shifted to the supply chain level (Agarwal et al., 2006; Christopher, 1992; Lambert and Cooper, 2000; Towill and Christopher, 2002; Vonderembse, et al., 2006; Miles and Snow, 2007). According to Lambert and Cooper (2000: p. 65) "in this emerging competitive environment, the ultimate success of the single business will depend on management's ability to integrate the company's intricate network of business relationships," (Bowersox, 1997; Christopher, 1998; Drucker, 1998).

This trend toward integration has created a more networked environment which has implications for the fundamental logic of value creation (Normann and Ramirez, 1993). "In the traditional conception of value creation, consumers were *outside the firm*," (Prahalad and Ramaswamy, 2004a: p. 6). This view sees the customer as exogenous to value creation activities and actually conceptualizes the customer as a destroyer or consumer of value (Vargo and Akaka, 2009). However today, armed with new tools such as IT enabled integration and dissatisfied with their available options, consumers desire to interact with firms to co-create value, (Prahalad and Ramaswamy, 2004b). As such, Zhang and Chen (2008: p. 242) observe that "companies are shifting their focus from increasing internal efficiency to leverage external resources, especially customer competence, in order to gain new competitive advantages, (Lovelock and Young, 1979; Prahalad and Ramaswamy, 2004b, Zhang and Chen, 2006; Prahalad and Krishnan, 2008)." "Their focus of strategic analysis is not the company or even the industry but the *value-creation system* itself, within which different economic actors – supplier, business partners, allies, customers – work together to co-produce value," (Normann and Ramirez, 1993: pp. 65-66). This has led to a network conceptualization of relationships which converge to create value in a web of resource integration (Vargo and Akaka, 2009). Vargo and Lusch (2008) refer to these resource integration networks as *service ecosystems* or loosely coupled systems of larger service systems which exist in healthcare delivery supply chains (Prahalad and Ramaswamy, 2004a; Shah et al., 2008; Sinha and Kohnke, 2009).

1.1 Problem Statement

A review of the literature related to value co-creation reveals an emerging body of work that is largely of the conceptual variety (Zhang and Chen, 2008). Vargo et al. (2008) and Vargo and Akaka (2009) advance the theory of value co-creation by providing a rich discussion of service dominant logic (SDL), the fundamental underpinning of the phenomenon (Vargo and Lusch, 2004a; 2008). SDL posits that value is realized in the *use* of resources, as opposed to the goods dominant logic (GDL) view that value is realized in the *exchange* (or transaction) of resources (Vargo and Akaka, 2009). A primary distinction between GDL and SDL rests in the perspective of each view related to the role of *goods* and *services.* Specifically, GDL is grounded in the traditional paradigm of economic exchange, suggesting that goods (tangible products) hold primacy over services or add-ons (intangible products such as after sale service) (Vargo and Lusch, 2004; 2008). On the other hand, "SDL is based on the idea that service, the application of competences for the benefit of another, is the fundamental basis of value creation through exchange. That is, services are exchanged for other services (i.e., by service systems) and goods when involved, are service provision vehicles," (Vargo and Akaka, 2009: p. 32). As such, value is always co-created at the intersection of, and interaction among, two or more value creation systems (with customers and others) (Vargo and Akaka, 2009).

This view is gaining currency (Schmenner et al., 2009) as the requisite interactions can be facilitated by IT and as such IT enabled value co-creation has been the focus of some researchers (see Prahalad and Krishnan, 2008). Others have explored value co-creation investigating the nature and enablers of firm interactions with customers (see

Prahalad and Ramaswamy, 2004a; 2004b). Normann and Ramirez (1993) provide a broader perspective extending their view beyond the customer – firm interaction, instead conceptualizing a *constellation* of economic actors (such as suppliers, customers, key partners, and focal firm employees) who interact to co-create value.

Ford and Scanlon (2007) conceptualize the health system supply chain, in essence describing a networked constellation. The healthcare supply chain is comprised of primary care physicians, specialists, hospitals, pharmacies, and health plans, all of whom interface with the patient to create value (Ford and Scanlon, 2007). This supply chain conceptualization (Ford and Scanlon, 2007), as well as the work of other scholars in the area of healthcare supply chain (Sinha and Kohnke, 2009) describe a *value co-creation system* (Normann and Ramirez, 1993) or a *service ecosystem* (Vargo and Akaka, 2009). These concepts have been extensively described in the value co-creation literature related to co-creation interactions with customers/patients (Prahalad and Ramaswamy, 2004a; 2004b; Prahalad and Krishnan, 2008) and more broadly with suppliers/healthcare providers, allies, business partners, and customers/patients (Normann and Ramirez, 1993). However, while much has been done to advance the conceptual understanding of value co-creation, research "is still in an early stage. The literature largely overlooked construct development," and empirical testing (Zhang and Chen, 2008: p. 242).

1.1.1 Supply Chain Management, Value Co-creation, and Healthcare Delivery

A few observations emerge from the literature. First, supply chain management concepts may help scholars to unlock the empirical understanding of value co-creation. While empirical testing has been sparse, Zhang and Chen (2008) offer a notable exception by examining value co-creation through the supply chain lens of mass customization. The authors tested and supported relationships between key value co-creation activities, "customerization"[1] capability, and service capability (see Zhang and Chen, 2008). The use of supply chain concepts stands to reason given that "supply chain is a governing strategy that creates value for customers, and it is defined as a system, which integrates suppliers, manufacturers, distributors, and customers in terms of material, financial, and information flows," (Liao, 2008: p.2).

However, there is "an absence of an integrated framework, incorporating all the activities [including organizational architectural factors such as strategy and culture] both upstream and downstream sides of the supply chain," in the extant literature (Li et al., 2006: p. 108). Strategy and culture are important concerns of firms because both have great influence on value creation and become more elusive and less understandable as firms "interact and align with the diverse network of suppliers and customers as their supply chain partners," (Roh et al., 2008: p. 362). Some scholars refer to the extant ambiguity related to supply chain practices (such as integration) which link supply chain strategies and performance as a *black box* (Handfield and Lawson, 2007). "Questions remain about how supply chains function and how deeply supply chain concepts are ingrained," (Vonderembse et al., 2006: p. 224). This is particularly true in the healthcare context where scholars posit that healthcare is "the home of some of the best and worst practices in supply chain management," (Byrnes, 2004).

[1] Zhang and Chen (2008: p. 243) defined *customerization capability* as "the unique capabilities generated during value co-creation processes by involving customers during customerization." These capabilities include: (1) providing the customer exactly what he/she wants, (2) increased collaboration, (3) less bureaucracy, and (4) precise targeting of customers.

Second, while these supply chain management concepts have gained momentum in the healthcare field (for example, see Chan et al., 2005; and Varkey et al., 2007), very little scholarly attention from Operations Management (OM) researchers has been paid to these issues in a broader service context, let alone in healthcare (Machuca et al., 2007). Research opportunities abound because "as hospitals face an increasingly complex list of challenges (e.g. aging population, cost pressures, and increasing concerns for patient safety) there is much to be gained by applying the rich knowledge base from the field of Operations Management (OM) to many of these problems," (Ramanathan, 2005; McDermott and Stock, 2007: p. 1021). However, the blind application of supply chain/OM concepts from manufacturing in the healthcare context should be done cautiously, as generalizations are not easily made (Smeltzer and Ramanathan, 2002). Key differences emerge when comparing the manufacturing and healthcare contexts (Schneller and Smeltzer, 2006; Shah et al., 2008; Smeltzer and Ramanathan, 2002). Understanding these differences is valuable given that supply chain management practices can be contextually specific (Liao, 2008).

While OM scholars have largely overlooked the healthcare supply chain, the relevant studies focus on back office processes which closely mirror the characteristics of manufacturing processes (Condel et al., 2004; Persoon et al., 2006; Rabb et al., 2006; Raab et al., 2006). This has left a limited stream of research into front office processes, such as patient care delivery, which deal with customer presence, and subsequent process variability (Frei et al., 1999). The process variability in the healthcare delivery supply chain can contribute to adverse performance such as buffering costs (de Treville and Antonakis, 2006; Hopp and Spearman, 2004). The dearth of studies into front office processes consists primarily of conceptual papers (Lapinski et al., 2006; Spear, 2004; Spear, 2005) with a few notable exceptions (Shannon, et al., 2006; and Tucker, 2007) which provide empirical studies of process improvement in patient care processes (Shah et al., 2008). In summary, "the U.S. health care industry is unique, and future research defining [effective] work characteristics" is needed to advance the scholarly understanding of supply chain concepts in this context (Shah et al., 2008: p. 783).

The purpose of this study is to advance the current scholarly understanding of the antecedents and consequences of value co-creation in healthcare delivery, a front office process. A supply chain management perspective is employed to inform the overarching research question: *does supply chain management influence value co-creation in a hospital environment where healthcare is delivered?* This broad curiosity is informed by addressing four more granular research questions.

1) What are the antecedent partner relationship, integrative information and resource strategy, and entrepreneurial culture characteristics that enable value co-creation through integrative supply chain practices?
2) What are the integrative supply chain practices that influence value density and supply chain performance?
3) What are the dimensions of supply chain performance and value density (environment) that lead to the development of a healthcare delivery capability?
4) What are the relationships between these antecedents and consequences of value density in healthcare delivery?

This general theme of this scholarly curiosity is shared by other prominent researchers in the field, providing evidence of novelty. For example, Schneller and Smeltzer (2006: p. 4) in their book entitled, *Strategic Management of the Health Care Supply Chain,* suggest the following research questions.

1. *"What are the characteristics of the more progressive hospital and hospital systems in managing the supply chains?*
   - *How do business strategy, organizational structure, personnel capabilities, and environmental and competitive forces of the organizations with more progressive supply chain practices differ from organizations with less progressive supply chain practices?*
   - *What is the role of leadership by clinicians and nonclinicians in organizations characterized by progressive supply chains?*

2. *What conditions predisposed these organizations to have leading-edge supply chain structures and practices?*

3. *What are the enablers and barriers to progressive supply chain management practices in hospitals and hospital systems?*
   - *What guidelines will lead to progressive supply chain practices?*

4. *What progressive supply chain practices can hospital and systems managers best use from leading practices in manufacturing and retail supply chains?"*

1.2 The Antecedents and Consequences of Value Co-creation

The focus of the current study is to explore value co-creation and specifically value density (Normann and Ramirez, 1993; Vargo and Akaka, 2009), positing that integrative information and resource strategy (Sabherwal and Chan, 2001; Vonderembse et al., 2006) and entrepreneurial culture (Jambulingam et al., 2005) can be empirically measured as antecedents of integrative supply chain management practices and value dense environment. Given the notion of Lambert and Cooper (2000) that supply chain management has two primary emphases; the management of information, and material or resources, supply chain management strategy is conceptualized in two dimensions: 1) information management strategy using Information Systems (IS) (Sabherwal and Chan, 2001; Apigian et al., 2006), and 2) resource management strategy (Vonderembse et al., 2006). Both integrative information and resource strategy and entrepreneurial culture are important antecedents to value co-creation given that these organizational architectures guide supply chain management processes, practices, and behaviors (Roh et al., 2008; Schein, 1992).

However, the healthcare delivery supply chain is unique as compared to the traditional product-focused supply chain in that there is no financial exchange as the patient moves from one provider to another for services (Shah et al., 2008). This has lead to scholarly curiosity regarding the actor motivations or the interaction mechanisms in healthcare delivery that drive providers to work together in supply chain management practices (Shah et al., 2008). This curiosity regarding the coordination mechanisms, or drivers of closeness, in the supply chain exists within and even outside of the healthcare context and has not been adequately explored or empirically tested (Goffin et al., 2006; Liao, 2008; McCutcheon and Stuart, 2000). Therefore, this study extends the work of Shah et al. (2008), and proposes that partnership relationship, comprised of three sub-dimensions including: 1) trust, 2) commitment, and 3) shared vision (Li, 2002; Liao, 2008), motivates the development of a hospital's healthcare delivery (supply chain) strategy and also drives its Entrepreneurial Culture.

Firms seek fit or alignment by configuring practices that are consistent with their strategies (Doty et al., 1993). This vertical alignment involves the creation of consistency among the strategies, objectives, action plans, and decisions throughout different levels of the firm (Kathuria et al., 2007). This is manifested through "management philosophies, patterns of organizational routines and behavioral norms," (Roh et al., 2008: p. 365). Therefore, this study identifies integrative supply chain practices for healthcare delivery consistent with the firm's strategies and culture. These supply chain management practices include: 1) physician partnership, 2) patient relationship, 3) information sharing, 4) information quality, 5) lean principles, and 6) Information Systems (IS) enabled processes (adapted from Li et al., 2005; Rai et al., 2006; Schneller and Smeltzer, 2006; Shah et al., 2008).

Integrative supply chain practices are in essence the development, unbundling, and rebundling of resources in order to configure them for use by other value co-creators (Normann, 2001; Vargo and Akaka, 2009). This phenomenon is referred to as *density creation* and it "is a measure of the best combination of resources mobilized for a particular situation," (Vargo and Akaka, 2009: p. 39). It is this *value dense environment,* characterized by large amounts of information, knowledge, and resources (Normann and Ramirez, 1993) that enables the performance of the healthcare delivery supply chain. This study measures the performance of the healthcare delivery supply chain along five dimensions adapted from Li (2002) which include: 1) supply chain flexibility, 2) supply chain integration, 3) patient responsiveness, 4) physician performance, and 5) partnership quality. The performance of the healthcare delivery supply chain and value density of the environment drive healthcare delivery capability measured using five of the Institute of Medicine's (2001) aims for healthcare delivery: 1) safety (IOM, 2000; 2001; Tucker, 2007), 2) effectiveness or mortality (Shah et al., 2008), 3) patient-centeredness or patient satisfaction (Marley et al., 2004), 4) timeliness or average length of stay (McDermott and Stock, 2007; Shah et al., 2008) and 5) efficiency or cost (Li and Benton, 2006; Shah et al., 2008).

1.3 Research Objectives and Contributions

While the present study develops an integrated model of the healthcare delivery supply chain, grounded in SDL theory, it would be valuable to test this model through large-scale empirical data collection thus producing a theoretical foundation as well as empirical evidence. This research develops one of the first integrated models linking supply chain strategy, practices, performance, and capability, a contribution which is absent in the literature (Li et al., 2006). The present study also provides a very early attempt to measure key phenomena related to the nascent theory of SDL, using SCM construct measures extending the conceptual work of Normann and Ramirez (1993), Prahalad and Ramaswamy (2004a) (2004b), Prahalad and Krishnan (2008), Vargo et al. (2008), Vargo and Akaka (2009) among others. Finally, this supply chain study is conceptualized in the healthcare delivery context. While interest from supply chain, OM, and IT scholars is growing in this area (for examples, see Shah et al., 2008; Sinha and Kohnke, 2009; Fredendall et al., 2009; Ilie et al., 2009), the field is largely underrepresented in the literature (Machuca et al., 2007).

Therefore, the objectives of this study are to empirically investigate: 1) the direct effects of partner relationship on a hospital's integrative information and resource (supply chain) strategy, 2) the direct effects partner relationship on entrepreneurial culture, 3) the direct effects of integrative information and resource (supply chain) strategy on integrative supply chain practices, 4) the direct relationship of entrepreneurial culture on integrative supply chain practices, 5) the direct effects of integrative supply chain practices on the creation of a value dense environment, 6) the direct effects of integrative supply chain practices on supply chain performance, 7) the direct effects of a value dense environment on supply chain performance, 8) the direct effects of a value dense environment on healthcare delivery capability, and 9) the direct effects of supply chain performance on healthcare delivery capability. In a nomological sense, these objectives will develop the antecedents and consequences of value density in the healthcare delivery supply chain as well as test their linkages. In doing so, these objectives will inform the research questions discussed in section 1.1.1.

This study provides value for the academic as well as practitioner communities. By using SDL theory, this study develops a theoretical model of the partner relationship characteristics, strategies, cultural elements, practices, performance, value density, and capabilities of the healthcare delivery supply chain. This research project represents one of the first empirical studies to develop and measure these phenomenological variables in the healthcare delivery supply chain. It is also one of the first large scale empirical studies into the antecedent strategies and practices of value co-creation. This study also identifies capability/competitive advantage as a consequence of value density in the healthcare delivery supply chain. Finally, another significant scholarly contribution of this study is the development of valid and reliable measurement instruments for 1) Integrative Information and Resource Strategy, 2) Integrative Supply Chain Practices, 3) Value Dense Environment, and 4) Healthcare Delivery Capability. The study also revalidates 1) Partner Relationship, 2) Entrepreneurial Culture, and 3) Supply Chain Performance.

For practitioners, this study provides insights into the architecture of effective healthcare delivery supply chains. Specific direction is provided in the form of operational definitions for Partner Relationship, Integrative Information and Resource Strategy, Entrepreneurial Culture, Integrative Supply Chain Practices, Value Dense Environment, Supply Chain Performance, and Healthcare Delivery Capability. Empirical testing provides evidence of key relationships between strategies, practices, performance, and capability as well as organizational architectural elements such as culture and also coordination mechanisms such as partner relationship.

This study proceeds as follows. Chapter 2 of this study develops a theoretical framework for healthcare delivery supply chains grounded in SDL theory. As such, Chapter 2 provides construct definitions and hypothesis development. This is followed by Chapter 3 which describes the first three stages of instrument (scale) development, while Chapter 4 discusses the large-scale survey which was employed to collect data for validity and reliability testing of the measures studied herein. Chapter 5 describes the analysis of the structural model for hypothesis testing and Chapter 6 outlines the contributions of this study as well as the implications, limitations, and opportunities for future research.

CHAPTER 2: THEORETICAL FRAMEWORK AND HYPOTHESES

Reasonable consensus regarding the overarching definition of supply chain management has existed for sometime from practitioners to academics as well as in differing contexts. Consider the Council of Logistics (CLM, 2000) definition of supply chain management as "the systemic, strategic coordination of the traditional business functions and tactics across business functions within a particular organization and across businesses within the supply chain for the purposes of improving the long-term performance of the individual organizations and the supply chain as a whole." In a manufacturing context, scholars have acknowledged that "SCM has been defined to explicitly recognize the strategic nature of coordination between trading partners and to explain the dual purpose of SCM: to improve the performance of an individual organization, and to improve the performance of the whole supply chain," (Li et al., 2006: p. 107). Similarly in differing contexts such as healthcare, scholars have opined that supply chain management "can be interpreted to include the flow of products and associated services to meet the needs of the hospital and those who serve patients," Schneller and Smeltzer (2006: p. 5). Schneller and Smeltzer (2006: p. 30) provide additional detail, defining the health care supply chain as "the information, supplies, and finances involved with the acquisition and movement of goods and services from the supplier to the end user in order to enhance clinical outcomes while controlling costs." Collectively, supply chain management deals with the coordination and flow of information and resources in the endeavor to create value and enhance performance for all of participating economic actors (see Fiala, 2005).

Supply chain management can thus be said to be about the strategies and practices employed by a firm to manage information and resources (including processes) in such a way that leads to valuable, rare, inimitable, and non-substitutable resource bundles useful in the creation of value and ultimately sustained performance or competitive advantage (Wernerfelt, 1984; Barney, 1991; Grant, 1991). The delivery of healthcare can be viewed as a bundle of resources, referred to as *care bundles* comprised of goods, services, and experiences (Sinha and Kohnke, 2009). The resources which comprise each care bundle are contributed and used by actors such as suppliers, customers, hospital employees, strategic partners and others in the healthcare supply chain who work together to create value (Norman and Ramirez, 1993). In healthcare as in other industries such as manufacturing, "a provider delivers 'higher value' if it delivers the same quality of services as another provider but at a lower cost or if it delivers higher-quality services at the same cost," (Miller, 2008: p. 3).

2.1 The Downstream Healthcare Supply Chain

According to Sinha and Kohnke (2009), the macro healthcare supply chain can be viewed in three delineated sections described as upstream, middle, and downstream. This is depicted in Figure 2.1.1. The upstream portion of the healthcare supply chain is comprised of actors involved in the development of important elements of the care bundle such as medical device manufacturers, biotech firms, and pharmaceutical manufacturers (Sinha and Kohnke, 2009). The middle of the macro healthcare supply chain deals with the financing and claims administration associated with care delivery and is occupied by banks, insurance companies, and third party administrators (TPAs).

These actors ensure that the providers and developers of care bundles are reimbursed (Sinha and Kohnke, 2009). Finally, the downstream portion of the macro healthcare supply chain is comprised of actors involved in healthcare delivery, specifically physicians, hospitals, clinics, home-health services, hospice, and patients (Sinha and Kohnke, 2009).

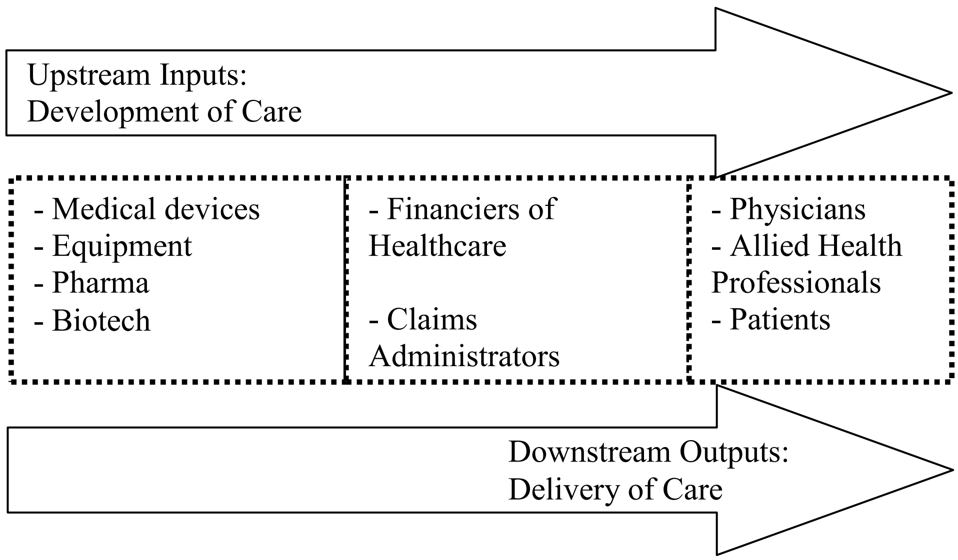


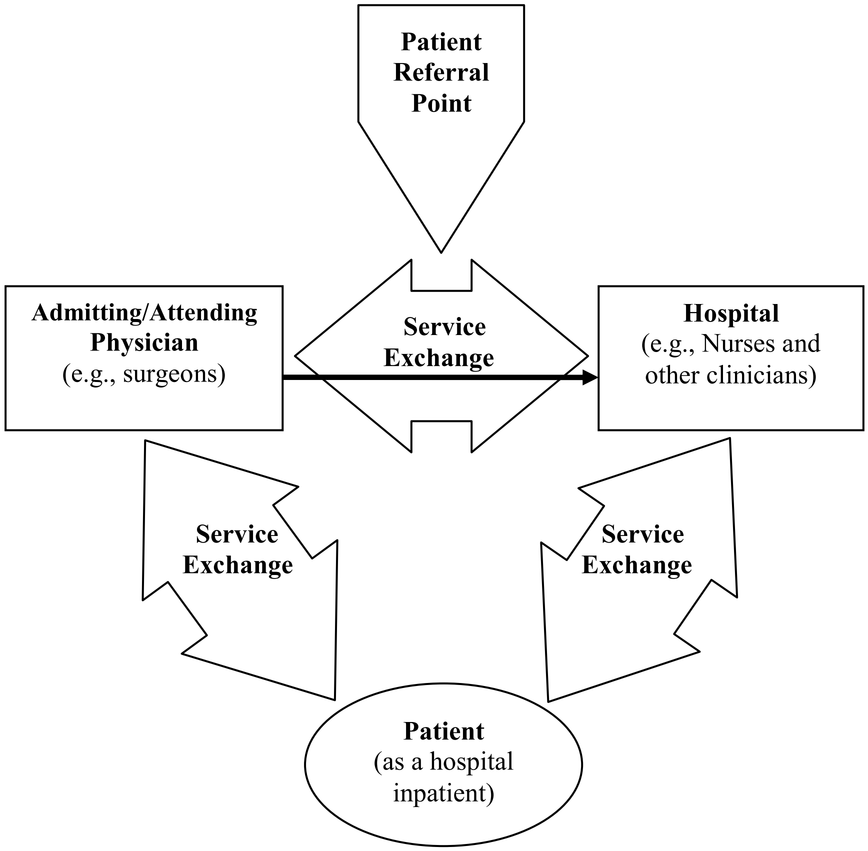
Figure 2.1.1. Macro-level view of the supply chain for the health care sector (adapted from Sinha and Kohnke, 2009).

Ford and Scanlon (2007) depict some of the specific actors in the middle and downstream portions of the healthcare delivery supply chain. According to Ford and Scanlon (2007) the healthcare supply chain is comprised of doctors, specialists, hospitals, pharmacies, the patient, health insurance plans, and employers. Doctors are Primary Care Physicians (PCPs) and other admitting physicians who provide care and counseling to the patient. These physicians in essence supply or refer patients to specialists and admit patients to hospitals for services. Specialists (e.g., physicians, home health, rehab, etc.) provide care and counseling to the patient and are also capable of referring patients to other specialists and admitting patients to hospitals for services. The hospital – and its allied health professional staff including nurses, physical therapists, and other personnel in the hospital – coordinate and provide care and counseling to the patient typically related to a specific medical procedure. Pharmaceutical companies and dispensers (such as pharmacies) provide medications and counseling services to the patient. The health insurance firm or health plan provides access to care through covered benefits and other services such as health coaching and chronic disease management to the patient. Finally, the employer in Ford and Scanlon's (2007) supply chain depiction is primarily responsible for selection of the health plan and the ultimate financier of healthcare services.

While it is commonly accepted that the current performance of the healthcare system is unsustainable (Hwang and Christensen, 2009), there is less consensus regarding where to focus improvement efforts. Consider that "Medicare Part D spending [covering pharmaceutical drugs] is estimated to be about $51 billion in 2009," (Dicken, 2009: p. 3) and is expected to rise. Additionally, health insurance premiums increased by 131% from 1999 to 2009 (National Coalition on Health, 2009). These facts lead some to focus improvement efforts on the upstream or middle portions of the macro healthcare supply chain. When considering the downstream healthcare supply chain, some go so far as to argue against reducing costs associated with the actual delivery of healthcare owing to concerns over a quality trade off. However, "research has shown that more services and higher spending do not result in better outcomes; indeed, they often produce just the opposite result," (Miller, 2008: p. 1). This reveals the downstream portion of the healthcare supply chain as an attractive context for improvement as "the most pressing task of health care [delivery] is to make care effective and affordable," (Coye et al., 2009: p. 126).

The majority of the burden in this regard falls on the shoulders of healthcare providers such as hospitals and physicians given that more than one-half (1/2) of health spending in the U.S. is for hospital, physician, and other clinical services, (Kaiser, 2009). As Ford and Scanlon (2007) discuss, the delivery of care is often very complex and uncoordinated, requiring steps and patient "handoffs" that delay or slow down care, increasing cost and decreasing safety and/or quality (IOM, 2001). These cumbersome processes waste valuable resources and lead to loss or asymmetry of information (IOM, 2001; Ford and Scanlon, 2007).

Therefore, the focus of the present study is the downstream portion of the healthcare supply chain which comprised of actors directly involved in healthcare delivery such as referring/admitting and attending physicians, hospitals, clinics, home-health services, and hospice (Sinha and Kohnke, 2009). Specifically, this study focuses on the interactions among patients, physicians and the hospital clinical staff. Figure 2.1.3 illustrates the referral/admission or supply of the patient from the admitting/attending physician to the hospital.



Note: Solid arrow indicates patient referral from physician to hospital. Double-headed arrows indicate the service exchange among the admitting/attending physician, the patient and hospital clinicians.

Figure 2.1.3. The healthcare delivery supply chain (developed based on Ford and Scanlon, 2007; and Sinha and Kohnke, 2009).

As an inpatient, service exchange occurs among the patient, the admitting/attending physician, and other clinicians coordinated by the hospital. Services are also exchanged between the physician and the hospital (e.g. the physician orders and receives diagnostics, or nurses provide the physician with information about the patient's condition which is useful in treatment). This conceptualizes the downstream supply chain actors as follows. Admitting/attending physicians supply patients (material) and services to the hospital and provide services to patients during inpatient hospitalizations. Thus, this study conceptualizes admitting/attending physicians primarily as 'suppliers' in a traditional supply chain sense. As will be discussed later, the physician's role in the downstream healthcare delivery supply chain is complex and multifaceted. As such, this conceptualization is admittedly a dramatic simplification of the physician's supply chain role. However, it is the most appropriate conceptualization in this context and is useful given the focus of this study. The hospital is conceptualized as the 'focal firm' in a traditional supply chain sense, given that care is delivered in the hospital and involves significant work by individuals employed by or affiliated with the hospital (Butler et al., 1996). Finally, the patient is conceptualized as the ultimate customer – the beneficiary of care (Schneller and Smeltzer, 2006).

As the focal firm in this healthcare delivery supply chain, the decisions made by hospital leadership impact how care is coordinated and delivered which in turn influences outcomes (Butler et al., 1996). For example, staffing decisions or investments in technology lead to the creation of the work environment for clinicians and can influence hospital outcomes (Li and Benton, 2006). This is at the heart of the present study and is depicted in the Health Care System framework put forth by the Institute of Medicine (2001). Here, the research framework for the present study is depicted in relationships among items B, C, D, and E in Figure 2.1.4. A hospital is an organization that facilitates the work of patient centered teams through the creation of a value dense environment (see B) that affords those involved in healthcare delivery with the knowledge and resources necessary to achieve high performance (see C) and positive outcomes (see D). The foundation of the system consists of supply chain concepts (see E) such as process improvement, IT use, coordination, and information sharing.

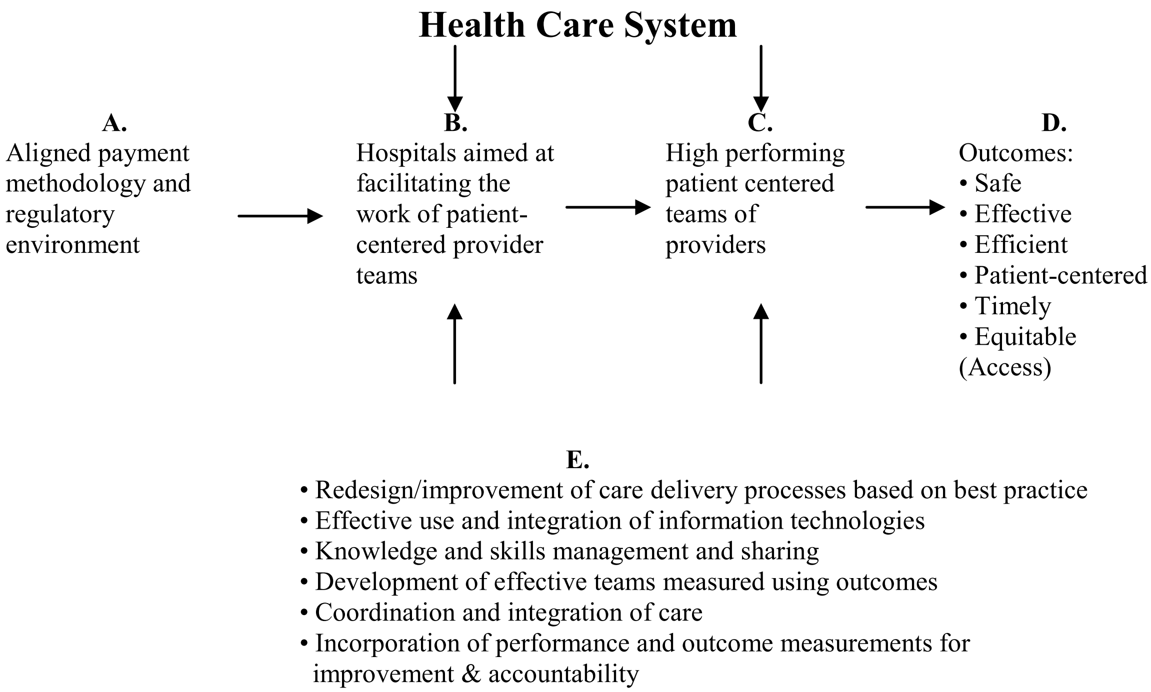


Figure 2.1.4. The Health Care System (adapted from IOM, 2001) and Research Framework Under Study.

2.2 Research in Supply Chain Management

As mentioned earlier, while there may be general consensus regarding the broad definitional parameters of supply chain management, the same cannot be said for explicative theories or tactical practices (Cigolini et al., 2004; Li et al., 2006; Liao, 2008). Explicative theory bases have included resource-based and resource-dependency theories (Rungtusanatham et al., 2003), industrial organization and associated transaction cost analysis (Ellram, 1990; Williamson, 1975), social-political perspectives (Stern and Reve, 1980), competitive strategy (Porter, 1985), learning theories/absorptive capacity (Cohen and Levinthal, 1990; Tu et al., 2006), strategic choice, and knowledge management

(Miles and Snow, 2007), relational coordination (Gittell, 2000; 2001; 2002a; 2002b; Weinberg et al., 2007; Gittell et al., 2000; Shah et al., 2008) and the theory of swift and even flow (Schmenner and Swink, 1998; Fredendeall et al., 2009). Still, others have recently identified the need for new theories, such as SDL, which are capable of better explaining SCM phenomena (Schmenner et al., 2009).

Similarly, numerous conceptualizations of SCM practices have been proposed (Li et al., 2006). The various conceptualizations include practices such as outsourcing, cycle time compression, supplier partnership, continuous process flow, IT sharing, quality, customer relations, purchasing, information sharing, supply chain integration, supply chain characteristics, geographic proximity, JIT capability, communication, cross-functional teams, supply base reduction, supplier involvement, agreed goals and vision, risk and reward sharing, cooperation, agreed supply chain leadership, quality of information sharing, and postponement (Dolan, 1996; Chen and Paulraj, 2004; Li et al., 2005; 2006; Min and Mentzer, 2004; Tan et al., 1998; Tan et al., 2002). See Table 2.2.1. Alvarado and Kotzab (2001) also suggest that IT use such as EDI for inter-organizational data exchange is a supply chain management practice.

Table 2.2.1. Conceptualizations of Supply Chain Practices

Supply Chain Practices Conceptualization	Literature
1) outsourcing, 2) cycle time compression, 3) supplier partnership, 4) continuous process flow, and 5) IT sharing.	Dolan, 1996.
1) quality, 2) customer relations, and 3) purchasing.	Tan, Kannan and Handfield, 1998.
1) information sharing, 2) supply chain integration, 3) supply chain characteristics, 4) geographic proximity, 5) JIT capability, and 6) customer service management.	Tan, Lyman and Wisner, 2002.
1) long-term partnership, 2) communication, 3) cross-functional teams, 4) supply base reduction, and 5) supplier involvement.	Chen and Paulraj, 2004.
1) agreed goals and vision, 2) risk and reward sharing, 3) cooperation, 4) information sharing, 5) process integration, 6) agreed supply chain leadership, and 7) long-term partnership.	Min and Mentzer, 2004.
1) customer relationship, 2) quality of information sharing, 3) level of information sharing, 4) strategic supplier partnership, 5) postponement, and 6) internal lean practices.	Li et al., 2005; 2006.

Notwithstanding the voluminous number of studies addressing supply chain management practices, a lack of consensus exist with regard to: 1) the linkage of philosophy or theory and practice (Cigolini et al., 2004), and 2) the key practices or dimensions of supply chain management. These observations provide support for the idea that the lack of consensus is likely driven by the contextually specific nature of these practices (Liao, 2008). The same may likely be the case for their corresponding theoretical explanations. Thus, a clear understanding of context is useful in the study of supply chain management.

2.3 The Context of the Study

The context of the present study is described by explaining key characteristics of healthcare delivery, some of which differ significantly from manufacturing operations. These observations from the literature are useful given the reality that the vast majority of the extant supply chain/OM scholarly knowledge base has been studied and developed in the manufacturing context (Machuca et al., 2007). “Probably more is known about supply chains in manufacturing than in any other industry type,” (Smeltzer and Ramanathan, 2002: p. 2561). Given the decades of research into issues such as quality management, operations strategy, and efficiency, most often in the manufacturing sector, there is an obvious need to transfer some of these important learnings into the healthcare operations context (McDermott and Stock, 2007). However, if scholars are to effectively transfer knowledge, or generalize from the extant base, it is important to do so with the understanding that “health care supply chains are organized quite differently from product-based scenarios,” (Shah et al., 2008: p. 765). With this understanding, some key characteristics of healthcare delivery are summarized in Table 2.3.1 and will now be discussed.

Table 2.3.1. Summary of the key characteristics of the healthcare delivery supply chain.

Characteristic	Summary	Literature
The co-creation phenomenon	Healthcare delivery is 1) co-produced, with 2) heterogeneous outcomes, and 3) perishability where the 4) the customer is inseparable from value creation.	Chase and Tansik, 1983; Schmenner, 1986; 2004; Smeltzer and Ramanatha, 2002.
Actor ambiguity	The patient is the customer, as well as the raw material in the 'input – output' transformation process. Nurses and physicians serve as end users of some materials (e.g., syringes, sutures, hip replacements) as well as service suppliers to each other and to patients. Physicians act as suppliers by referring/admitting patients (material) to the hospital.	Schneller and Smeltzer, 2006.
Variable demand	The co-creation phenomenon and the patient's role ambiguity makes demand difficult to estimate in terms of variety.	Schneller and Smeltzer, 2006; Shah et al., 2008.
Centrality of the physician	The physician's decisions greatly influence the supply chain, and are plagued by the agency dilemma and an absence of coordination mechanisms.	Smeltzer and Ramanatha, 2002; Schneller and Smeltzer, 2006; Ford and Scanlon, 2007; Shah et al., 2008.
Information asymmetries	Inadequacy and slow adoption of IT systems has resulted in suboptimal outcomes and provider favored information asymmetries.	Ford and Scanlon, 2007.

2.3.1 The Co-creation Phenomenon

To begin, healthcare delivery has been identified as a service industry in the operations management literature. For example, Chase and Tansik's (1983) taxonomy, the customer contact model, classifies healthcare delivery (and hospital providers) as a 'pure service.' "*Pure services* include those organizations whose production is carried on in the presence of the customers (medical care, restaurants, transportation, personal services); [while] *mixed services* commonly involve a mix of face-to-face contact and variously coupled back office work (branch offices primarily); and *quasi-manufacturing* entails virtually no face-to-face contact (home offices and distribution centers)," (Chase and Tansik, 1983: p. 1040). The key features of pure services include subjective performance standards, imprecise measurements of deviation in delivery, ill defined feedback loops, and instantaneous corrective action. Another popular taxonomy provided by Schmmener (1986; 2004) classifies service firms into four types referred to as 'service factory,' 'service shop,' 'mass service,' and 'professional service' based upon the degree of interaction and customization (1986) or variation in his revised model (2004), and the degree of labor intensity (1986) or relative throughput time (2004). See Figure 2.3.1.1.

Here Schmenner (1986) endeavored to bring order to service operations by attempting to mirror manufacturing's classifications of job shop, batch, line, and continuous flow (Schmenner, 2004). Schmenner (1986) argues that firm performance improves as movement is made 'on the diagonal' toward the service factory characterized by low degree of interaction and customization and low labor intensity. Hospitals are classified as service shop which suggests that healthcare delivery entails a high degree of demand variation and interaction/customization while the throughput time of degree of labor intensity is fairly low (Schmenner, 1986; 2004). This is owing to the notion that healthcare delivery involves personalized and highly varied interactions between healthcare workers and customers (Shah et al., 2008).

Implicit in the work of Chase and Tansik (1983) and Schmenner (1986; 2004) are four key characteristics of service firms; 1) co-production of value, 2) heterogeneity versus homogeneity of outcomes, 3) perishability of the service, and the 4) inseparability of the customer from the exchange (Dobrzykowski, et al., *in press*; Hong et al., 2010). These four characteristics are related and interdependent and thus referred to as *the co-production phenomenon* for the purposes of the present study and are illustrated in Figure 2.3.1.2.

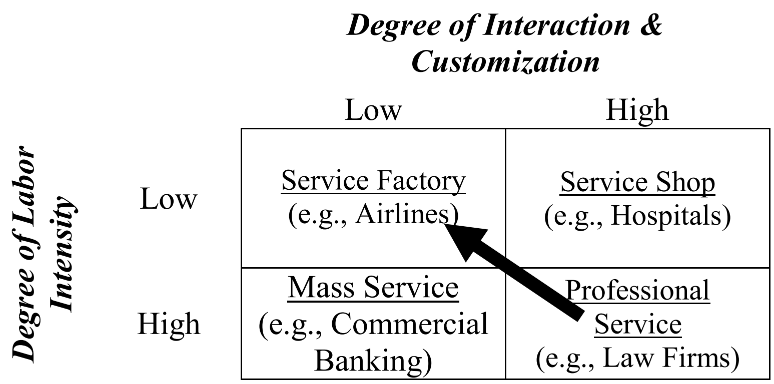


Figure 2.3.1.1. Modified form of Schmenner's (1986) service matrix.

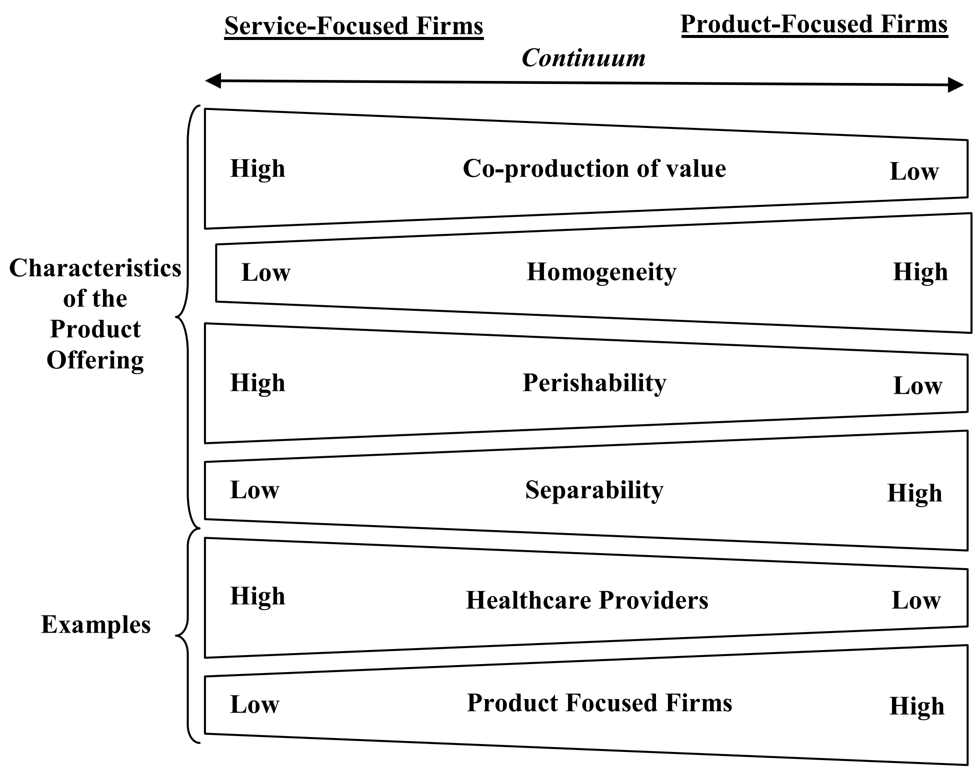


Figure 2.3.1.2. Distinctions between products and services, and examples (adapted from Dobrzykowski et al., *in press*).

Customer involvement in the production process is reasonably straightforward (Bitner, et al., 1997; Foster et al., 2000). Customer involvement is essential in service firms while less perceptible in product-focused manufacturing firms (Foster et al., 2000). Involvement can vary from minimal interaction to high interaction (product co-creation) (Chase and Tansik, 1983; Dobrzykowski et al., *forthcoming*). As their level of involvement rises, customers increase in criticality in co-creating the service experience. Under such circumstances, customers can take on production roles (as co-producers of value) and have impact on the quality, productivity, and value of the outputs (Bitner et al., 1997). The ability of service firms to interact with customers results in the creation of idiosyncratically unique or heterogeneous outputs for customers, or what Schmenner (1986) refers to as customization. This is different from product focused manufacturers who seek homogeneity or standardization of products as illustrated in Figure 2.3.1.2 (Foster et al., 2000). The concept has its roots in the idea that "products can be commoditized but co-creation experiences cannot," (Prahalad and Ramaswamy, 2004a: p. 9). Foster et al. (2000) suggest that heterogeneity can be viewed in two aspects: (1) heterogeneous service providers and service processes and (2) heterogeneous creation of value outputs within a given firm. Hong et al. (2010) point out two additional distinctions; perishability and inseparability (Rathmell, 1966; Kaplan and Haenlin, 2006).

"Services produced by healthcare provider institutions unlike many material products have to be produced and consumed at the same time," (Smeltzer and Ramanathan, 2002). Because services cannot be inventoried per se, they are considered to be consumed at the moment of production (perishability) (Sundbo, 2002). Therefore, the customer is engaged as a co-producer, participating in the production/creation and delivery process, becoming inseparable from key activities involved in value creation (Kelley et al., 1990). This co-producer role leads customers to evaluate service not solely on the outcome, but also the process of service delivery (Chen et al., 1994). This is particularly the case in healthcare delivery as "patients may not be certain of the quality level of their surgery [for example], but they know they were treated well or poorly by the doctors and staff," (Marley et al., 2004: p. 354).

2.3.2 Actor Role Ambiguity, Variable Demand, and Physicians' Centrality

This co-production phenomenon is complicated in the healthcare context by actor role ambiguity. Not only does the hospital have contact with the customer, but the customer is not clearly defined (Smeltzer and Ramanathan, 2002) with many key actors playing multiple roles in value creation. "The patient, of course, is the ultimate client or beneficiary of an effective [healthcare] supply chain," (Schneller and Smeltzer, 2006: p. 6). However, patients have a duality of roles in the healthcare delivery supply chain given that they also serve as the material input, coming in different shapes and sizes (Schneller and Smeltzer, 2006). Disease in any one individual is frequently characterized by its 'emergence,' or change, rather than its steady state," (Schneller and Smeltzer, 2006: p. 7). This results in highly varied demand and very personalized interactions among clinicians and customers (Shah et al., 2008).

Nurses, physicians, and other allied health professionals are the end users of many materials (e.g. syringes, sutures, hip replacement devices, etc.), thus as actors in the healthcare delivery supply chain of the hospital, they may be viewed as internal customers (Schneller and Smeltzer, 2006). On the other hand, owing to the conceptualization of the patient as a material input in the traditional production 'input – output' transformation process (Schneller and Smeltzer, 2006), physicians also serve as supplier to the hospital by admitting patients for procedures. This leads to the centrality of the physician in the healthcare delivery supply chain.

Physicians play a central or dominant role in diagnosing a patient's illness and determining the course of treatment (or treatment plan) within some acceptable parameters (Schneller and Smeltzer, 2006). These assessments and consequent decisions regarding the patient's needs (e.g., how much stress a patient will apply to a hip implant) produce large variation in the materials used in care delivery, even for patients with comparable demand characteristics (Schneller and Smeltzer, 2006). This can lead to large inventories and create inefficiencies borne largely by the hospital. Ultimately, physician decisions influence the patient's length of stay (LOS), a key outcomes metric (Gnanlet and Gilland, 2009), along with other consumption drivers of hospital materials and resources (Schneller and Smeltzer, 2006). "Probably no other organization in the United States has such important members who are not employees but perform their work within the organization," (Smeltzer and Ramanathan, 2002: p. 2562). The centrality of the physician in the healthcare delivery supply chain presents two unique challenges related to: 1) an agency dilemma (Ford and Scanlon, 2007) and 2) a lack of coordination mechanisms (Shah et al., 2008).

With regard to the agency dilemma, consider the physician's relationships with 1) the patient receiving treatment services, 2) the hospital where services are provided, and 3) the health insurance plan contracted with and remunerating both the physician and the hospital. The physician maintains a significant responsibility in ensuring both service delivery quality as well as contract fulfillment. “In meeting these responsibilities, an agency conflict can arise between reducing costs, as a representative of the health plan [and hospital], and ensuring quality as an agent for the patient,” (Ford and Scanlon, 2007: p, 194). From the physician’s perspective, providing more service, often in the form of diagnostic tests, state-of-the art clinical procedures, and/or pharmaceutical medications is a means of ensuring that the patient’s expectations for quality are satisfied. In the fee-for-service environment, more testing may also increase payments to the physician while possibly mitigating the risk of medical malpractice claims and costs (Ford and Scanlon, 2007). However, many of these actions can drive up costs in the supply chain.

Another agency problem facing physicians relates to upstream supplier relationships. Physicians often have entrenched relationships with suppliers which result in product preferences (Schneller and Smeltzer, 2006). These relationships are sometimes rooted in physician training where supplier preferences are developed. Another source of supplier preference is supplier-supported product development, in which many physicians participate, given the healthcare sector’s emphasis on research and development. These dependencies can span R&D, typically extending to continuing education and product training. As a result, “clinicians are often loyal to certain products and resistant to changing products or processes,” (Schneller and Smeltzer, 2006: p. 7). This can contribute to poor supply chain performance, exacerbated by the absence of coordination mechanisms.

2.3.2.1 The Decentralized Healthcare Delivery Supply Chain

The supply chain literature suggests that the allocation of decision making rights across supply chain actors and work design improvement should be directed by financial and/or contractual arrangements (Ganeshan et al., 1998; Li and Wang, 2007; Sahin and Robinson, 2002: Tsay, 1999). Absent these coordination mechanisms, there is little incentive for independent economic enterprises to coordinate their respective activities or assume risk (Gan et al., 2005). In supply chains linked by contractual agreements or common ownership, the supply chain is perceived as one entity with distributed work aimed at optimizing the performance of the value creation system. "However, in a decentralized supply chain, members act independently to optimize their individual performance," (Shah et al., 2008: p. 760).

The healthcare delivery supply chain is an example of a decentralized supply chain largely characterized by a lack of coordination mechanisms (financial or contractual) amongst physicians, hospitals, and patients. It should be stated that a few trifling coordination mechanisms do exist among these actors, such as the credentialing agreement between the hospital and the physician granting the physician 'privileges' to practice at said hospital, but such agreements are rarely revoked in the absence of egregious clinical wrongdoing. This conceptualization also assumes a scenario whereby the physician is not an employee of the hospital. With regard to the patient-physician or patient-hospital relationship, the relatively de minimis financial deductible is typically the only coordination mechanism in place.

Shah et al., (2008) describe the implications of decentralization in a case study of a downstream healthcare supply chain consisting of independent hospital providers in a patient referral relationship.

> *"A review of the supply chain literature indicates that coordination mechanisms in product-based supply chains revolve around financial tools because upstream suppliers are dependent on downstream manufacturers to be remunerated for the products they supply (the work they do). Such financial dependence allows the downstream manufacturer to have considerable influence on upstream suppliers and their operations. In a coordinated supply chain, decision-making rights regarding how work is done are allocated by the focal firm. [Supply chain management practices such as process] improvement in such a supply chain is accomplished either by fiat (e.g., all subunits of an organization must implement six sigma) or by setting institutional norms (e.g., ISO 9000 certification is required to be a Ford supplier). When the supply chain members are not linked through contractual or financial mechanisms, undertaking [supply chain management practices such as] process improvement is challenging because, in the absence of an apparent focal firm, the proper allocation of decision-making rights among supply chain members is not clear,"*
> *(Shah et al., 2008: p. 761).*

2.3.3. Information Asymmetries

Finally, healthcare delivery is complex and the IT systems capable of capturing and transforming data into information are not widespread and fully integrated (Ford and Scanlon, 2007). "There are problems getting information about healthcare procedures and products," (Smeltzer and Ramanathan, 2002: p. 2562). Information asymmetries or incomplete information flows among patients, physicians, hospitals, insurers, and payers arise in the supply chain giving some members a distinct advantage in negotiations and resulting in suboptimal outcomes (Ford and Scanlon, 2007). While IT has been a fundamental enabler of supply chain improvements in manufacturing, the adoption of IT in healthcare has been sparse (Smeltzer and Ramanathan, 2002).

While services – specifically healthcare delivery – have distinguishing contextual characteristics, scholars are considering the service and manufacturing classifications as a continuum in which firms may be more product-focused or more service-focused and vice versa (Hill et al., 2002; Mont, 2002; Gunasekaran, 2005; Hong et al., 2010; Dobrzykowski et al., *in press*). For example, Ayres (1998) observes that services have risen in activity within manufacturing. Others note that 65-75% of the employees working in traditional manufacturing industries now perform service functions (Mont, 2002). This trend toward service provision is reflected in the work of (Hill et al., 2002) and Gunasekaran (2005) who suggest that manufacturing has become more of a service. Manufacturing firms nowadays in many cases offer service 'solutions' as value added benefits for customers of tangible products (Hill et al., 2002: p. 195). These observations imply that traditional boundaries between services and manufacturing are blurring (Mont, 2002) and thus the view of a manufacturing/service continuum is gaining wide acceptance. This is evident in the healthcare delivery context as the output or *care bundle* is clearly comprised of a bundle of goods, services, and experiences (Sinha and Kohnke, 2009). See Figure 2.1.1 earlier. This may provide insight into the significant history of migration of manufacturing-based tools and techniques into the healthcare setting, (McDermott and Stock, 2007).

The care bundle conceptualization considered along with the characteristics of the healthcare delivery supply chain described in Table 2.3.1 earlier – the co-creation phenomenon, actor ambiguity, variable demand, the centrality of the physician, and information asymmetries – present unique challenges, but may help to explain why scholars have selected this context as a favored exemplar of value co-creation (for examples, see Normann and Ramirez, 1993; Prahalad and Ramaswamy, 2004a). A detailed discussion of value co-creation theory is now provided.

2.4 Theoretical Grounding

An understanding of contemporary value creation theory and methods is essential given that this is an important fundamental aim of supply chain management (Fiala, 2005). SDL provides an explanation for value creation with roots extending back to Adam Smith's (1776) work distinguishing between two broad views of value – 'value-in-use' and 'value-in-exchange.' (Vargo et al., 2008; Vargo and Akaka, 2009). "Historically, value-in-use has been recognized as the real meaning of value, until Smith refocused on value-in-exchange for convenience, given his national wealth standard [unit of analysis], rather than a personal (or national) wellbeing standard," (Vargo and Akaka, 2009: p. 38). While Smith acknowledged that value-in-use represents 'real value' as determined and realized by the individual (customer), he focused on value-in-exchange (or nominal value) owing to its more straight forward measurement and simplicity as compared to value-in-use (real value) (Vargo et al., 2008). The work of Smith (1776) together with Say's (1821) notion of utility – utility embedded in products represented by price – drove the adoption of a goods-centered paradigm or goods dominant logic (GDL). GDL then emerged in the scholarly business disciplines that followed (Vargo and Morgan, 2005) such as Operations, IT, and Marketing (Vargo and Akaka, 2009).

The GDL perspective is consistent with established thinking on value creation. Consider, Porter's (1985) value chain concept which has long been accepted as a useful explanation of a value creation in the firm and consequent competitive advantage owing to its identification of cost drivers and sources of differentiation. The value chain model describes the primary and secondary activities of a firm necessary to create margin or nominal value-in-exchange, and in doing so provides a framework for those activities which may be performed internally or outsourced to “pursue exactly what is required: inbound materials, raw materials inventories (both considered inbound logistics by Porter), manufacturing (called operations by Porter), finished goods inventories, and distribution within a single organization (considered outbound logistics by Porter),” (Gehmlich, 2008: p. 31). Value chain thinking has been applied in and outside of manufacturing, specifically discussed in healthcare (Gehmlich, 2008).

Primary activities include patient admission (representing inbound logistics), diagnosis, treatment, and care delivery (representing operations), patient discharge (representing outbound logistics), hospital marketing (representing marketing and sales), and health check ups (representing after sale service). The supporting activities are shown as hospital infrastructure (representing firm infrastructure), hospital staff (representing human resource management), research and development (representing technological development), and medical supplies (representing procurement) (Gehmlich, 2008). According to Porter (1985), a firm manages these activities in a unique way to create value-in-exchange referred to as margin in the space between it and the patient, placing the customer on the outside of the value creation process (Prahalad and Ramaswamy, 2004a).

Under the GDL view, the supply chain can be viewed as a linear collection of value chains, as opposed to a network (Ford and Scanlon, 2007) or constellation of value co-creating actors (Normann and Ramirez, 1993). According to this perspective, every firm or healthcare provider occupies a position in the supply chain with upstream suppliers 'adding value' in their inputs prior to advancing them downstream to the focal firm where it then adds value through the collection of the primary and secondary activities described earlier, before sending the product or service downstream again to the next actor or end consumer (Normann and Ramirez, 1993). An example of this approach in a healthcare context could be a primary care physician who examines and diagnosis a patient with severe Bronchitis prior to referring the patient for hospital admission. The hospital then coordinates inpatient treatment before discharging the patient home and coordinates home care. This is described in Figure 2.4.2.

Figure 2.4.2. Linear value chain representation in a healthcare context.

Some scholars believe that this GDL paradigm has become outmoded (e.g., Normann and Ramirez, 1993) in favor of a SDL perspective. Some of the fundamental premises of SDL which are key in the context of the present study include: 1) the customer is always a co-creator of value, 2) all economic and social actors are resource integrators, and 3) value is always uniquely and phenomenologically determined by the beneficiary of value (Vargo and Akaka, 2009). These characteristics are apparent in healthcare delivery as patient outcomes and value perceptions inherently require their involvement (Marley et al., 2004), providers of care as well as patients and other value contributors rely upon information and materials (resources) provided exogenously

(Normann and Ramirez, 1993), and outcomes are all consequently personalized (Marley et al., 2004). A complete list of the foundational premises of SDL is found in Table 2.4.1.

Table 2.4.1. Foundational premises of service dominant logic (adapted from Vargo and Lusch, 2008; Vargo and Akaka, 2009).

	Premise	Explanation/Justification
FP1	Service is the fundamental basis of all exchange.	The application of operant resources (knowledge and skills), "service," is the basis for all exchange. In this way, service is exchanged for service.
FP2	Indirect exchange masks or conceals the fundamental basis of exchange.	Goods, money, and institutions mask the natural service-for-service nature of exchange.
FP3	Goods are distribution mechanisms for service provision. Value in use.	Goods (both durable and non-durable) derive their value through use – the service they provide the beneficiary.
FP4	Operant resources are the fundamental source of competitive advantage.	The comparative ability to cause desired change drives competition and largely determines the firm's success.
FP5	All economies are service economies, with an emphasis on value co-creation.	Service (singular) is only now becoming more apparent with increased specialization and outsourcing.
FP6	The customer is always a co-creator of value.	Implies value creation is interactional.
FP7	The enterprise cannot deliver value, but only offer value propositions.	The firm can offer its applied resources and collaboratively (interactively) create value following acceptance, but can not create/deliver value alone.
FP8	A service-centered view is inherently customer oriented and relational.	Service is customer-determined and co-created; and thus inherently customer oriented and relational.
FP9	All economic and social actors are resource integrators (of services).	Implies the context of value creation is networks of networks (resource-integrators).
FP10	Value is always uniquely and phenomenological determined by the beneficiary.	Value is not only heterogeneous, but idiosyncratic, experiential, contextual, and meaning laden.

This theory provides that value creation centers on personalized interactions among customers, the focal firm's employees, and other supply chain actors (Prahalad and Ramaswamy, 2004a; Prahalad and Krishnan, 2008). As such, the customer is no longer viewed outside of the value chain, (Prahalad and Ramaswamy, 2004a), but instead can and does interact in a myriad of value creation activities throughout the entire supply chain or resource integrated network (Zhang and Chen, 2006). In this way, the customer's role transitions from that of a *consumer* of value to a *creator* of value (Normann and

Ramirez, 1993). These value co-production activities are very similar to those discussed in Porter's (1985) value chain and include co-development of new products and services, production, assembly, distribution, use, and after sale service (von Hipple, 1998; Ross, 1996; Duray, 2002; Zhang and Chen, 2008). As was the case with Porter's (1985) value chain, these activities have relevance in a healthcare setting as co-development of new services represents (technological) development, diagnosis and treatment represents operations, patient discharge represents distribution or outbound logistics, and health check ups represents use and after sales service.

These value co-creation activities require some combination of *operant* and *operand resources*. Operant resources are those resources capable of acting upon other resources to draw out and create value (e.g., knowledge and skills) and thus hold primacy over operand resources which are those which must be acted upon to generate gain (e.g., goods, natural resources, and money) (Constantin and Lusch 1994; Vargo and Lusch 2004; Vargo and Akaka 2009). SDL argues that the operant and operand resources used in value co-creation reside largely outside of the firm with suppliers, customers, and other key stakeholders. These economic actors interact to share operant and operand resources in effect exchanging services for mutual benefit. This is reflected in Figure 2.1.3 earlier and Figure 2.4.3 below. Here goods or resources, for example, can be viewed as an operand resource that must be acted upon to create value. In this example, customers do not derive value from goods in and of themselves, but rather create value when goods can be used as a medium of exchange for some benefit such as the use of pharmaceuticals.

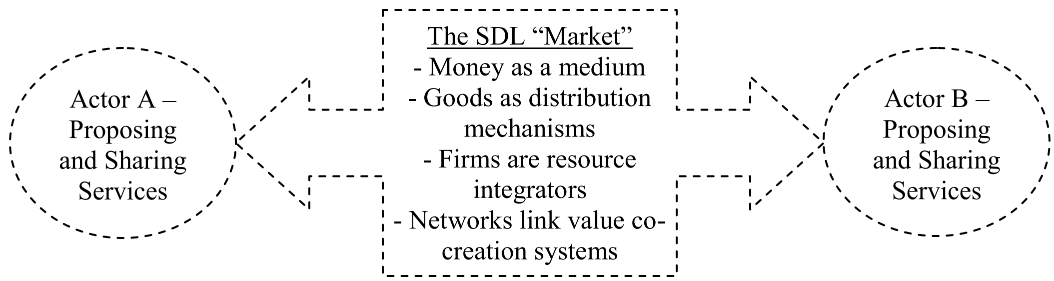


Figure 2.4.3. Service(s) exchanged for services (adapted from Vargo et al., in press).

This movement toward value co-creation has caused firms to realize that they do not simply add value in a discrete process stage, but instead they partner with customers/patients, suppliers, and other business partners to repeatedly reinvent value (Normann and Ramirez, 1993). As such, the focus of these firms has shifted from the *product/service* itself to the *value creation system* or *ecosystem* which comprises these actors (Vargo and Akaka, 2009). The continual quest to improve the fit between the composition and competencies of the *value creation system* and the customer has emerged as a primary goal centering attention on the "reconfiguration of roles and relationships among this constellation of actors in order to mobilize the creation of value in new forms and by new players," (Normann and Ramirez, 1993: 66).

Given the discussion above regarding the healthcare delivery context and value co-creation, a research model is developed which employs supply chain management constructs and coordination mechanisms to measure antecedents and consequences of value density, grounded in the theory of service-dominant logic (SDL). Construct definitions and hypothesized relationships follow in Sections 2.5 through Section 2.12.

2.5 Theoretical Model

Partnering Relationship, Organizational Architecture, Supply Chain Management, Value Density and Capability

As discussed in Chapter 1, attention today in healthcare operations is focused on managing costs, improving quality, and the over all efficiency and effectiveness of delivering care (McDermott and Stock, 2007). At the same time, contemporary ideas regarding value creation methods based on knowledge sharing are being introduced (Normann and Ramirez, 1993; Schmenner et al., 2009). This is shifting attention from the traditional internal focus to "the design of multi-firm network organizations whose capabilities are focused on knowledge sharing and application," (Miles and Snow, 2007: p. 459). For example, Bamford and Griffin (2008: p. 228) in case study research exploring operational teamwork in eight U.K. hospitals found evidence that it is not "so much a multi-disciplinary team, but rather a multi-disciplinary network which spanned the patient pathway (the patients journey through the 'process')." As such, it is recognized that an efficient and user-friendly supply chain can produce positive financial outcomes for providers and improve service to patients (McKone-Sweet et al., 2005). However, the unique characteristics of healthcare delivery cause the supply chain to be decentralized requiring coordination mechanisms to effectively implement a supply chain management strategy.

Relational coordination theory provides some insight into potential coordination mechanisms for the decentralized healthcare delivery supply chain suggesting that work is coordinated through communication networks and relationships that exist among workers (Shah et al., 2008). The strength of the actor networks is associated with superior performance (Gittell, 2000, 2001, 2002a). Relational coordination is comprised of three basic coordination mechanisms; shared knowledge, shared goals, and mutual respect for work (Gittell, 2002a). Shared knowledge provides feedback, informing the worker of how their tasks and the tasks of other contributing actors impact the overall work process. Shared goals serve to motivate and inspire workers to act with greater regard for the overall work process. Finally, mutual respect for others' work provides positive reinforcement to behave in line with the goals of the overall work process (Shah et al., 2008). Viewed in aggregate these three mechanisms reinforce timeliness, frequency, and problem solving in communication, therefore enhancing coordination. According to Shah et al. (2008: p. 780), "the theory of relational coordination helps explain the improved performance in the [decentralized healthcare] supply chain even in the absence of financial incentives." However, many studies suggest that healthcare providers fail to coordinate their work to the detriment of outcomes (e.g., Cannon et al., 2002; Jacobs et al., 2006).

While relational coordination provides an explanation for the facilitation of supply chain management practices (specifically lean process improvement) in Shah's et al., (2008) single case study, their findings may lack generalizability to explain breakdowns in coordination. This is particularly true in the context of the present study, given not only the healthcare delivery supply chain's decentralized nature, but also the centrality of the physician and the subsequent agency dilemma. One alternative explanation may rest in the shared vision of supply chain members, as well as the trust and commitment they possess. According to Miles and Snow (2007: p. 461), “collaborative networks will appear in various knowledge-intensive industries [such as healthcare], and they will require ongoing investments in intangible assets, such as the ability to collaborate and build inter-organizational trust, in order to grow and succeed.” Other scholars studying supply chain management practices in healthcare operations have suggested that a lack of accountability or commitment may negatively impact practices (Hayer, 2002; Bamford and Griffin, 2008). As such, there is an opportunity to build upon Shah’s et al. (2008) conceptualization of relational coordination, extending the concept to include not only sharing of knowledge, goals, and respect for work – in other words a shared vision – but also trust and commitment. Li (2002) and Liao (2008) conceptualized and tested a construct called *Partner Relationship* which consists of these three dimensions; trust, commitment, and shared vision, finding evidence of its role as an antecedent of supply chain management. This is reflected in the theoretical model, Figure 2.5.1. Construct definitions are provided in Table 2.5.1.

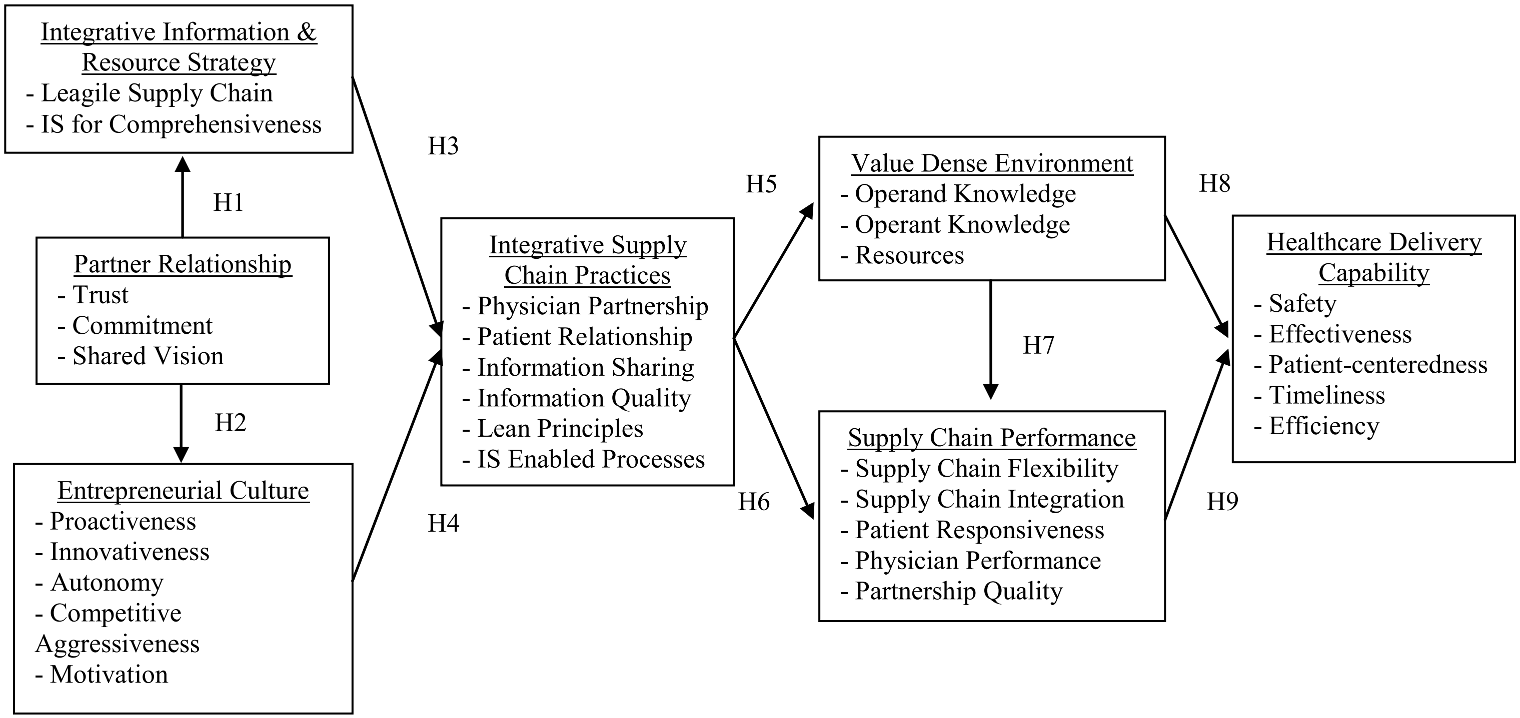


Figure 2.5.1. Theoretical Model.

Table 2.5.1. Construct Definitions.

Construct	Construct Definition	Subconstructs/ Dimensions	Literature
Partner Relationship (Section 2.6)	the extent of trust, commitment, and shared vision among healthcare delivery actors.	- Trust - Commitment - Shared vision	Alvarez, 1994; Ganesan, 1994; Morgan and Hunt, 1994; Monczka, et al., 1998; Wilson and Vlosky, 1998; Spekman et al., 1998; Lee and Kim, 1999; Li, 2002; Ramayah et al., 2008; Shah et al., 2008.
Integrative Information and Resource Strategy (Section 2.7)	the extent to which a hospital pursues an approach for managing processes, quality systems, and information technologies that balances both efficiency and agility in patient care.	- Leagile supply chain - IS strategy for comprehensiveness	Vonderembse et al., 2006; Agarwal et al., 2006; Sabherwal and Chan 2001; Apigian et al., 2006.
Entrepreneurial Culture (Section 2.8)	the extent to which those involved in healthcare delivery shift efforts and assets from unproductive to productive activities.	- Proactiveness - Innovativeness - Autonomy - Competitive Aggressiveness - Motivation	Drucker, 1985; Jambulingam et al., 2005; Venkatraman, 1989; Lumpkin and Dess, 1996.
Supply Chain Management Practices (Section 2.9)	the extent to which a set of activities is undertaken in a hospital to promote effective management of healthcare delivery.	- Strategic Physician Partnership - Patient Relationship - Information Sharing - Information Quality - Lean Principles - IS Enabled Processes	Li et al., 2005; 2006; Schneller and Smeltzer, 2006; Paggell, 2004; Paulraj et al., 2008; Shah et al., 2008; Rai et al., 2006.
Value Dense Environment (Section 2.10)	the extent to which those involved in healthcare delivery have *know what* (operand) knowledge and *know how* (operant) knowledge and resources available for use in providing care.	- Operand Knowledge - Operant Knowledge - Resources	Edmondson et al., 2003; Normann and Ramirez, 1993; Prahalad and Ramaswamy, 2004a; Vargo and Akaka, 2009.
Supply Chain Performance (Section 2.11)	the extent to which healthcare delivery in a hospital is flexible, well integrated, and responsive to patients, while enabling physicians to execute their duties, with outcomes that match the expectations of all involved.	- Flexibility - Integration - Patient Responsiveness - Physician Performance - Partnership Quality	Vickery et al., 1999; Frohlich and Westbrook, 2001; Narasimhan and Jayaram, 1998; Gunesakaran et al., 2001; Li et al., 2002.
Healthcare Delivery Capability (Section 2.12)	the extent to which those involved in patient care are able to provide services to patients in a safe, effective, patient-centered, timely, and efficient manner.	- Safety - Effectiveness - Patient Centeredness - Timeliness - Efficiency	IOM, 2001; McFadden et al., 2006; Knox et al., 1986; Tarnow-Mordi et al., 1990; Weeks et al., 1995; Marley et al., 2004; Shah et al., 2008; McDermott and Stock, 2007; Li and Benton, 2006.

Hospitals develop strategies and make decisions in managing the supply chain regarding how to best "organize the resources under their control to achieve their goals," (McDermott and Stock, 2007: p. 1022). The present study conceptualizes *Integrative Information and Resource Strategy*, which is comprised of two subconstructs: 1) Leagile Supply Chain Strategy (Vonderembse et al., 2006; Agarwal et al., 2006), and 2) IS for Comprehensiveness Strategy (Apigian et al., 2006; Sabherwal and Chan, 2001). This is owing to the notion that supply chain management deals with resource and information management between value co-creation actors (Lambert and Copper, 2000). The focus of this strategy rests on how the firm plans to collaborate with others to create value and is motivated by the nature of the firm's external relationships, making relationship attributes, such as trust, key (Miles and Snow, 2007). The theoretical model therefore postulates that Partner Relationship will influence the hospital's Integrative Information and Resource Strategy.

Networked approaches to value creation center not only on trust, but also the creation of an organizational culture which promotes equitable treatment and collaboration with actors external to the firm (Miles and Snow, 2007). Entrepreneurial orientations are particularly beneficial as firms strive to maximize the value of their collaborations, developing a culture of "collaborative entrepreneurship," (Miles and Snow, 2007: p. 461). Given this, trust, commitment, and shared vision motivate the hospital to develop an *Entrepreneurial Culture* in its dealings with value creation actors. This is reflected in Figure 2.5.1.

Supply chain management involves the management of information and resources toward the aim of its primary objective – value creation (Lambert and Cooper, 2000; Schneller and Smeltzer, 2006). Cabrera et al. (2001: p. 251) opine that "whether or not the organization is able to achieve its strategic objective will depend on whether it can deploy the right kinds of processes and behaviors, which are in turn determined by the organization's architecture." Strategy and culture are two high impact architectural elements at the firm's disposal (Roh et al., 2008). Together, the appropriate culture and strategy can guide the firm to execute valuable supply chain practices such as effective information flow (Leisen et al., 2002; Gallivan and Srite, 2005). "These decisions lead to hands-on, action oriented activities that dictate how a planned strategy is turned into an effectively implemented one," (McDermott and Stock, 2007: p. 1022). Therefore as shown in Figure 2.5.1, the present study posits relationships linking the Integrative Information and Resource Strategy of the hospital to its *Integrative Supply Chain Practices*, and a hospital's Entrepreneurial Culture to its *Integrative Supply Chain Practices*.

Integrative Supply Chain Practices bring benefits to the firm in terms of performance and the environment within which value creations actors work. For example, long term supplier (physician) relationships can improve supplier (physician) performance and increase customer (patient) responsiveness (Power et al., 2001; Li et al., 2006). Integrative Supply Chain Practices such as information quality and information sharing also serve to create an environment where value creation actors have access to the operand and operant resources necessary for value co-creation (Edmondson et al., 2003; Vargo and Akaka, 2009). Such an environment, referred to herein as a *Value Dense*

Environment, can be measured by its value density (Normann and Ramirez, 1993). The present study thus postulates relationships between Integrative Supply Chain Practices and the Value Dense Environment within which value co-creation actors work, as well as between Integrative Supply Chain Practices and the *Supply Chain Performance* of the healthcare delivery supply chain (Li et al., 2006). Herein, Supply Chain Performance is adapted from Li (2002) and comprised of flexibility, integration, patient responsiveness, physician performance, and partnership quality.

A Value Dense Environment provides the resources necessary for value co-creation actors such as physicians and other clinicians to achieve better supply chain performance. This is because value density can be thought of as a measure of the "best combination of resources mobilized for a particular situation," (Normann, 2001: p. 27). In a Value Dense Environment, actors share, trade, and utilize operand and operant inputs such as information and resources to improve supply chain performance and also develop healthcare delivery capability related to important outcomes metrics such as safety, effectiveness, patient centeredness, timeliness of care delivery and efficiency (IOM, 2001). Supply Chain Performance has also been shown to positively impact capability (Li et al., 2006) and as such the present study postulates a positive relationship between Supply Chain Performance and the development of *Healthcare Delivery Capability*. See Figure 2.5.1.

2.6 Partner Relationship

Ramayah et al. (2008: p. 38) state that "a high level of trust, commitment, and a shared common vision among supply chain partners is indeed essential for interorganizational collaboration (Spekman et al., 1998)." Formal collaborative relationships, such as those between physicians and hospitals in providing care to patients, must be rooted in mutual trust, shared vision and objectives, and require frameworks and structures that encourage and facilitate such behavior (Bowersox et al., 2000). These can be considered coordination mechanisms and they are of particular benefit in managing decentralized supply chains (Shah et al., 2008) such as that understudy herein.

Scholars suggest that supply chain management is actually built upon the foundation of trust and commitment (Lee and Billington, 1992). In the absence of this foundation, any effort to manage the flow of resources and information in the supply chain is problematic (Handfield and Nichols, 1999). Trust and commitment are necessary to build and foster long-term, collaborative relationships among economic actors (Spekman et al., 1998; Tan et al., 1998; Li 2002). Given the current more networked approach to value creation, these organizational attributes are of particular importance (Miles and Snow, 2007).

Li (2002) conceptualized a construct for Partner Relationship consisting of three dimensions; trust, commitment, and shared vision. The present study adapts Li's (2002) conceptualization of Partner Relationship for the context of a decentralized healthcare delivery supply chain. ***Partner Relationship*** is thus defined as the extent of trust, commitment, and shared vision among healthcare delivery actors. A list of subconstructs and their respective definitions and literature support are provided in Table 2.6.1.

Table 2.6.1 List of Subconstructs for Partner Relationship

Subconstruct	Definition	Literature
Trust	the extent of willingness to rely on an admitting/attending physician in whom one has confidence and a belief of integrity.	Ganesan, 1994; Monczka, et al., 1998; Wilson and Vlosky, 1998; Spekman et al., 1998; Li, 2002; Ramayah et al., 2008.
Commitment	the extent of willingness of admitting/attending physicians to exert effort on behalf of the relationship.	Morgan and Hunt, 1994; Monczka et al., 1998; Spekman et al., 1998; Li, 2002; Ramayah et al., 2008.
Shared vision between healthcare delivery partners	the extent of similarity of the pattern of shared values, goals and beliefs among healthcare delivery actors.	Alvarez, 1994; Lee and Kim, 1999; Li, 2002; Shah et al., 2008.

Trust is defined as the extent of willingness to rely on an admitting/attending physician in whom one has confidence and a belief of integrity. (Ganesan, 1994; Monczka et al., 1998; Wilson and Vlosky, 1998; Spekman et al., 1998; Ramayah et al., 2008). Trust is displayed in faith, belief, reliance, and/or confidence in a supply chain partner and is manifested in a willingness to forego individual opportunistic behavior (Spekman et al., 1998). Trust is comprised of two distinct elements: 1) benevolence which is the extent to which one actor believes that the other actor has motives and intentions beneficial to itself in the face of new and perhaps unforeseen conditions, conditions for which a commitment was not received and 2) credibility which is the extent to which one actor believes the other actor has the necessary ability and expertise to perform a certain job/task reliably and effectively (Ganesan, 1994). It follows that trust is rooted in a partner's reliability and expertise focused on the objective credibility of a value creation partner, while benevolence centers on the intentions and motivations of partners (Li 2002).

Commitment is defined as the extent of willingness of admitting/attending physicians to exert effort on behalf of the relationship (Morgan and Hunt, 1994; Monczka et al., 1998; Spekman et al., 1998; Ramayah et al., 2008). Ramayah et al. (2008: p. 40) state that "similar to trust, commitment is one of the most important ingredients for successful partnership alliances (Mohr and Spekman, 1994; Monczka et al., 1998; Lee and Kim, 1999)." Commitment is a lasting desire to maintain a valued relationship (Li 2002) and serves as a key facilitator of social exchange (Morgan and Hunt, 1994). It refers to the willingness of value creation actors to commit their resources such as money, time, and facilities to their relationships (Ramayah et al., 2008). In doing so, partners display commitment recognizing that it 1) is important factor for the success of long-term relationship benefits, 2) displays an intention for deeper involvement in the partnership through investments that may bring some risk to the actor, and 3) demonstrates the importance of the relationship to other partners (Mentzer et al., 2000). It follows that many scholars agree (see Monczka et al., 1998; Li 2002) "that commitment induces partners to allocate resources to maintain and to continue to enhance the effectiveness of the supply chain," (Ramayah et al., 2008: p. 40).

Shared Vision is defined as the extent of similarity of the pattern of shared values, goals and beliefs among healthcare delivery actors (Alvarez, 1994; Lee and Kim, 1999; Shah et al., 2008). Shared vision is thus the extent to which partners in healthcare delivery share common beliefs about the goals, behaviors, and policies which are appropriate and inappropriate, important and unimportant, and/or right or wrong (Ballou et al., 2000). Shah et al. (2008) implicitly describe shared vision as a critical coordination mechanism in decentralized supply chains such as the focus of this study. Shah et al.

(2008) ground their work in relational coordination theory suggesting three basic mechanism for coordination; shared knowledge, shared goals, and mutual respect for work (Gittell, 2002a). Shared knowledge informs actors how their work and the work of other partners contribute to the overall value creation effort, while mutual respect for one another's work reinforces the necessity to behave in a fashion consistent with the shared goals of the group (Shah et al., 2008). In their case study of hospital providers, Shah et al. (2008: p. 781) finds that "a broader understanding of the entire process, guided by shared goals and knowledge, also helps to create an environment in which employees feel psychologically safe and empowered to suggest possible process improvements, while reducing waste associated with a culture of finger pointing (Edmondson et al., 2003)."

2.7 Integrative Information and Resource Strategy

The implementation of an appropriate supply chain management strategy can produce improvements in cost, quality, flexibility, responsiveness and delivery (dependability) (Chen and Paulraj, 2004). The notion that these pressures are extant in healthcare delivery points to the potential gains that could be realized by improved operations management strategy in healthcare (McDermott and Stock, 2007).

The body of research exploring healthcare operations is nascent (McDermott and Stock, 2007) and thus far has focused primarily on capacity and demand management (Jack and Powers, 2004). For example, Smith-Daniels et al. (1988) establish a research agenda suggesting that demand and capacity management in healthcare centers on decision making related to the allocation of: 1) facilities, 2) equipment, and 3) workforce. More recently, research as explore standard performance measures, (Li and Benton, 1995), the influence of strategic operations management on hospital performance (Li et al., 2002), and the influence of operational decisions on clinical performance in Health Maintenance Organizations (HMOs) (Heinke, 1995). While these researchers have explored various aspects of capacity and demand management (see Kim, Horowitz et al., 2000; Jack and Powers, 2004; Powers and Jack, 2008; Jack and Powers, 2009), none have adopted a downstream supply chain view of healthcare delivery as described by Sinha and Kohnke (2009). "Operations strategy has flourished as a field, yet there is still much to be learned regarding how this knowledge base can effectively be applied within the healthcare setting," (McDermott and Stock, 2007: p. 1022).

There are two fundamental aspects of strategy as relates to healthcare delivery. Stock and McDermott (2007: p. 1023) state that "through structural (e.g. facilities, location, technology) and infrastructural (e.g. workforce management, incentives, hospital processes, quality systems) investments (Skinner, 1969; Hayes and Wheelwright, 1984; and see Tucker and Edmondson, 2003) hospitals configure their operations to achieve their strategic goals (Heineke, 1995; Butler, Leong and Everett, 1996; Goldstein et al., 2002; Li et al., 2002)." The present study focuses attention on technology as one of a hospital's structural elements given that facilities and location largely fall outside of the scope of the research questions under study. With regard to technology, research suggests that investments in information technology (both software and hardware) as well as other types of equipment appear to be positively associated with multiple hospital performance metrics including quality (Kumar and Motwani, 1999; Li and Collier, 2000; Li and Benton, 2003; 2006), efficiency (Watcharasriroj and Tang, 2004), costs (Kumar and Motwani, 1999; Li and Benton, 2006), and financial performance (Li and Collier, 2000).

With regard to the infrastructural elements of a hospital's operations strategy, researchers have explored aspects such as hospital processes (Tucker and Edmondson, 2003; Edmondson, 2003; Goldstein and Ward, 2004), quality systems (Li et al., 2002), workforce management (Li et al., 2002), and demand management (a hospital analogue to planning and control systems) (Li et al., 2002; McDermott and Stock, 2007). The focus of the present study rests on the hospital processes and quality systems infrastructural elements that comprise Integrative Supply Chain Practices.

"Strategy is the art of creating value," (Normann and Ramirez, 1993: p. 65). The strategies of the firm indicate the deliberate choices managers make from a diverse set of activities (or structural and infrastructural elements) to deliver a mix of value that is unique (Porter, 1996). In doing so, strategy is about combining specific activities (Porter, 1996). In developing strategies, or in essence selecting the key structural and infrastructural elements employed by a hospital to create value, researchers have suggested three primary foci (Butler et al., 1996). These foci have generally organized the firm around achieving: 1) low cost, 2) unique performance or value for customers, or 3) some combination thereof. A few well known business strategy typologies have guided much of the work in the area of strategy development. These seminal works consist of Porter's (1980) cost leadership, differentiation, and focus strategic types, and Miles and Snow's (1978) defenders, prospectors, and analyzers strategic types (Apigian et al., 2006). Since the developed of these strategic foci, similar themes have emerged, either explicitly or implicitly, in other contexts such as information systems strategy (see Sabherwal and Chan, 2001; and Apigian et al., 2006), supply chain management strategy (see Vonderembse et al., 2006), manufacturing strategy (see Miller and Roth, 1994; Frohlich and Dixon, 2001), and even healthcare operations (Butler et al., 1996).

With this understanding, it follows that a primary pursuit of the firm is to achieve fit between its context or environment and its strategy (Porter, 1996). Miles and Snow (1984) suggest that such alignment is instrumental for the firm's survival, excellence, and sustainable excellence. However, it is important to note that while these concepts are applicable in the healthcare context, the strategic types may be less clearly defined, or at least less discrete in nature. For example, Shortell et al. (1990) analyze hospitals, categorizing them in the Miles and Snow (1978) typology of prospectors, defenders, and analyzers. Shortell et al. (1990) provide rare empirical evidence that this strategy typology is applicable in the healthcare context. However, their findings show that although the dichotomous conceptualizations of prospectors and defenders are apparent, "both require skill at cost-containment and service differentiation," and must be addressed from the clinical as well as business perspectives of the hospital (Butler et al., 1996; p. 140). This implies that in developing healthcare delivery supply chains, hospitals face a duality of objectives centering on cost as well as flexibility. Clearly, the challenge facing healthcare managers is to devise and implement resource management strategies that ensure that they consistently provide high quality services despite demand fluctuations (Jack and Powers, 2009) and at the same time respond to cost and quality pressures (McDermott and Stock, 2007). In other words, healthcare delivery supply chains should be lean and also agile in managing the structural and infrastructural elements of the supply chain.

Therefore, the present study conceptualizes a construct for Integrative Information and Resource Strategy which is comprised of two dimensions which direct decision making with regard to: 1) infrastructural organizational elements, specifically hospital processes and quality systems (Skinner, 1969; Hayes and Wheelwright, 1984; and see Tucker and Edmondson, 2003) and 2) structural organizational elements, specifically IS strategy (McDermott and Stock, 2007; and Butler et al., 1996). ***Integrative Information and Resource Strategy*** is defined as the extent to which a hospital pursues an approach for managing processes, quality systems, and information technologies that balances both efficiency and agility in patient care. A list of subconstructs and their respective definitions and literature support are provided in Table 2.7.1.

Table 2.7.1 List of Subconstructs for Integrative Information and Resource Strategy

Subconstruct	Definition	Literature
Leagile Supply Chain Strategy	the extent to which a hospital encourages actors involved in providing patient care to continuously improve processes to eliminate waste and non-value added activities, while understanding the needs of patients, being adaptable to change, and able to provide responsive, personalized care.	Vonderembse et al., 2006; Agarwal et al., 2006.
IS for Comprehensiveness Strategy	the extent to which a hospital provides and encourages actors involved in providing patient care to use information systems for operational, customer/patient focused, and interorganizational/physician activities.	Sabherwal and Chan, 2001; Apigian et al., 2006.

Leagile Supply Chain Strategy is defined as the extent to which a hospital encourages actors involved in providing patient care to continuously improve processes to eliminate waste and non-value added activities, while understanding the needs of patients, being adaptable to change, and able to provide responsive, personalized care. Vonderembse et al. (2006) conceptualized the hybrid supply chain strategy which contains elements from both the lean and agile (leagile) supply chain strategies in recognition that certain environments call for both cost containment as well as flexibility.

The lean enterprise concept began gaining popularity over two decades ago (Womack et al., 1990; Womack and Jones, 1996). Lean aims to eliminate of waste or non-value added activities through continuous improvement efforts (Towill and Christopher, 2002; Agarwal et al., 2006; Vondrembse et al., 2006; Mohammed and Banwet, 2008). Employee empowerment and team work is a central theme of the lean supply chain (Vonderembse et al., 2006). Using lean, firms work on confirmed orders (Vonderembse et al., 2006) and it is best suited for environments where demand is relatively predictable and stable and where variety requirements are low (Towill and Christopher, 2002). As such, lean supply chains focus on upstream IT integration with operations and suppliers (Vonderembse et al., 2006). The result is that lean supply chain stress high quality but standard and low cost products.

On the other hand, agility is defined as the firm's ability to respond rapidly to changes in demand, both in term of volume and variety (Christopher, 2000). The agile strategy emerged as market and customer demand characteristics began to change rapidly (Hayes and Wheelwright, 2005). Firms responded by pursuing volume and variety flexibility to be more responsive (Booth, 1996; Vondrembse et al., 2006). The agile supply chain strategy emphasizes connectivity with customers (the market) by integrating IT (Agarwal et al., 2006; Vondrembse et al., 2006). Information sharing throughout the supply chain is key to success. This enables the agile organization to be context-specific, dynamic, flexible and growth-oriented across the supply chain (Vondrembse et al., 2006).

This is achieved through deployment new technologies, new competencies, and even develop new markets.

Many scholars have observed that these two approaches can complement one another, and suggest the Leagile supply chain strategy in many contexts (Towill and Christopher, 2002; Lee, 2004; Agarwal et al., 2006; Vondrembse et al., 2006). "The best supply chains aren't just fast and cost-effective. They are also agile and adaptable, and they ensure that all their companies' interests stay aligned," (Lee, 2004: p. 102). The Leagile supply chain strategy employs concepts from both the lean and agile strategies to achieve agility at the product line level, while following lean principles as the component level (Vonderembse et al., 2006).

Product level demand variability addresses variation in customer orders for a given product, while demand variability at the component level addresses variation in the component requirements for each ordered product. For example, product variability for a restaurant is uncertainty centering on which dish(es) a customer who enters the store will order. It is difficult for the restaurateur to predict whether the customer will order breakfast, lunch, dinner, deserts, etc. Component level variability is uncertainty that exists regarding the customer's requirements for each product ordered such as choice of bread, meat, cheese, and condiments for a lunch sandwich. If the restaurateur receives an advance lunch order from the customer, the restaurateur will be ready with all of the necessary components to make the sandwich, but he/she would not have prepared the products and components necessary for breakfast and dinner. This allows the restaurant to eliminate multiple forms of waste and improve customer responsiveness. This is a simplistic example of a manufacturing concept referred to as 'assemble to order' which is at the heart of the Leagile supply chain strategy (Vonderembse et al., 2006).

In the 'assemble to order' environment, product demand is reasonably predictable, while component demand may be variable. This is much like the environment in the downstream healthcare delivery supply chain. One notable exception is care delivered in the emergency department (Shah et al., 2008). However, in the context of care delivered during most inpatient hospital stays (e.g., following surgery), the order is received prior to admission, or minimally the nursing staff on the floor is notified in advance that the patient will be transported to a room under their purview, enabling the clinical and allied health professionals identify the product-line needs of the patient *(e.g. breakfast, lunch, or dinner)* such as cardiac services, etc. and begin to assemble the appropriate components in the form of ancillary equipment and services.

Lean methods are emphasized in the Leagile supply chain strategy through the use of continuous process improvement to eliminate waste which improves costs and flexibility (Vonderembse et al., 2006). A key aspect of lean that is employed under the Leagile approach is employee empowerment. Here the focus rests in empowering employees to perform work in their functional teams or departments (Vonderembse et al., 2006).

Finally, the Leagile Supply Chain Strategy emphasizes integration across the healthcare delivery supply chain. This includes integration with suppliers (physicians in the case of the present study) as well as with customers, again in an attempt to understand and deliver on their requirements (Vonderembse et al., 2006). The Leagile supply chain is a suitable Integrative Information and Resource Strategy given that the primary hospital strategy typically emphasizes quality of care, flexibility, and timeliness, owing to the customized nature of delivering care in an environment pressured for cost reductions (Jack and Powers, 2004).

IS for Comprehensiveness Strategy is defined as the extent to which a hospital provides and encourages actors involved in providing patient care to use information systems for operational, customer/patient focused, and interorganizational/physician activities. Sabherwal and Chan (2001) use Miles and Snow's (1978) strategy typology to develop IS strategies. In doing so, the authors link four types of IS systems deployed by firms to support the overall value creation strategy to the Miles and Snow (1978) strategy typology (e.g., Camillus and Lederer, 1985; Karimi, Gupta and Somers, 1996; Gilbert, 1995). These four types of IS systems include: (1) *operational support systems* which are used to control and monitor day-to-day operations, (2) *market information systems* which are used to observe customer demand changes and quickly respond to their requirements, (3) *interorganizational support systems* which are used to connect customers and suppliers, known in the context of the current study as value co-creation actors, and (4) *strategic support systems* which are used in the long range planning process of a hospital to identify and forecast major market opportunities (Shortell and Zajac, 1990). Sabherwal and Chan (2001) described the use of these four systems across the Miles and Snow (1978) typology as shown in Table 2.7.2.

Table 2.7.2. IS Strategy Profiles of Defenders, Prospectors, and Analyzers (Sabherwal and Chan, 2001).

	Defenders	**Prospectors**	**Analyzers**
IS Strategy Attribute	*IS for Efficiency*	*IS for Flexibility*	*IS for Comprehensiveness*
Operational Support Systems	High	Low	Medium
Market Information Systems	Low	High	High
Interorganizational Support Systems	High	Medium	High
Strategic Support Systems	High	High	High

Sabherwal and Chan (2001) call attention to the differences in a firm's IS strategy, based essentially on their cost, differentiation, or Leagile approach to value creation. The IS for Comprehensiveness strategy is adapted for this study owing to its ability to broadly integrate the supply chain in pursuit of both low cost and differentiation or high quality. See Table 2.7.2. For the purposes of the present study, *strategic support systems* are omitted given that: 1) they are not shown to provide direct support to the management of the healthcare delivery supply chain, and 2) such systems are posited by Sabherwal and Chan (2001) to be represented in each strategy type therefore rendering them as undifferentiated among the various strategies. Finally, it is worthy to note that Sabherwal and Chan (2001) provide empirical evidence that Miles and Snow's (1978) analyzer (or Leagile) strategy type *fits* with the IS for Comprehensiveness IS strategy.

Apigian et al. (2006) also use Miles and Snow (1978) strategy typology as the basis for IS strategy development focusing on a firm's Internet use for information sharing. Here the authors posit that Internet use for internal operations as well as customer and supplier interactions should serve the analyzer (Leagile) strategy type

(Apigian et al., 2006). The empirical results of Apigian et al. (2006) however, do not lend support for the use of IS for customer and supplier interactions, but they do reveal the critical role that IS plays in coordinating internal operations. In summary, the Sabherwal and Chan (2001) study essentially supports the notion that Leagile strategies are well served to deploy an IS strategy focused on market/customer support and interorganizational support systems, as well as operational support systems but to a slightly lesser extent. The Apigian et al. (2006) study posits that Leagile approaches to value creation employ balanced Internet strategies connecting customers, suppliers and internal operations, while providing empirical support only for internal operations. Taken together the findings of Apigian et al. (2006) emphasize the primacy of IS systems use for internal operations, which when considered with Sabherwal and Chan's (2001) findings suggests a balance approach between operational, market/customer focused, and interorganizational systems.

2.7.1 Partner Relationship and Integrative Information and Resource Strategy

As firms develop trust and collaborative skills necessary to form networks, the design of strategies, structures and processes becomes important to grow in capability and scope (Miles and Snow, 2007). This leads the hospital to develop a Integrative Information and Resource Strategy in order to gain access to more knowledge and increase their value co-creating capability. This is particularly the case when considering the decentralized nature of the healthcare delivery supply chain.

"A decentralized supply chain can be coordinated by fostering close relationships among supply chain partners," (Shah et al. 2008: p. 781). Trust is a foundational element that ensures successful supply chain performance (Kwon and Suh, 2004; Hong and Jin, 2007). "Lack of trust between supply chain partners reduces willingness to share tactical and strategic information," (Ramayah et al., 2008: p. 39). Further, an absence of trust impairs the ability of a value creation network (or system) to make critical exchanges of a social, political and economic nature (Bowersox et al., 2000; Cross and Kelley, 2004). This leads to adverse outcomes such as increased transaction costs (hand-offs) and inefficient and ineffective performance (Kwon and Suh, 2004). Finally Smith and Smith (2005) in a case study of the Australian auto textile and healthcare industries, illustrated that the development of trusting, cooperative relationships between supply chain actors positively influenced organizational performance (Ramayah et al., 2008). Improving organizational performance is a fundamental driver of a hospital's strategy (McDermott and Stock, 2007).

Finally, the partner relationship construct was directly adopted and tested by Liao (2008) from Li (2002). Both studies provide evidence that partner relationship is an antecedent to supply chain management. Li (2002) tested and provided evidence that partner relationship positively impacts supply chain management practices as well as supply chain performance. Liao (2008) modeled and tested relationships of partner relationship as an antecedent to supplier alignment and supplier empowerment. Both relationships were statistically significant. The present study postulates that strategy guides the firm's practices and behavior. In the context of supply chain management, particularly in a decentralized supply chain, partner relationship should be an important antecedent to the strategy a hospital pursues with its supply chain partners.

Therefore, the present study postulates:

H1: Partner Relationship is positively associated with Integrative Information and Resource Strategy.

2.8 Entrepreneurial Culture

Organizational culture (or orientation) is the fundamental tacit set of assumptions about the world and organization that a group of people share, and that determines their thoughts, perceptions, feelings, and their outward-facing behaviors (Schein, 1996; Roh et al., 2008). When considering supply chain management, cultures or orientations can be unique to a firm (Min and Mentzer, 2004) and should be contextually specific to the firm's situation (Roh et al., 2008). Cultures are evident in the various behavior patterns of firms and show differences in terms of focus, the management of employees, criteria for success, criteria for effectiveness, and organizational glue (Cameron and Quinn, 1999). Roh et al. (2008: p. 365) point out that "it should be noted, however, that these patterns of culture are not mutually exclusive (Al-Khalifa and Aspinwall, 2001). [In other words,] no organization may show only one cultural pattern." Rather cultural types provide general classifications to assist in understanding a firm's orientation.

Entrepreneurship is a relevant cultural orientation in the supply chain management context (see Jambulingam et al., 2005). An entrepreneurial focus is a strategic orientation that involves the way in which the firm commits and controls resources, including how it forms networks (relationships) (Kuratko and Hornsby, 2009). Entrepreneurial hospitals can be thought of as those which encourage patient care actors to shift efforts and assets from unproductive to productive activities (Drucker, 1985). Jambulingam et al. (2005) provide useful and relevant insights into the cultural orientations of another service shop type of business (from Schmenner, 1986), that of retail pharmacies. Jambulingam et al. (2005) explore the entrepreneurial orientation or culture of these service firms suggesting that such an orientation is comprised of "a firm's ability and willingness to: (1) innovate (innovativeness), (2) take action in anticipation of changes (proactiveness), (3) encourage independent activity by employees (autonomy), (4) respond to maneuvers of rivals (competitive aggressiveness), (5) take chances (risk taking), and (6) motivate employees to work hard and face challenges (motivation) (Lumpkin and Dess, 1996)." The authors suggest that firms vary in the degree to which they demonstrate each of these entrepreneurial intangibles.

Innovativeness is conceptualized as a firm's tendency to engage in and support new ideas, experimentation, novelty, and creativity that may result in new services (Lumpkin and Dess, 1996). Proactiveness refers to a firm's processes targeted at anticipating and acting on unknown future needs (Venkatraman, 1989). Autonomy addresses the degree to which all employees of a firm enjoy freedom to bring forth new vision or ideas and follow it through to completion. Competitive aggressiveness refers to the firm's propensity to directly and intensely challenge competitors to improve their current market position or enter a new market altogether. (Lumpkin and Dess, 1996). Competitive aggressiveness captures the reactive tendencies of the firm – the opposite of proactiveness. Risk taking speaks to the firm's proclivity or appetite for risky projects. It reflects managerial preferences for bold action to achieve firm objectives (Gasse, 1982). Finally, motivation refers to a firm's ability to enhance employees' morality and attitudes about work. Favorable attitudes about and morale of hard work contributes to their motivation to produce high level job performance (Jambulingam et al., 2005).

Analysis of survey data collected from the pharmacies reveals six clusters of entrepreneurial cultures (Jambulingam et al., 2005). These include: 1) competitive aggressors, 2) ambitious, 3) true entrepreneurs, 4) low-risk entrepreneurs, 5) proactive innovators, and 6) anything but entrepreneurs. The authors then analyzed the data in search of the performance of each cluster against four outcome measures consisting of effectiveness, customer orientation, growth, and innovative services provided. Two clusters outperform the other four – true entrepreneurs and low-risk entrepreneurs. The true entrepreneurs cluster is comprised of firms which emphasize risk-taking, innovativeness and proactiveness to a greater extent than any other cluster. Their emphasis on competitive aggressiveness and autonomy is significantly higher, statistically speaking, than four of the five clusters, however, not significantly lower than low-risk entrepreneurs. The true entrepreneurs cluster places a simultaneously high emphasis on each of the six entrepreneurial dimensions (Jambulingam et al., 2005). Low-risk entrepreneurs are very similar to true entrepreneurs with one important exception. Low-risk entrepreneurs display a significantly lower emphasis on risk taking. Like true entrepreneurs, the low-risk entrepreneur cluster is significantly higher than any of the other groups on innovativeness, proactiveness, and autonomy. With regard to competitive aggressiveness and motivation, it is significantly higher than three of the four groups, however not significantly lower than the true entrepreneurs cluster. The low-risk entrepreneurs place significantly lower emphasis on risk-taking (about one-half or one-third) compared to any of the other entrepreneurial dimensions (Jambulingam et al., 2005). Given the characteristics of each of these clusters, their associated outcomes are not surprising. True entrepreneurs outperformed all other clusters for growth and innovative services, while the low-risk entrepreneurs outperformed all other clusters for effectiveness and customer orientation.

The present study conceptualizes a construct for Entrepreneurial Culture which is comprised of the five dimensions from the low-risk entrepreneurship culture type from Jambulingam et al. (2005). This conceptualization is supported by 1) logical reasoning and literature indicating that patient care is well served to avoiding risk (Tucker, 2004), as well as 2) the findings of Jambulingam et al. (2005) that a low-risk entrepreneurial culture is associated with better outcomes for effectiveness and customer orientation, both of which are key measures for success in healthcare delivery (IOM, 2001). ***Entrepreneurial Culture*** is thus defined as the extent to which those involved in healthcare delivery shift efforts and assets from unproductive to productive activities (Drucker, 1985). A list of subconstructs (the dimensions of an Entrepreneurial Culture) and their respective definitions and literature support are provided in Table 2.8.1.

Proactiveness is defined as the extent to which healthcare delivery processes are targeted at anticipating and acting on unknown future market (patient) needs (Venkatraman, 1989; Jambulingam et al., 2005).

Innovativeness is defined as the extent to which those involved healthcare delivery engage in and support new ideas, experimentation, novelty, and creativity, some of which that may result in new services (Lumpkin and Dess, 1996).

Autonomy is defined as the extent to which all those involved in healthcare delivery have freedom to bring forth new vision or ideas and follow it through to completion (Jambulingam et al., 2005).

Table 2.8.1 List of Subconstructs for Entrepreneurial Culture

Subconstruct	Definition	Literature
Proactiveness	the extent to which healthcare delivery processes are targeted at anticipating and acting on unknown future market (patient) needs.	Venkatraman, 1989; Jambulingam et al., 2005.
Innovativeness	the extent to which those involved in healthcare delivery engage in and support new ideas, experimentation, novelty, and creativity, some of which that may result in new services.	Lumpkin and Dess, 1996; Jambulingam, 2005.
Autonomy	the extent to which all those involved in healthcare delivery have freedom to bring forth new vision or ideas and follow it through to completion.	Jambulingam, 2005.
Competitive aggressiveness	the extent to which those involved in healthcare delivery have a propensity to directly and intensely challenge competitors to improve their current market position or enter a new market altogether.	Lumpkin and Dess, 1996; Jambulingam, 2005.
Motivation	the extent to which those involved in healthcare delivery enhance each others' morality and attitudes about work, encouraging hard work and high level job performance.	Jambulingam et al., 2005.

Competitive aggressiveness is defined as the extent to which those involved in healthcare delivery have a propensity to directly and intensely challenge competitors to improve their current market position or enter a new market altogether, (Lumpkin and Dess, 1996).

Finally, ***Motivation*** is defined as the extent to which those involved in healthcare delivery enhance each others' morality and attitudes about work, encouraging hard work and high level job performance (Jambulingam et al., 2005).

2.8.1 Partner Relationship and Entrepreneurial Culture

All three dimension of partner relationship serve as the foundation for the development of an Entrepreneurial Culture. Trust serves to stimulate positive attitudes and behaviors (Schurr and Ozanne, 1985) and serves as motivation for employees. This is of particular relevance to the present study given that the sharing of information between supply chain actors places a premium on trust because of the consequential competitive risks (Young et al., 1999). Further, Chen et al. (2007) suggest that trust in supply chain partners is key for effective collaboration (Ramayah et al., 2008). As such, if a hospital is to develop a culture centered on partner collaboration, it must first have trust in its partners.

Further, trust and a shared vision with supply chain partners drives the culture of the firm toward a collaborative 'world view' (Spekman et al., 1998; Lee and Kim, 1999; Li 2002). These relationship dimensions, along with commitment to value creation partners, is necessary for the development of a culture of collaboration. Partner Relationship is particularly important considering SDL, given that the hospital's clinical staff is most likely to "share what [they] have with committed partners [which is key,] because relationships shape the trajectory of the opportunity," (Read et al., 2009: p. 3).

Therefore, the present study postulates:

H2: Partner Relationship is positively associated with Entrepreneurial Culture.

2.9 Integrative Supply Chain Practices

Min and Mentzer (2004: p. 63) state that "supply chain management extends the concept of functional integration (i.e., the integration of traditional business functions, departments, and processes) beyond a firm to all the firms in the supply chain (Cooper and Ellram, 1993; Cooper et al., 1997: Ellram and Cooper, 1990; Greene. 1991) and, thus, individual members of a supply chain help each other improve the competitiveness of the supply chain, which should improve competitiveness for all supply chain members

(Bowersox and Closs, 1996; Cavinato, 1992; Cooper and Ellram, 1993; Lee and Billington. 1992)." As discussed in Chapter 2, while general consensus exists regarding the concept of supply chain management, much less is known about the specific practices required to maximize the potential benefits (Li et al., 2006). This is particularly the case when considering value co-creation in the healthcare context. The present study therefore conceptualizes a construct for supply chain management practices based on the work of Li (2002) and Li et al. (2005; 2006), which is comprised of six integrative dimensions which include: 1) strategic physician partnership, 2) patient relationship, 3) information sharing, 4) information quality, 5) lean principles, and 6) IS enabled processes. ***Integrative Supply Chain Practices*** is defined as the extent to which a set of activities is undertaken in a hospital to promote effective management of healthcare delivery (adapted from Li et al., 2005; 2006). A list of subconstructs and their respective definitions and literature support are provided in Table 2.9.1.

Strategic Physician Partnership is defined as the extent to which the hospital has long-term relationships with its key physicians intended to leverage the strategic and operational capabilities of both parties to help them achieve significant ongoing benefits. A strategic partnership involves long-term, direct relations that promote collaboration such as mutual planning or problem solving (Gunasekaran et al., 2001). Such relationships enable a firm to work closely with a smaller number of partners who are amenable to sharing responsibility for the success of the firm's offerings (Li et al., 2005). Partners involved in product/service design for example can provide valuable insights into cost effective design choices and technologies (Monczka et al., 1993). Strategically aligned partners are also able to work very closely, therefore eliminating wasteful effort and time (Balsmeier and Voisin, 1996). As such, Noble (1997) suggests that effective partnerships such as these can be a critical aspect in the development of a high performance supply chain (Li et al., 2005).

Table 2.9.1 List of Subconstructs for Integrative Supply Chain Practices

Subconstruct	Definition	Literature
Strategic physician partnership	the extent to which the hospital has long-term relationships with its key physicians intended to leverage the strategic and operational capabilities of both parties to help them achieve significant ongoing benefits.	Balsmeier and Voisin, 1996; Gunasekaran et al., 2001; Lamming, 1996; Monczka et al, 1998; Stuart, 1997; Li et al 2005; 2006.
Patient relationship	the extent to which the hospital employs practices for the purposes of managing patient complaints, building long-term relationships with patients, and improving patient satisfaction.	Aggarwal, 1997; Claycomb et al., 1999; Magretta, 1998; Noble, 1997; Tan et al., 1998; Wines, 1996; Li et al., 2005; 2006; Chopra and Meindl, 2004; Schneller and Smeltzer, 2006.
Information sharing	the extent to which critical information is communicated to those involved in healthcare delivery.	Balsmeier and Voisin, 1996; Jones, 1998; Lalonde, 1998; Mentzer et al., 2000; Monczka et al., 1998; Novack et al., 1995; Stein and Sweat, 1998; Towill, 1997; Yu et al., 2001; IOM, 2001; Pagell, 2004; Li et al., 2005; 2006; Paulraj et al., 2008.
Information quality	the extent to which the information exchange between those involved in healthcare delivery is accurate, timely, adequate, and credible.	Alvarez, 1994; Berry et al., 1994; Chizzo 1998; Holmberg, 2000; Jarrell, 1998; Lee et al., 1997; Mason-Jones and Towill, 1997; McAdam and McCormack, 2001; Metters, 1997; Monczka et al., 1998; Li et al., 2005; 2006.
Lean principles	the extent to which efforts are made to improve healthcare delivery processes by incorporating standardized work, seamless linkages, simple and direct pathways, and process improvements based on scientific methods.	Spear and Bowen, 1999; Spear, 2005; Shah et al., 2008.
IS enabled processes	the extent to which IS is used to facilitate the flow of physical materials and information among those involved in healthcare delivery.	Adapted from Rai et al., 2006; Amini et al., 2007; Jha et al., 2009.

Patient Relationship is defined as the extent to which the hospital employs practices for the purposes of managing patient complaints, building long-term relationships with patients, and improving patient satisfaction (adapted from Aggarwal, 1997; Claycomb et al., 1999; Tan et al., 1998). Many scholars consider customer (or in the case of this study patient) relationship management to be a critical aspect of supply chain management (see Noble, 1997; and Tan et al., 1998). In healthcare delivery, customer relationship management (CRM) is considered to be one of the three primary supply chain management processes, next to internal supply management (ISM), and supplier relationship management (SRM) (Chopra and Meindl, 2004; Schneller and Smeltzer, 2006). Close relationships with customers/patients enables a firm to differentiate its service offerings from the competition and extend the value provided to its customers (Magretta, 1998; Li et al., 2005).

Information Sharing is defined as the extent to which critical information is communicated to those involved in healthcare delivery. Information among healthcare delivery supply chain partners is critical to achieve positive outcomes, yet many healthcare organizations, physicians, and hospitals operate as separate "silos," making diagnosis and treatment decisions with asymmetric information about the patient's medical history, condition, medications provided by other clinicians, or services provided in other settings (IOM, 2001). Many scholars have postulated that the key element in developing a seamless supply chain rests in making up-to-date and undistorted information about customer needs available to all value creation actors in the supply chain (Balsmeier and Voisin, 1996). Similarly, Lalonde (1998) suggests that information sharing is one of the five building blocks that represent a concrete supply chain relationship (Li et al., 2005). Supply chain partners who regularly share information are successful in working together as one entity (Stein and Sweat, 1998), a critically important concept in the decentralized healthcare supply chain. In working together, supply chain actors can better understand the needs of the customer and respond more quickly (Li et al., 2006). The negative effects of poor information sharing or information asymmetries are apparent in the supply chain literature, causing the bullwhip effect (Yu et al., 2001). On the other hand, effective information sharing has been shown to reduce costs and improve quality (Stein and Sweat, 1998). For these reasons, many scholars observe that by capturing available data and sharing it with supply chain partners can serve as a source of capability/competitive advantage (Jones, 1998; Novack et al., 1995).

Lean Principles is defined as the extent to which efforts are made to improve healthcare delivery processes by incorporating standardized work, seamless linkages, simple and direct pathways, and process improvements based on scientific methods. Lean has been studied in a healthcare context, specifically in a similarly conceptualized healthcare deliver supply chain in a case study by Shah et al (2008). Shah et al (2008: pp. 763-764) conceptualized Lean based on Spears and Bowen (1999) and Spear (2005) highlighting the following principles.

> "Principle 1—Standardized work: defines how people perform their work and ensures that all work is highly specified to its content, sequence, timing, and outcome. Processes must be designed such that deviations from
> this specification are readily apparent. Standardized work reduces or eliminates decision making related to how work should be performed.
>
> Principle 2—Seamless linkages: establishes that people performing the work must be connected to one another with direct and unambiguous links. There is complete certainty about exactly who has performed what work at each process handoff. Seamless linkages reduce or eliminate the

need for information transfer and the errors (defects and delays) such transfers introduce.

Principle 3—Simple and direct pathways: designates that the process must be designed so that production flows are simple and direct and do not change from one production run to another. Such predictable flows ensure that the exact appropriate resources are devoted to production. Simple and direct pathways reduce or eliminate decision making related to where work should be directed as it flows through the process.

Principle 4—Process improvements based on scientific methods: outlines the scientific method of hypothesis testing that employees must use to improve the process and discourages them from learning from personal experience alone. Such methods reduce or eliminate decision making based on intuition while promoting decision making based on scientifically derived evidence."

Contrary to much of the scholarly research into supply chain practices such as lean (see Schmenner and Swink, 1998; Hopp and Spearman, 2004), Shah et al (2008: p. 778) show that lean can be implemented in highly variable, unpredictable environments which are not "stable or [where] unstable demand can be buffered using production smoothing techniques."

IS Enabled Processes is defined as the extent to which IS is used to facilitate the flow of physical materials and information among those involved in healthcare delivery. While some scholars omit IS in their conceptualizations of supply chain practice (for example see Li et al., 2005), it plays an unmistakably important role in managing supply chain activities. Given this, Donlan (1996), includes IT sharing in a conceptualization of supply chain management practices which include: 1) outsourcing, 2) cycle time compression, 3) supplier partnership, 4) continuous process flow and 5) IT sharing. Likewise, Alvarado and Kotzab (2001) suggest that IT use such as EDI for inter-organizational data exchange is a supply chain management practice (Li et al., 2006).

These conceptualizations of supply chain practices considered along with the statement by Ilie et al. (2009: p. 216) that "observers of the health care sector have recognized that IT has the potential to reduce health care costs (Thompson and Brailer, 2004) while also improving the overall quality of care by providing consistency of clinical data and data sharing along the health care supply chain (IOM, 2001; Menachemi et al., 2007)," has motivated the inclusion of IS enabled processes as a dimension of supply chain management practices in the current study.

According to Rai et al. (2006) three types of supply chain process integration capabilities manage the: 1) physical flows of materials, 2) the information flows, and 3) the financial flows. Given that the focus of this study is the decentralized healthcare delivery supply chain, financial flows between supply chain actors play only a minimal or no role and are therefore excluded from the conceptualization of IS enabled processes. This leaves IS enabled processes related to the physical flows and information flows during healthcare delivery. Radio Frequency Identification (RFID) is the focus of this study in investigating physical flows, while electronic medical records (EMR) represent the focus of this study's investigation into information flows.

RFID is an emerging technology employed in hospitals for asset management (tracking) purposes, thus affording visibility into the status of assets in the supply chain (Amini et al., 2007). The technology consists of small integrated-circuit 'tags' that are able to retain data, and be passively tracked for location by virtue of a wireless "integrator" network that reads the tags. RFID has recently been employed in hospitals to track a variety of physical inventory and materials such as products, equipment and even humans (Amini et al., 2007). "Today, improvements in technology-assisted patient care

are critical," (Amini et al., 2007: p. 596). RFID based systems can help [improve care delivery] in a number of ways, from providing real-time tracking information about patients, medications and medical equipment, to reporting process-related statictics," (Amini et al., 2007: p. 596). For the purposes of this study, RFID is considered an operational IS tool (Sabherwal and Chan, 2001).

Based on the extant literature, this study defines a dimension of IS Enabled Processes referred to as ***IT Use for Asset Management*** which is defined as the extent to which RFID is used to monitor and locate resource materials needed during patient care (Amini et al., 2007; Tzeng et al., 2008).

EMR is an IS (application) tool which enables the healthcare delivery supply chain to operate efficiently and effectively (Ilie et al., 2009). According to the Institute of Medicine, an EMR is "an electronic patient record that resides in a system specifically designed to support users through availability of complete and accurate data, practitioner reminders and alerts, clinical decision-support, links to bodies of medical knowledge and other aids" (IOM, 1991: pp. 2–3, 11). EMR's typically maintain a computerized physician order entry (CPOE) module enabling physicians to "directly enter orders for medications, diagnostic tests and ancillary services," (Poon et al., 2004: p. 184). An EMR integrates the healthcare delivery supply chain providing health record interoperability for physicians, pharmacies, insurance providers, pharmaceutical manufacturers and other economic actors in the supply chain (Ilie et al., 2009).

This integration is achieved through four required functionalities for comprehensive EMR use (Jha et al., 2009). These include: 1) electronic clinical documentation (e.g., patient demographics, medication lists, etc.), 2) results viewing (e.g., lab reports, consultant reports, etc.), 3) computerized provider order entry (e.g., lab tests, consultation requests, etc.), and 4) decision support (e.g., clinical guidelines, drug allergy alerts, etc.). In their large scale survey of 3,049 U.S. hospitals, Jha et al. (2009) revealed that hospital usage of EMR systems varies significantly with only 16% using CPOE applications while 80% reported use of laboratory of radiology reporting systems. This is consistent with other research suggesting the EMR adoption varied dramatically (see AHA, 2005, Ash et al., 2004; Cutler et al., 2005).

Based on the work of Jha et al. (2009), this study defines a dimension of IS Enabled Processes that addresses the management of patient care information. This dimension is ***Comprehensive EMR Use*** and it is defined as the extent to which EMR is utilized in the hospital for clinical documentation, results viewing, computerized physician order entry (CPOE), and decision support.

2.9.1 Integrative Information and Resource Strategy and Integrative Supply Chain Practices

Prahalad and Krishnan (2008: p. 51) state that business processes link business strategy to operations and "define the logical relationships among activities within the firm and its relationships with network collaborators and its relationships with consumers." In doing so, the practices of a firm should be consistent with an overarching strategy (Doty et al., 1993).

A hospital's Integrative Information and Resource Strategy, as described herein, strives for efficiency, flexibility and effectiveness. The pursuit of efficiency leads a hospital to employ lean principles to eliminate waste and non-value added activities.

Lean principles also enhance flexibility (Vonderembse et al., 2006), which relies upon the sharing of high accurate, timely, adequate and credible information. Such information sharing can be facilitated by a comprehensive IS system (Sabherwal and Chan, 2001; Apigian et al., 2006) among physicians and other clinical staff members.

Effectiveness is ensured when a hospital employs practices for managing patient complaints and improving satisfaction. Effectiveness, in a lasting sense, also results from the establishment of long-term relationships with physicians which emphasize mutual benefit (Edmondson et al., 2003).

Therefore, the present study postulates:

H3: Integrative Information and Resource Strategy is positively associated with Integrative Supply Chain Practices.

2.9.2 Entrepreneurial Culture and Integrative Supply Chain Practices

"A change in corporate culture is required for the implementation of supply chain management practice," (Tan et al., 1998; Li, 2002: p. 39). This is owing to the notion that behaviors and practices are the product of 1) identifying with, sharing, and/or internalizing an organizations values (e.g., the culture) or 2) the cognitive assessment of the instrumental worth of an ongoing relationship with a partner (Li, 2002). Hayer (2002) found support for this idea in a study for the Commission for Health Improvement, finding that a culture of non-accountability negatively impacts practices (Bamford and Griffin, 2008).

Certainly, a hospital's culture can influence the work of actors in the healthcare delivery supply chain. Shah et al. (2008) suggest that an interorganizational culture of respect for others' work among healthcare providers can influence coordination and positively impact the performance of the healthcare delivery supply chain. On the other hand, as with Hayer (2002), a culture of finger pointing has been associated with inefficiency and increased waste in healthcare delivery (Edmondson et al., 2003).

An Entrepreneurial Culture promotes 'working together' with other individuals involved in healthcare delivery, and in doing so clinicians can effectuate or influence the nature of their work practices (Sarasvathy, 2001). As such, a culture can promote the development of long-term, mutually beneficial relationships with physicians as well as the sharing of timely, accurate, adequate, and credible information. Further, quality, a supply chain management practice, is at the heart of an entrepreneurial culture focused on shifting efforts and assets from unproductive to productive activities (Drucker, 1985). For example, in order for a quality process to function effectively, it must have a complete focus on the customer. If a company postpones initiatives awaiting customer complaints before initiating improvements, it has most likely waited too long, (Kuratko and Hornsby, 2009). Additionally, Hwang and Christensen (2008) suggest the frequent need for increased involvement (proactiveness) of the non-physician clinical staff in healthcare delivery in an effort to reduce cost. Considering SDL, an Entrepreneurial Culture can inspire the clinical staff to work closely with other willful agents (e.g., physicians with high Partner Relationship) to co-create the future (value) (Read et al., 2009).

Therefore, the present study postulates:

H4: Entrepreneurial Culture is positively associated with Integrative Supply Chain Practices

2.10 Value Dense Environment

It has been discussed earlier, that in this more networked environment firms are turning their focus from the product or service they provide to the value creation system itself (Normann and Ramirez, 1993). More specifically, firms are focusing on the environment that they develop for their economic actors to co-create value (Normann and Ramirez, 1993). This environment can be measured by its value density or in other words, "the amount of information, knowledge and other resources that an economic actor has on hand at any moment in time to leverage his or her own value creation," (Normann and Ramirez, 1993: p. 69). Such a value dense environment is not only created directly by the focal firm, but it is also the result of knowledge and resources brought forth by other value co-creating actors. This knowledge and resources emerge in two varieties; operand and operant. As discussed earlier in section 2.4, operand resources are those which must be acted on to be beneficial such as goods, natural resources, and money (Constantin and Lusch, 1994; Vargo and Lusch, 2004a). Operant resources are those which act upon other resources (of the operand variety) to create benefit (Vargo and Akaka, 2009). "That is operant resources, such as knowledge and skills, are the underlying source of value," (Vargo and Akaka, 2009: p. 36).

Prahalad and Ramaswamy (2004a) describe the necessary building blocks – dialog, access, risk-benefits, and transparency (DART) – as the foundation for interactions between economic actors participating in the value co-creation system. Dialog refers to the deep engagement, ability, interaction, and of significant importance, the willingness of both sides to engage in conversation. Access describes the idea that the effectiveness of the value creation system depends on the focal firm availing value co-creating actors to as much information as he/she needs from the firm as well as the other actors in the system. This is consistent with the importance of information transparency, the third building block. Finally, the risk-benefits dimension of DART refers to the capability of the customer to fairly and thoroughly assess the advantages and disadvantages of the expected outcomes of his/her decisions in the value creation system. Prahalad and Ramaswamy (2004a) illustrate the concept in healthcare, by suggesting that these decisions may be related to seeking treatment or taking medications. In an effective value creation system, "instead of just depending on the doctor – the expert – the patient has the tools and the support structure to help make that decision – not in some generic risk category but for 'me' – with a medical condition, a lifestyle, or social obligations," (Prahalad and Ramaswamy, 2004a: p. 9).

It follows then that the objective of all actors in the supply chain (or value co-creation system) is to provide input into the value creation processes of other actors and therefore to obtain reciprocal input (Vargo and Akaka, 2009). This is accomplished through service provision, and the application of resources that contribute to the *density* of other actors (Vargo and Akaka, 2009). Density creation then results from the 'unbundling,' 'rebundling,' and 'liquefied' resources in an effort to reconfigure them for use by other value co-creation actors (Normann and Ramirez, 1993; Normann, 2001) and leads to the best combination of resources on hand for any given situation (Vargo and Akaka, 2009). Given this discussion, some scholars postulate that "density creation is the new operations," (Vargo and Akaka, 2009: p. 39).

The knowledge management literature may provide some useful insights into this concept. In investigating the nature of knowledge scholars distinguish between the degree to which knowledge is codified or tacit (Nelson and Winter, 1982; Polyani, 1966). Codified knowledge is more easily transmittable in formal, symbolic language, while tacit knowledge is acquired through experience and difficult to articulate (Polyani, 1966). Nonaka (1994) suggests that tacit knowledge is often context specific and centers in action.

According to Edmondson et al. (2003), tacit and codified knowledge are not discrete dichotomies, but rather serve as end points on a continuum. Some tacit knowledge may exist owing to an absence of an agreed upon form of communication among an epistemic cohort, but may not be permanently or inherently tacit. For example, the codified/tactic status of medical knowledge deployed in healthcare delivery may be temporal in nature, considering that much of the current codified knowledge was previously tacit (e.g., Vosburg and Newbower, 2000).

Teece (1977) describes a central implication of these conceptual distinctions regarding knowledge in discussing the ease of transfer across organizations, groups, and individuals. When knowledge is codified, it can be more easily transferred in documents – a transfer that is complete when this '*know what'* is acquired in the receipt of such materials (Edmondson et al., 2003). In the case of codified *'know how'* transfer is still reasonably straightforward using these mechanisms, although practice or discussion may be necessary to capably execute the new task (Edmondson et al., 2003). On the other hand, tacit knowledge often requires proximity and interpersonal interaction for its transmission (Davenport and Prusak, 1998; Hansen, 1999; Sole and Edmondson, 2002; Szulanski, 1996). Hansen (1999) investigated the transfer of tacit and codified knowledge and found that personal contact and close relationships were important for tacit knowledge transfer, but this was not the case for codified knowledge. Tacit knowledge transfer mechanisms include apprenticeship, repeated practice, and mentorship (Nonaka and Takeuchi, 1995; Spender, 1996). In the healthcare delivery context, process or operational knowledge is generally not well codified as compared to knowledge about medical treatments and as a consequence geographic variation in operational processes is common (O'Connor et al., 1999). Given this, Edmondson et al. (2003: p. 200) observe that "unlike in most manufacturing operations, coordination in health care tends to be worked out relationally and interpersonally – in action," (Gittell, 2002b).

Rooted in this discussion, the present study conceptualizes a construct for value dense environment which is comprised of the three dimensions measuring: 1) the operand knowledge, 2) the operant knowledge, and 3) the resources available to value co-creation actors (Normann and Ramirez, 1993; Prahalad and Ramaswamy, 2004a; Vargo and Akaka, 2009). ***Value Dense Environment*** is thus defined as the extent to which those involved in healthcare delivery have *know what* (operand) knowledge and *know how* (operant) knowledge and resources available for use in providing care. A list of subconstructs and their respective definitions and literature support are provided in Table 2.10.1.

Operand Knowledge is defined as the extent to which physicians, hospital clinical staff, and patients have '*know what'* knowledge to one another for use during healthcare delivery.

Operant Knowledge is defined as the extent to which physicians, hospital clinical staff, and patients have '*know how'* knowledge to one another for use during healthcare delivery.

Resources is defined as the extent to which physicians, hospital clinical staff, and patients have the materials necessary during healthcare deliver.

Table 2.10.1 List of Subconstructs for Value Dense Environment

Subconstruct	**Definition**	**Literature**
Operand knowledge	the extent to which physicians, hospital clinical staff, and patients have '*know what'* knowledge for use during healthcare delivery.	Garud, 1997; Lundvall and Johnson, 1994; Edmondson et al., 2003; Vargo and Akaka, 2009.
Operant knowledge	the extent to which physicians, hospital clinical staff, and patients have *'know how'* knowledge for use during healthcare delivery.	Garud, 1997; Lundvall and Johnson, 1994; Edmondson et al., 2003; Vargo and Akaka, 2009.
Resources	the extent to which physicians, hospital clinical staff, and patients have the resources necessary during healthcare deliver.	Normann and Ramirez, 1993; Vargo and Akaka, 2009.

2.10.1 Integrative Supply Chain Practices and Value Dense Environment

Long-term, mutually beneficial physician partnerships and the sharing of timely, accurate, adequate and credible information are key for the creation of a value dense environment (Normann and Ramirez, 1993). These activities signal that a dialogue is open among those involved in delivering care (Prahalad and Ramaswamy, 2004a). This results in a transparent environment where those who need information, knowledge and resources to create value have appropriate access and can make well informed decisions as a result (Prahalad and Ramaswamy, 2004a).

This type of information sharing involves all value co-creation actors bringing forth information about *what* kind of care to deliver (e.g., treatment plans) to patients and *how* (e.g., demonstration) to deliver it (Edmondson et al., 2003). This information sharing can be facilitated by EMR (Ilie et al., 2009). Lean principles contribute to this environment by streamlining process flows and the resources needed by value co-creation actors (Shah et al., 2008). Additionally, IS enabled processes such as RFID can assist in locating resources, thereby ensuring that the necessary resources (e.g., equipment) are available for care delivery when they are needed. Support for this notion is provided by Hwang and Christensen (2008) in their suggestion that the pairing of technology enablers and new approaches to business, such as a more networked approach, is what leads to greater affordability and accessibility in healthcare. Finally, practices employed to manage and improve patient satisfaction can inform the healthcare delivery environment.

Therefore, the present study postulates:

H5: Integrative Supply Chain Practices is positively associated with a Value Dense Environment.

2.11 Supply Chain Performance

Performance measurement is a key concept in managing any endeavor. According to Beamon (1998) a set of performance measures are valuable to the firm as they can be used to assess a system's efficiency and/or effectiveness or to benchmark competing systems. A significant challenge in measuring supply chain management performance is the extant disconnect between strategy and measurement (Holmberg, 2000). It follows that just as strategy is contextually specific to the firm (Roh et al., 2008), so should be the firm's performance measurements. Finally, Holmberg (2000) also suggests that measures should account for activities which span the entire supply chain. Considering these insights, the current study adapts the supply chain management performance measures of Li (2002) which are comprised of five dimensions: 1) supply chain flexibility, 2) supply chain integration, 3) patient responsiveness, 4) physician performance, and 5) partnership quality.

Supply Chain Performance is thus defined as the extent to which healthcare delivery in a hospital is flexible, well integrated, and responsive to patients, while enabling physicians to execute their duties, with outcomes that match the expectations of all those involved. The first three dimensions reflect the Integrative Information and Resource Strategy conceptualized in section 2.7 earlier (requiring both agility and leaness) and also takes into consideration the characteristics of the healthcare delivery environment, namely the centrality of the physician in the fourth dimension as well also addressing value co-creation, the theoretical grounding of the study in the fifth dimension. A list of subconstructs and their respective definitions and literature support are provided in Table 2.11.1.

Supply Chain Flexibility is defined as the extent to which those involved in healthcare delivery are able to effectively adapt or respond to changes that directly impacts the hospital's patient.

Supply Chain Integration is defined as the extent to which all of the activities, of all of those involved in healthcare delivery are coordinated together.

Patient Responsiveness is defined as the extent to which a hospital can provide prompt attention to a patient's needs.

Physician Performance is defined as the extent to which admitting/attending physicians provide dependable, timely, and appropriate services to patients.

Partnership Quality is defined as the extent to which the outcome of the relationship among all those involved in healthcare delivery matches the expectations of each party.

Table 2.11.1 List of Subconstructs for Supply Chain Performance

Subconstruct	**Definition**	**Literature**
Supply chain flexibility	the extent to which those involved in healthcare delivery are able to effectively adapt or respond to changes that directly impacts the hospital's patient.	Adapted from Vickery et al., 1999; Aggarwal, 1997; Li, 2002.
Supply chain integration	the extent to which all of the activities, of all of those involved in healthcare delivery are coordinated together.	Stevens, 1990; Stock et al., 1988; Narasimhan and Jayaram, 1998; Frohlich and Westbrook, 2001; Magretta, 1998; Wood, 1997; Li, 2002.
Patient responsiveness	the extent to which a hospital can provide prompt attention to a patient's needs.	Narasimhan and Jayaram, 1998; Beamon, 1998; Lee and Billington, 1992; Stevens, 1990; Kiefer and Novack, 1999; Spekman et al., 1998; Gunasekaran et al., 2001; Li, 2002.
Physician performance	the extent to which admitting/attending physicians provide dependable, timely, and appropriate services to patients.	Beamon, 1998; Davis, 1993; Levy, 1997; Shin et al., 2000; Tan et al., 1998; Vonderembse and Tracey, 1999; Carr and Pearson, 1999; Stevens, 1990; Gunesakaran et al., 2001; Li, 2002.
Partnership quality	the extent to which the outcome of the relationship among all those involved in healthcare delivery matches the expectations of each party.	Lee and Kim, 1999; Wilson and Vlosky, 1998, Ellram, 1990; Harland, 1996; Ganesan, 1994; Walton, 1996; Ballou et al., 2000; Bucklin and Sengupta, 1993; Mentzer et al., 2000; Li, 2002.

2.11.1 Integrative Supply Chain Practices and Supply Chain Performance

Integrative Supply Chain Practices result in many performance benefits. For example, a long term partnership orientation enables exchange partners to develop greater confidence in one another, display cooperative and trusting behaviors, and increase investments in relationship-specific assets in order to accomplish mutual goals (Paulraj et al., 2008: p. 57). Operations Management as well as healthcare scholars have found that the performance of a new procedure or technology improves with increased experience (Ramsay, et al., 2000). This provides support to the experience curve or learning curve experience notion that firms 'learn by doing,' or that 'practice makes perfect' (Pisano, 1996). This supports the notion that physician partnership can positive influence performance.

In their study of 15 hospitals implementing new technology, Edmondson et al. (2003: p. 198) state that "to realize performance improvement, existing routines may need to be revised or discarded to make room for new routines, (Edmondson et al., 2001)." This suggests that the development of new and/or improved healthcare delivery performance may require the implementation of lean principles.

Li et al. (2009) suggest that inter-organizational information sharing quality has a positive impact on the supply chain integrated performance. These practices, considered collectively, can improve the flexibility, integration, patient responsiveness, physician performance, and over all partnership quality of the healthcare delivery supply chain. As such, it is expected that integrative supply chain practices will results in better supply chain performance (Narasimhan and Jayaram, 1998).

Therefore, the present study postulates:

H6: Integrative Supply Chain Practices is positively associated with Supply Chain Performance.

2.11.2 Value Dense Environment and Supply Chain Performance

An environment characterized by the right combination of operand and operant knowledge and resources is key for the creation of personalized care delivery (Vargo and Akaka, 2009). This is a manifestation of flexibility. In such an environment, healthcare delivery supply chain actors have the tools necessary to provide prompt response to the needs of patients. This improves physician performance by enabling the physician to provide timely and appropriate services to the patient. Such an environment also engages the patient in their healthcare by providing he/she with the tools necessary to participate in decisions about their care (Prahalad and Ramaswamy, 2004a). For these reasons, all those involved in healthcare delivery – patients, physicians, and the clinical staff of the hospital – are able to achieve their goals and expectations from their value co-creation interactions (Normann and Ramirez, 1993).

Therefore, the present study postulates:

H7: Value Dense Environment is positively associated with Supply Chain Performance.

2.12 Healthcare Delivery Capability

A competitive advantage or capability is the extent to which a firm (such as a hospital) is able to create a defensible position over the competition (Porter, 1985; McGinnis and Vallopra, 1999; Li et al., 2006). These capabilities are potential differentiators between the firm and the competition and are the outcomes of critical management decisions, but they are not under the direct control of management (Tracey et al., 1999). The capabilities that form a firm's competitive advantage are the result of its strategic business objectives and thus the firm strategies (Giffy et al., 1990). The empirical literature in supply chain is reasonably consistent regarding the key capabilities that represent competitive advantage: price/cost, quality, delivery, and flexibility (White, 1996; Skinner, 1985; Roth and Miller, 1990; Tracey et al., 1999). Subsequent research provides support for time based competition as an important competitive capability (Stalk, 1988; Vesey, 1991; Handfield and Pannesi, 1995; Kessler and Chakrabarti, 1996; Zhang, 2001). Koufteros et al. (1997) developed a framework for competitive capabilities focusing on time based practices (Li et al., 2006).

In the study of healthcare operations, "attention typically comes in the form of focus on costs of services, quality (often measured through mortality rates) and length of stay," (McDermott and Stock, 2007: p. 1020). Similarly, Butler et al. (1996) suggest that a hospital's operational capabilities should consist of foci on cost, quality, service delivery, and flexibility. In a more specific sense, the Institute of Medicine 2001 report, *Crossing the Quality Chasm* (IOM, 2001) identifies six aims to improve the quality on healthcare outcomes. Five of these aims are appropriate outcomes goals for the healthcare delivery supply chain conceptualized in this study. The report posits that healthcare delivery should be *safe, effective, patient-centered, timely, efficient*, and *equitable* (IOM, 2009). The report continues to define each aim.

> ***Safe*:** avoiding injuries to patients from the care that is intended to help them.
>
> ***Effective*:** providing services based on scientific knowledge to all who could benefit, and refraining from providing services to those not likely to benefit.
>
> ***Patient-centered*:** providing care that is respectful of and responsive to individual patient preferences, needs, and values, and ensuring that patient values guide all clinical decisions.

> ***Timely***: reducing waits and sometimes harmful delays for both those who receive and those who give care
>
> ***Efficient***: avoiding waste, including waste of equipment, supplies, ideas, and energy.
>
> ***Equitable***: providing care that does not vary in quality because of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status.

The first five of these aims are the result of activities which occur in the healthcare delivery supply chain. Safety can be conceptualized and measured using the surrogate of medial errors. Effectiveness is analogous to quality and can be measured by mortality. Patient-centeredness can be measured by patient satisfaction. Timeliness can be conceptualized by process time. Efficiency is appropriately measured by cost. Length of stay (LOS) is also include as an important outcome capability of the healthcare delivery supply chain owing to the notion that it is an important aggregate measure of effectiveness and efficiency (McDermott and Stock, 2007). This leaves only one of the IOM (2001) aims unaccounted for; healthcare should be equitable. While this is a worthy pursuit it falls outside of the scope of the present study given that advancements in this area reside at the policy level.

Therefore, the present study conceptualizes a construct for healthcare delivery capability which is comprised of five dimensions measuring: 1) safety, 2) effectiveness, 3) patient centeredness, 4) timeliness, and 5) efficiency (IOM, 2001). ***Healthcare delivery capability*** is thus defined as the extent to which those involved in patient care are able to provide services to patients in a safe, effective, patient-centered, timely, and efficient manner. A list of subconstructs and their respective definitions and literature support are provided in Table 2.12.1.

Table 2.12.1 List of Subconstructs for Healthcare Delivery Capability

Subconstruct	Definition	Literature
Safety	the extent to which those involved in healthcare delivery are able to reduce diagnostic, treatment, preventative, and other medical errors in treating patients.	IOM, 2001; IOM, 2009; McFadden, Stock, and Gowen, 2006.
Effectiveness	the extent to which those involved in healthcare delivery achieve low mortality and nosocomial infection rates and high quality care.	Knox et al., 1986; Tarnow-Mordi et al., 1990; Dey et al., 2006; Ramanathan, 2005; Shah et al., 2008; McDermott and Stock, 2007; Weeks et al., 1995; Li and Benton, 2006.
Patient centeredness	the extent to which patients judge the overall hospital experience favorably and would return for a future visit.	Marley et al., 2004; Kane, Maceijewski, and Finch, 1997.
Timeliness	the extent to which the efforts and actions of those involved in healthcare delivery result in short average lengths of stays – or the length of time a patient maintains inpatient status in the hospital.	Thomas et al., 1997; Shi, 1996; Thomas et al., 1997; Langland-Orban et al., 1996; McDermott and Stock, 2007.
Efficiency	the extent to which the actions of those involved in healthcare delivery contribute to holding down costs, attaining high labor productivity, and maintaining high capacity utilization.	Li and Benton, 2006.

Safety is defined as the extent to which those involved in healthcare delivery are able to reduce diagnostic, treatment, preventative, and other medical errors in treating patients. Medical errors represent another important outcome in care delivery. While the 2007 *National Healthcare Quality Report (NHQR)* (AHRQ, 2008), reports that the overall rate of quality improvement in healthcare is slow, improvements in safety are particularly slow (IOM, 2009). The Institute of Medicine (2000) reports that between 44,000 and 98,000 people die in hospitals every year due to preventable medical errors in their landmark, *To Err is Human* (Berwick, 2004). It follows that "US hospitals are becoming more aware of the need to reduce medical errors and to improve patient safety," (McFadden et al., 2006: p. 326).

Medical errors are defined by the Institute of Medicine (2000) as the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim. Errors are not only costly in terms of human life, but they also drive up the financial cost of healthcare delivery in hospitals by between $17 billion and $29 billion per year in USA, as well as drive down satisfaction for patients and healthcare professionals (IOM, 2000). Medical errors have been categorized in four groups (IOM, 2000).

Diagnostic

- Error or delay in diagnosis
- Failure to employ indicated tests
- Use of outmoded tests or therapy
- Failure to act on results of monitoring or testing

Treatment

- Error in the performance of an operation, procedure, or test
- Error in administering the treatment
- Error in the dose or method of using a drug
- Avoidable delay in treatment or in responding to an abnormal test
- Inappropriate (not indicated) care

Preventive

- Failure to provide prophylactic treatment
- Inadequate monitoring or follow-up of treatment

Other

- Failure of communication
- Equipment failure
- Other system failure

Such errors are not believed to result from individual recklessness or the decisions and actions of a particular group of "bad apples" (IOM, 2000). Instead, the Institute of Medicine (2000) suggests that errors are caused by faulty systems and processes which lead healthcare professionals to make mistakes or fail to prevent them.

Effectiveness is defined as the extent to which those involved in healthcare delivery achieve low mortality and nosocomial infection rates and high quality care. Mortality rates are an important measure of hospital performance (Knox et al., 1986; Tarnow-Mordi et al., 1990; Ramanathan, 2005; Shah et al., 2008). As such, researchers have placed a strong emphasis on mortality rates, or even better – risk adjusted mortality rates – as a measure of hospital quality (Butler et al., 1996; see Dey et al., 2006; McDermott and Stock, 2007).

However, Sherck and Shatney (1996) point out that morbidity (a measure of disease) is an important measure of quality which may be tied to the delivery of care (Dey et al., 2006). As such infection rates (particularly nosocomial or hospital acquired infections) are meaningful measures of quality in healthcare (Weeks et al., 1995).

While quality can be measured using archival data, this study proposes a psychometric measure for quality adopted from Li and Benton (2006) in their study of nurse management and technology investment decisions in community hospitals. Li and Benton (2006) employed four perceptual measurement items which included: 1) clinical quality, 2) customer satisfaction, 3) responding to patient request, and 4) responding to patient complaints.

Patient-centeredness is defined as the extent to which patients judge the overall hospital experience favorably and would return for a future visit (Marley et al., 2004). This satisfaction measurement should consider the technical, interpersonal, social, and moral dimensions of care (Kane et al., 1997). In an Institute of Medicine (IOM) study investigating highly effective clinical services, the IOM (2008) suggests that the imperatives in healthcare delivery include constraining costs, improving quality, and engaging patients as consumers of healthcare. With regard to patient engagement, many politicians and policy makers believe that empowering patients as consumers is key to achieving positive outcomes across many metrics, however, this requires that consumers have access to information (i.e., about treatment effectiveness, risk, benefits, and alternative treatments) which is sparse in many environments (IOM, 2008).

Timeliness is defined as the extent to which the efforts and actions of those involved in healthcare delivery result in short average lengths of stays – or the length of time a patient maintains inpatient status in the hospital (Thomas et al., 1997). The present study is consistent with Shah et al. (2008: p. 767) in their study of a downstream healthcare delivery supply chain in that "while cycle time has been alternately defined as takt-time (i.e., the desired time between units of production output, synchronized to customer demand) and total throughput time (Schroeder, 2008, p. 128), we use the total throughput time here because customer demand is uncertain in the population, making takt-time difficult to compute and less applicable in this context."

A great deal of effort has been dedicated toward understanding and improving the availability of resources for the provision of prompt healthcare delivery services. "This [LOS] is a synonymous to the critical feature of 'speed; in the manufacturing strategy literature," (Butler et al., 1996: p. 147). LOS refers to the average length of time a patient maintains inpatient status in the hospital (Thomas et al., 1997). As such, lower values for LOS reflect better operational performance (Shi, 1996; Thomas et al., 1997; Langland-Orban et al., 1996). LOS is a popular performance measure because it is thought to encompass many traditional operations performance dimensions (Skinner, 1969; Hayes and Wheelwright, 1984; McDermott and Stock, 2007). Scholarly research as revealed that LOS is related to efficiency, cost, speed in service delivery, and quality (Ashby et al., 2000; Glick et al., 2003; Thomas et al., 1997; Burns et al., 1994). Thus, it has been adopted by many hospitals as a key performance metric and can be seen as a meaningful overall performance measure (McDermott and Stock, 2007).

Efficiency is defined as the extent to which the actions of those involved in healthcare delivery contribute to holding down costs, attaining high labor productivity, and maintaining high capacity utilization. LOS and staffing costs are key measures of efficiency which drive hospital administrators to seek optimal coordination of available internal and external resources (Gnanlet and Gilland, 2009). Constraining costs is a key outcome measure in care delivery owing to the notion that a significant portion of healthcare costs are directly related to care delivery (IOM, 2008). In their study of nurse management and technology investment decisions in community hospitals, Li and Benton (2006) measured cost using perceptual measures which included three items: 1) holding down in patient costs, 2) attaining high labor productivity, and 3) maintaining high capacity utilization. These items are adopted by the present study.

2.12.1 Value Dense Environment and Healthcare Delivery Capability

According to Normann and Ramirez (1993: p. 69), "companies [hospitals] create value when they make not only their offerings more intelligent but their customers [patients] and suppliers [physicians] more intelligent as well." The creation and continual recreation of a value dense environment enables a hospital to create capability or competitive advantage (Normann and Ramirez, 1993). Consider mortality, a key performance metric for hospitals. Hospital administrators strive to effectively juggle internal resources and external resources, including the clinical staff, to create an environment "to reduce adverse outcomes such as high mortality rates," (Gnanlet and Gilland, 2009: p. 296).

Likewise with regard to safety, Das et al. (2008: p. 532) suggests that "perhaps high expertise workers have accumulated the knowledge needed to take precautionary on-the-job measures" to improve safety. This supports a relationship between a value dense environment and the development of healthcare delivery capability in that expertise is both developed and shared through operant tacit knowledge exchange (Edmondson et al., 2003). Such a capability is also developed in an environment with the right combination of knowledge and resources. Integrative supply chain practices facilitate this environment and are said to be key to achieving healthcare delivery capability in "ensuring a constant supply of drugs and materials, establishing good inter- and intra-departmental communication," (Dey et al., 2006: p. 854). This constant supply of resources contributes to a value dense environment and can enhance a hospital's healthcare delivery capability.

A value dense environment enables providers to create patient centeredness and enhance effectiveness while having access to the right resources and knowledge necessary for patient care. This results in timely and efficient healthcare delivery.

Therefore, the present study postulates:

H8: Value Dense Environment is positively associated with Healthcare Delivery Capability.

2.12.2 Supply Chain Performance and Healthcare Delivery Capability

Various studies have provided evidence that a well managed supply chain will directly and positively influence organizational performance (Shin et al. 2000; Prasad and Tata, 2000). More specifically, supply chain performance has been linked to a firm's competitive advantage and capabilities by a number of Operations Management researchers (Li, 2002). Consider Vonderembse and Tracey (1999) who found that supplier performance is associated with firm capabilities related to cost, quality, and delivery. Frohlich and Westbrook (2001) provide another relevant example in their findings that supplier and customer integration is related to cost, time (speed), and dependability among other firm capabilities.

In healthcare, a more integrated approach is anticipated to pay big dividends. When considering the integration resulting from EMR, "the U.S. Department of Health and Human Services (Thompson and Brailer, 2004) estimates that EMR technology could save the U.S. economy $140 billion a year (10% of current health care costs) while also reducing the estimated 98,000 annual deaths attributed to medication errors," (Ilie et al., 2009: p. 214). Others believe that the better integration achieved through EMR use may lead to more timely information, fewer medical errors, better patient care, and cost reduction (Menachemi et al., 2007).

Shah et al (2008: p. 778) in a case study of a decentralized healthcare deliver supply chain in the ER, suggest that characteristics of lean such as the use of "standardized and highly specific protocol[s] and involving, empowering, and training all [supply chain] process members" can influence healthcare delivery supply chain quality outcomes such as process cycle times and patient mortality. These outcomes represent healthcare delivery capability in terms of timeliness and effectiveness.

"Competitive advantage capability can be gained through partnership by providing better service to customers with improved delivery systems and lead times," (Ramayah et al., 2008: p. 38). In short, effective supply chain performance can benefit safety, effectiveness, patient-centeredness, timeliness and the efficiency of healthcare delivery.

Therefore, the present study postulates:

H9: Supply Chain Performance is positively associated with Healthcare Delivery Capability.

CHAPTER 3: INSTRUMENT DEVELOPMENT – ITEM GENERATION AND PILOT TEST

An essential tenet of scientific method is the provision of clearly defined variables, methods, and procedures (Pedhazur and Schmelkin, 1991). It is with this in mind that Chapters 3, 4, and 5 describe the research methods employed herein, including instrument development, sample frame, data collection, and data analysis.

This research study employs survey method, and consequently requires the use of psychometric measurement instruments to test the hypotheses posited herein. As such, it is necessary to ensure the validity and reliability of these instruments. Therefore, an aim of this study is to develop (or revalidate) valid and reliable instruments for the following constructs: partner relationship (PR) integrative information and resource strategy (IIRS), entrepreneurial culture (EC), integrative supply chain management practices (ISCM), value dense environment (VDE), supply chain performance (SCP), and healthcare delivery capability (HCDC). This is referred to as the instrument development process and consists of four overarching stages in the case of this study (see Jin, 2008). The four stages are: 1) item generation[2], 2) pre-testing, 3) Q-sort pilot study testing, and 4) large-scale data analysis and instrument validation. This chapter describes stages 1 through 3, while stage 4, the large-scale data analysis, is described in chapter 4.

3.1 Item generation

The first step in developing valid scientific measures centers on specifying the domain of the construct, which begins with a review of the literature (Churchill, 1979). It is through a comprehensive literature review and academic and practitioner field

[2] Item generation is a process which involves the development of a set of questions, whereby each question corresponds to an item that measures a particular phenomenological dimension of the variable under study.

interviews (testing) that items can be generated which provide valid and reliable measurement properties. Therefore, the comprehensive literature review provided in Chapter 2 has been employed to develop clear construct definitions. As cited, these definitions provide an understanding of the domain of each construct and have been built upon the work of pervious authors. See Table 2.5.1 for the construct definitions and the subsequent tables in sections 2.6 through 2.12 for subconstruct definitions.

This study closely adapts operational measures (items) for four constructs developed in other studies: PR (from Li, 2002; Liao, 2008), EC (from Jambulingam et al., 2005), ISCM (from Li et al., 2005; 2006), and SCP (Li, 2002) with minor modification. A notable exception is ISCM, which owing to the context of the study, will require two subconstructs not included in the Li et al., (2005; 2006) studies; lean principles and IS enabled processes. Shah et al. (2008) and Rai et al. (2006), respectfully, serve as the literature base for measurement development for these subconstructs.

This study develops new measurement scales for three constructs: IIRS (based on the work of Vonderembse et al., 2006; Agarwal et al., 2006; Apigian et al., 2006; Sabherwal and Chan, 2001), VDE (based on the work of Edmondson et al., 2003; Normann and Ramirez, 1993; Prahalad and Ramaswamy, 2004a; Vargo and Akaka, 2009), and HCDC (based on IOM, 2001; McFadden et al., 2006; Knox et al., 1986; Tarnow-Mordi et al., 1990; Weeks et al., 1995; Marley et al., 2004; Shah et al., 2008; McDermott and Stock, 2007; Li and Benton, 2006).

Item generation follows the development of construct definitions. Understanding that “the literature should indicate how the variable has been defined previously and how many dimensions or components it has,” (Churchill, 1979; p. 67), the extant studies discussed in Chapter 2 serve as the foundation for item generation. Specifically, the studies cited in the tables in sections 2.6 through 2.12 provide the literature base for subconstruct item generation.

3.2 Pre-testing

In an attempt to further develop and refine the scales, interviews with two academicians and two practitioners possessing sufficient domain knowledge were conducted as part of an experience survey (Churchill, 1979). The participating academics are considered experts in their fields of supply chain management and IT and are well published in these areas. The participating practitioners each possess approximately 20 years of hospital-based and healthcare experience, primarily in the quality management area.

The theoretical model was be presented during the interviews, following the rigorous instrument development approach of Swink and Song (2007), in an Operations Management study focused on supply chain integration practices. The subjects were then solicited for their opinions regarding the construct definitions and the researcher requested them to describe any relevant experiences. The subject's perceptions of the relevance and completeness of the candidate scale items was also solicited. Each respondent's feedback was analyzed for consistency with the researcher's expectation for the meaning of each construct. As a result of this feedback, additional items were generated and included through the instrument development and purification process resulting from experience surveying (Churchill, 1979).

These interviews assisted in the improvement of the phraseology of the items as well as to support the choice of scale values and response format. This exercise also enhanced the content validity of the instrument. Upon final review of the survey items, ‘practitioner one’ commented that “I thought the survey was very easy to follow and to understand.” Additionally, ‘practitioner two’ opined, “I like the scale (easy to use) the questions are worded in a way that anyone with hospital knowledge should be able to answer them and, specifically, any administrator or manager should be able to answer the questions for their own organization. Two thumbs up.”

3.3 Q-sort pilot testing

The steps described during the item generation and pre-testing phases produced a set of questions intended to measure each construct. These questions were subjected to additional testing using the Q-sort methodology (Moore and Benbasat, 1991). A summary of the number of items entering the Q-sort is provided in table 3.3.1. The list of original Q-sort items can be found in Appendix A.

Six healthcare professionals with significant hospital-based experience were selected and participated as judges in the Q-sort process (Churchill, 1979). The study-related domain knowledge of the judges was confirmed by the researcher and is evidenced in their job titles which include: President of Physician Services and Clinical Integration, Ambulatory Medical Information Officer, Service Line Vice President, Clinical Director and Department Chair, Regional Manager of Physician Relations, and Manager of Care Coordination/Black Belt. Three of the Q-sort judges were Physicians (Medical Doctors – MDs) and all of the judges possessed prior clinical academic training.

Structured interviews were conducted in three rounds containing two judges each. The structured interviews began with the researcher providing the research model and a standard set of instructions to the judges. These instructions can be found in Appendix B. Envelopes labeled with construct definitions were then provided to the judges along with randomized index cards, each labeled with a specific candidate scale item. Each judge was then asked to organize the cards in construct categories, creating a grouping of cards for each construct. A category of "not applicable" was also provided to the participating judge. The researcher was available to answer procedurally oriented questions, therefore the judges understanding was confirmed throughout the process to ensure outcome accuracy.

Upon the completion of each Q-sort exercise, inconsistencies between the judge's item placement and the researcher's expectations were identified and discussed. Judges were asked to provide their reasoning for these placements as well as for feedback capable of clarifying ambiguous items. A thorough analysis was the conducted following each round to evaluate and decide the disposition of ambiguous items. Consequently, items were revised, deleted, combined and disentangled when double-barreled in nature. This process will ensure construct validity, and identify any items or combinations of items which may be considered ambiguous or to possess 'different shades of meaning' by the respondent (Churchill, 1979).

Table 3.3.1 Numbers of items entering Q-sort

Construct	**Subconstructs**	**# of Items**
Partner Relationship (PR)	Trust	4
	Commitment	4
	Shared Vision	4
Integrative Information & Resource Strategy (IIRS)	Leagile Patient Care Strategy	5
	Operational IS Strategy	4
	Patient-focused IS Strategy	4
	Interorganizational (Physician-focused) IS Strategy	5
Entrepreneurial Culture (EC)	Proactiveness	4
	Innovativeness	4
	Autonomy	4
	Competitive Aggressiveness	4
	Motivation	4
Integrative Supply Chain Management Practices (ISCM)	Strategic Physician Partnership	4
	Patient Relationship	4
	Information Sharing	5
	Information Quality	5
	Lean Principles	5
	IT Use for Asset Management	6
	EMR for Electronic Clinical Documentation	7
	EMR for Results Viewing	6
	EMR for Computerized Physician Order Entry	5
	EMR for Decision Support	6
Value Dense Environment (VDE)	Operand Knowledge (*Know What*)	6
	Operant Knowledge (*Know How*)	4
	Resources	4
Supply Chain Performance (SCP)	Supply Chain Flexibility	4
	Supply Chain Integration	4
	Patient Responsiveness	4
	Physician Performance	4
	Partnership Quality	4
Healthcare Delivery Capability (HCDC)	Safety	4
	Effectiveness	5
	Patient Centeredness	5
	Timeliness	4
	Efficiency	5
Total		160

Finally, in an effort to improve data collection efforts as well as enhance the relevance of the study, feedback was solicited from the Q-sort judges regarding the following questions; 1) who should be the key respondent? 2) what incentive should be used? 3) do you have referrals to other judges? 4) what demographics should be captured in the survey? and 5) does physician employment status matter (as a coordination mechanism)?

3.3.1 Assessment of Q-sort results

Convergent and discriminant validity is assessed using three methods of inter-rater reliability; inter-judge raw agreement, placement ratio, and Cohen's Kappa (Moore and Benbasat, 1991). The inter-rater raw agreement score is calculated by summing the total number of items agreed upon by both judges placed into one category. This number is then divided by the total number of items, which is 160 in the present study. The placement ratio is a measure of the agreement of category classifications between the judges and theories. Therefore, it is calculated by assessing the total numbers of items that are correctly placed into the intended category by one judge as well as the second judge and dividing that number by twice the total number of items, which is 320 in the present study. The higher the percentage of correct placements, the higher the degree of construct validity (in terms of convergence and divergence) and potential for reliability can be expected. The minimum target percentage for correct placements is generally 80%.

Cohen's Kappa (Cohen, 1960) is the third and most robust indicator of inter-rater agreement. Unlike the raw agreement and placement ratio tests, Cohen's Kappa informs two key questions. "First, *how much better is the agreement between the observers' readings [placements] than would be expected by chance alone?*" (Gordis, 2009: p. 104). This is addressed by calculating the percentage agreement observed minus the percentage agreement expected by chance alone, and forms the numerator in the Kappa formula. See figure 3.3.1.1.

$$K = \frac{\%\ \text{agreement observed} - \%\ \text{agreement expected by chance alone}}{100\% - \%\ \text{agreement expected by chance alone}}$$

Figure 3.3.1.1 The Kappa (K) calculation (Gordis, 2009)

Second, "*what is the most that the two observers could have improved their agreement over the agreement that would have been expected by chance alone?*" (Gordis, 2009: p. 104). This second question is addressed in the denominator of the Kappa formula; 100% (which represents full agreement) minus the percentage agreement expected by chance alone. See figure 3.3.1.1.[3] "Thus, Kappa quantifies the extent to which the observed agreement that the observers [judges] achieved exceeds that which would be expected by chance alone, and expresses it as a proportion of the maximum improvement that could occur beyond the agreement expected by chance alone," (Gordis, 2009: 104). This is likely why Cohen's Kappa has been so widely accepted as a measure of inter-rater agreement, having been cited more than 2,000 times in literature (Hsu and Field, 1989).

Landis and Koch (1977) provide guidance regarding the interpretation of Cohen's Kappa. The authors contend that Kappa values as low as 0.20 represent 'fair agreement,' however values above 0.60 are far more desirable, with Kappa values greater than "0.75 representing excellent agreement beyond chance" (Gordis, 2009: 105). See table 3.3.1.1.

[3] Jin (2008) provides additional mathematical detail regarding the Kappa calculation.

Others have indicated that a score of 0.65 indicating inter-rater reliability should be considered an acceptable threshold (Vessey, 1984; Jarvenpaa, 1989; Todd and Benbasat, 1989; Moore and Benbasat, 1991). These procedures and evaluative measures are consistent with those employed in other scholarly supply chain studies (see Swink and Song, 2007) and typically provide adequate assessment of convergent validity within each construct, and discriminant validity across constructs (Davis, 1986, 1989).

Table 3.3.1.1. Interpreting various values of K (from Landis and Koch, 1977)

K	**Interpretation**
<0	No agreement
0-0.19	Poor agreement
0.20-0.39	Fair agreement
0.40-0.59	Moderate agreement
0.60-0.79	Substantial agreement
0.80-1.00	Almost perfect agreement

3.3.2 Results of Q-sort pilot testing

The Q-sort pilot testing produced strong evidence of convergent and discriminant validity throughout the process. However, opportunities were taken to revise or delete items between each of the three rounds. All 35 subconstructs were tested in rounds one and two. Owing to the favorable results from these rounds, only the IIRS variable was tested in round three. Following round three, the surviving items were included in the final survey instrument without revision.

160 items were placed during the first Q-sort round. The inter-judge raw agreement score was 93.1% (149/160), the placement (hit) ratio was 97.2% (311/320), and the Cohen's Kappa score was 92.2%. See tables 3.3.2.1 and 3.3.2.2 in Appendix C. Although all three indices can be considered to be 'almost perfect agreement' (Landis

and Koch, 1977), the researcher examined those items which did not fall on the diagonal indicating less than perfect agreement. The researcher discussed these potentially problematic items with the respective Q-sort judge and the items were either revised, or deleted and replaced with new less ambiguous questions. Specifically, five items were revised and two items were deleted and replaced with new items following round one of the Q-sort pilot test.

The revised instrument was tested in round two of the Q-sort. Again, all 35 constructs were tested using 160 items. Round two also produced favorable results. The inter-judge raw agreement score increased slightly to 94.0% (151/160), the placement (hit) ratio decreased slightly to 96.6% (309/320), and the Cohen's Kappa score increased to was 93.6%. See tables 3.3.2.3 and 3.3.2.4 in Appendix C. Again, all three indices can be considered to be 'almost perfect agreement' (Landis and Koch, 1977).

Given these results, the Q-sort pilot was concluded for all of constructs except the Integrative Information and Resource Strategy (IIRS) variable. This variable, while acceptable in terms of the established statistical thresholds, did not perform as well as others in the Q-sort. In round one, the placement (hit) ratios for the four subconstructs of IIRS were: Leagile Patient Care Strategy = 100%, Operational IS Strategy = 90%, Patient-focused IS Strategy = 75%, and Interorganizational (Physician-focused) Strategy = 90%. These placement (hit) ratios improved in round two to: Leagile Patient Care Strategy = 100%, Operational IS Strategy = 100%, Patient-focused IS Strategy = 75%, and Interorganizational (Physician-focused) Strategy = 100%. Considering these results as well as feedback from the Q-sort judges, the decision was made to replace one of the items measuring Patient-focused IS Strategy.

The revised instrument was tested in round three of the Q-sort. In this round, only the IISR construct comprised of four subconstructs was tested. This involved 18 items. Round three produced perfect results. The inter-judge raw agreement score increased to 100% (18/18), the placement (hit) ratio increased to 100% (36/36), and the Cohen's Kappa score increased to 100%. See tables 3.3.2.5 and 3.3.2.6.

Table 3.3.2.5. Inter-Judge Raw Agreement Scores: Third Sorting Round

		Judge 5				
		4	5	6	7	NA
Judge 6	4	5				
	5		4			
	6			4		
	7				5	
Total Items Placed: 18		**Number of Agreement: 18**			**Agreement Ratio: 100%**	

Table 3.3.2.6. Items Placement Ratios: Third Q-sort Round

		Actual Categories						
		4	5	6	7	NA	Total	%
Theory	4	10					10	100
	5		8				8	100
	6			8			8	100
	7				10		10	100
Total Items Placed: 36			**Number of Hits: 36**				**Agreement Ratio: 100%**	

Given that 100% is the maximum score to estimate convergent and discriminant validity using the Q-sort method (Landis and Koch, 1977), the pilot test was concluded and the final 160 items were submitted for use in the large-scale survey. Table 3.3.2.7 is provided to summarize the results of the three round Q-sort pilot test. The final survey instrument is displayed in appendix C. The next chapter will describe the large-scale data collection initiative and instrument validation process.

Table 3.3.2.7. Summary of the three round Q-sort pilot test

Agreement Indicators	Round 1	Round 2	Round 3*
Raw agreement	93.1%	94.0%	100%
Placement (hit) ratio	97.3%	96.6%	100%
Cohen's Kappa	92.2%	93.6%	100%

* Round three tested only the IIRS construct (18 items total).

CHAPTER 4: LARGE-SCALE SURVEY – INSTRUMENT VALIDATION

Data were collected via a large-scale survey following item generation, pre-testing, and the Q-sort pilot test. The purpose of the large-scale survey was to collect data useful for the validation of the instruments developed, as described in chapter 3, as well as to test the relationships hypothesized herein. Chapter 4 describes the research methodology employed in the large-scale survey (section 4.1) and discusses the validity and reliability testing of the measurement models of the variables under study (section 4.2).

4.1 Research Methodology

This section discusses the data collection method and procedures, the sample frames used for data collection, and the characteristics of the survey respondents. This will be followed by a discussion of the statistical testing performed to assess the validity and reliability of the instruments.

4.1.1 Data collection – methods and procedures

A sample survey approach, using an online survey, was employed for data collection. Survey is an attractive method of data collection as it has the potential to afford the researcher a large amount of information that can be analyzed to test relationships between two or more variables (Miller, 1991). It allows for "both quantitative and qualitative data [to be] analyzed with appropriate parametric and nonparametric statistics," (Miller, 1991: p. 22). Survey is also attractive owing to its ability to generate a great deal of information from a large sample of the subjects under study (Kerlinger, 1986). This presents the opportunity to validate a researcher's psychometric measurement scales and also increase the generalizability of findings beyond that of some case study or structured interview methods (Jin, 2008; Dobrzykowski et al., 2010). However, survey method is not absent all weaknesses.

A challenge faced by the researcher when using survey method is low response rate. Response rate can be critical to the generalizability of a research study's findings (Malhotra and Grover, 1998). This is a serious and timely concern for researchers as response rates in academic studies have been observed to have declined steadily in recent decades (Baruch, 1999). These challenges have been exacerbated in the context of online internet based surveys owing to personal reluctance to use the internet, limited web access, and protected email addresses (Klassen and Jacobs, 2001).

Recognizing these challenges, actions were taken, following suggestions from Erdos (1970) and Blankenship and Breen (1992), to enhance the response to this survey. In terms of design, "the questionnaire should have a simple, appealing appearance," (Erdos, 1970: p. 128). Blankenship and Breen (1992) share this recommendation. The survey instrument for this study was designed to be easy to read with a white background and clear black letters that are highly visible. See appendix C. Next, Erdos (1970) advocates for the use of incentives to drive survey participation. This opinion also emerged from the Q-sort pilot testing phase. Thus, following the suggestions of the expert practitioner judges, a $1,000 incentive was employed. The incentive came by virtue of a random raffle drawing for survey respondents and earmarked $500 for the winning individual respondent and $500 for a charity of the winning respondent's choice. It was anticipated that the selected charity would be the Foundation of the respondent's hospital. Finally, advanced personalized notice is thought to increase response rate (Blankenship and Breen, 1992; see also Erdos, 1970). Therefore, when possible, telephone calls were placed to potential respondents to pre-qualify them and enable the personalization of an e-mail containing the respondent's name, as well as the reasons for and importance of the study. The email message also contained a link to the online questionnaire. The pre-qualification step (when possible) also mitigated another threat to survey research – "that the questionnaire may be answered by someone other than the addressee," (Erdos, 1970: p. 125).

This leads to another critical issue, that is, the identification and selection of an appropriate respondent (Kerlinger, 1986). Given, the focus of this study on the downstream healthcare delivery supply chain, described in detail in section 2.1, the unit of analysis is acute care hospitals in the USA. To reiterate from section 2.1, this is a worthy area of study owing to the fact that greater than 50% of healthcare spending in the U.S. is directed toward hospital, physician, and other clinical services, (Kaiser, 2009). Therefore, acute care facilities in the USA have been selected as the focus of the study.

Next, the researcher turned to the extant literature as an initial step in ensuring that a respondent was selected who possessed adequate domain knowledge of the phenomenon under study. Executives in the area of Quality have served as key respondents in complimentary Operations Management research studies (see Meyer and Collier, 2001; Goldstein and Naor, 2005; Gowen III et al., 2006; McFadden et al., 2009). Additionally, nursing professionals have been another key respondent for Operational investigations (see Tucker, 2004; McFadden et al., 2009). Next, knowledgeable practitioners were solicited for input regarding the appropriate respondent during the Q-sort pilot testing phase of instrument development. Two additional respondent types gained consideration as a result of these solicitations; Patient Care Services Executives and Case Management Executives. These areas are primarily involved in coordinating patient care, a primary focus of this study. Documents obtained from large tertiary care hospitals and health systems confirm that such individuals "lead the day-to-day operational activities of the Case Management staff… [and] … collaborate with medical staff and patient care departments to achieve quality, cost effective care." In a consistent fashion, the Case Management Society of America defines Case Management as "a collaborative process of assessment, planning, facilitation and advocacy for options and services to meet an individual's health needs through communication and available resources to promote quality cost-effective outcomes," (CMSA, 2010a). Thus, the final sample frame included target respondents holding the titles of Vice President (VP) of Patient Care Services, Chief Nursing Officer (CNO) or VP of Nursing, Director of Nursing, VP of Case Management, Director of Case Management, VP of Quality Initiatives, Director of Quality Initiatives or an equivalent substitute. Internet research also confirmed that individuals at this level of the organization possess sufficient domain knowledge to serve as a survey respondent.

Notwithstanding the rigor employed in the procedure just described, "a sample survey deals with only a fraction of the total population (universe)," (Miller, 1991: p. 22). Therefore, research can benefit when "more than one data collection method is used within a single study" as this can enhance the generalizability and richness of findings (Erdos, 1970: p. 163). Thus, this study collected data from three sample frames; The

American Hospital Association (AHA), the Case Management Society of America (CMSA), and the University HealthSystem Consortium (UHC).

4.1.1.1 The American Hospital Association (AHA) sample

The AHA was founded in 1898 and today functions as the national organization for all types of hospitals in the USA. "Close to 5,000 hospitals, health care systems, networks, other providers of care and 37,000 individual members come together to form the AHA," (AHA, 2010a). Their members include long-term care providers, acute care hospitals, clinics, Veterans Administration hospitals, For-Profit and Not-For-Profit hospitals, and various other healthcare providers. Owing to the widely held respect for the organization and the comprehensive composition of their membership, the AHA has served as the sample frame, or a portion thereof, for other scholarly studies in the Operations literature (see Meyer and Collier, 2001; Li et al., 2002; Li and Benton, 2006).

The initial step in developing this sample frame began with the procurement of a random list of hospitals from the AHA. This list contained general information such as hospital name, location, and telephone number for a random list of acute care hospitals located throughout the USA. Neither specific hospital employees, nor their contact information were identified on this list. Next, following the data collection approach of McFadden et al. (2009), multiple telephonic attempts were made to contact as many hospitals as feasible under reasonable resource parameters. The purpose of these contact attempts was to speak with the targeted respondents described earlier, explain the study, and invite their participation. In some cases, attempts to contact multiple target respondents within a hospital were made. During each telephone call, the solicitor was able to explain to the target respondents that the focus of the study was linking improvements in patient care outcomes with the integration of nursing and physician work practices. "By calling the personnel directly, we were able to explain the purpose of the study, ensure that the surveys [web links] were emailed to the appropriate individuals and that email addresses were accurate and current," (McFadden et al., 2009: p. 396). Flynn et al. (1990) suggest that is approach can be effective in increasing response rates in Operations Management research. As such, other researchers have incorporated telephonic contacts into their data collection procedures in the manufacturing context (see Frohlich, 2002; Qi et al., 2009).

Outcomes from these efforts fell into four categories: 1) the target respondent was unavailable and a message was left, 2) the target respondent was unavailable but an email address for that person was obtained from an assistant, 3) the target respondent was reached and agreed to participate in the study, or 4) the target respondent was reached and declined participation in the study. In sum, 1,475 outbound telephone calls were placed to 959 hospitals. From these hospitals, 260 executives agreed to participate in the survey and provided their email address. An additional 180 email addresses were obtained without participation commitments, while 81 executives from 75 hospitals declined participation. This left 440 email invitations to be sent by the solicitation team immediately following the telephone contact. From these, 134 survey responses were received with no redundancy (i.e., two executives from the same hospital submitting survey responses). This provides for a response rate of 30.5% (134/440). After screening, one of the surveys was deleted from the database due to excessive missing values. This calculation method is consistent with Qi et al. (2009). This response rate compares favorably to other Operations study's in the hospital context. See table 4.1.1.1. This is particularly evident when applying the method of McFadden et al. (2009), who used only target respondents who agreed to participate in the study. This calculation procedure produces a response rate of 51.5% (134/260) for the present study. In the end, the data collected from the AHA sample represents 70.0% (133/190) of the data available for analysis in the study.

4.1.1.2 The Case Management Society of America (CMSA) sample

A sample frame was sought from CMSA owing to the input of the Q-sort judges, specifically their observations and secondary documentation regarding the important role of case management personnel in coordinating patient care. The CMSA was founded in 1990 and now serves over 11,000 members and 70 chapters with networking opportunities (CMSA, 2010b). CMSA membership is comprised of case managers from a variety of healthcare organizations including acute care hospitals, long term care facilities (nursing homes), insurance companies, health and wellness firms, and home healthcare providers among others. These members look to the CMSA for leadership with regard to educational forums, establishing standards, and legislative advocacy to advance the profession (CMSA, 2010b). Essentially, the CMSA's organizational mission involves the improvement of healthcare delivery. Given that this pursuit is shared by the present study, the CMSA agreed to endorse this study.

Table 4.1.1.1. Other hospital study response rates from *Journal of Operations Management*

Author	**Sample Frame**	**Target Respondent**	**Response Rate**
McFadden et al. (2009)	www.hospitallink.com Called to develop sample frame from 'agreeable' respondents.	Quality Director, Risk Manager, Director of Nursing, and Information Systems Director	371/626 = 59.3%
Goldstein et al. (2002)	Michigan hospitals.	CEOs and Vice Presidents of Operations.	67/160 = 41.9%
Goldstein and Naor (2005)	U.S Hospitals (Meyer and Collier, 2001)	Quality Managers or Quality Executives	195/814 = 24%
Gowen III et al. (2006)	www.hospitallink.com Called to develop sample frame. Randomly selected 607 hospitals.	Quality and Risk Directors	372/607 = 61%
Li et al. (2002)	American Hospital Association Guide. Hospital Service Management database established in 1994–1995.	Hospital Administrators and/or Chief Operating Managers	151/492 = 30.7%
Li and Benton (2006)	American Hospital Association Guide. Hospitals in Ohio, Oregon, and Florida.	Hospital Administrators and/or Chief Operating Managers	165/492 = 33.5%
Meyer and Collier (2001)	American Hospital Association.	Manager, Director & VP Quality (excluded <60 bed hospitals)	228/814 = 28%

The survey instrument was made available to CMSA members via their monthly internet newsletter. The first newsletter containing the survey introduction and web link appeared March 19, 2010 (wave one). The announcement was aesthetically attractive and enjoyed reasonably favorable placement; approximately one-third of the way down the newsletter. See appendix D. This was followed by a second release on April 17, 2010 with a similar position (wave two). Wave one produced 15 responses and wave two generated an additional 16 responses for a total of 31 completed surveys. All responses were free of substantial missing values and were from unique hospitals with no redundancy. Unfortunately, the response rate is impossible to calculate, as the CMSA database cannot be filtered to determine the number of members who are employed in managerial or executive level positions in acute care hospitals. In the end, the data collected from the CMSA sample represents 16.3% (31/190) of the data available for analysis in the study.

4.1.1.3 The University HealthSystem Consortium (UHC) sample

UHC is an alliance of approximately 100 academic medical centers and 200 affiliate hospitals located throughout the U.S. This represents greater than 90% of the non-profit academic medical centers in the country. UHC was established in 1984 and its purpose is to assist its members to measure and improve clinical, operational, and financial performance.

Operations researchers have taken interest in investigating Academic Medical Centers owing to the notion that these institutions tend to be early adopters of new technologies and procedures and consequently produce high quality outcomes. McDermott and Stock (2007) provide one example as they found that teaching hospitals were associated with better ALOS performance than non-teaching hospitals. This finding might be driven by the notion that staff and faculty at teaching hospitals, as researchers and educators, are more familiar and comfortable with adopting newer practices and techniques to improve operations (McDermott and Stock, 2007). In turn, this propensity may positively impact their ability to move patients more quickly through diagnosis and treatment, and consequently through the hospital more rapidly. Consider Massachusetts General Hospital, a teaching institution and pioneering leader in the development of care paths, which is a technique used to standardize pre- and post-operative care for a variety of medical procedures (McDermott and Stock, 2007). Massachusetts General Hospital saw ALOS for coronary artery bypass surgery patients decrease after the implementation of new care paths (Wheelwright and Weber, 1995).

UHC agreed to endorse the present study and distribute the survey link to many of its member institutions by means of its clinical operations listserv. Members of this list serve consist primarily of Directors of Quality, a target respondent discussed earlier (see also Meyer and Collier, 2001; Goldstein and Naor, 2005; Gowen III et al., 2006; McFadden et al., 2009). This clinical operations listserv includes approximately 175 of UHC's 300 or so members. An initial announcement was released on the listserv on March 16, 2010. See appendix E. Two follow up reminders were released at approximately the two week and four week points following the initial email. From this listserv of 175 members, 27 survey responses were received with no redundancy (i.e., two executives from the same hospital submitting survey responses). This provides for a response rate of 15.4% (27/175). After screening, one of the survey responses was deleted from the database due to excessive missing values. This calculation method is consistent with Qi et al. (2009). The data collection results are summarized in table 4.1.1.3.1. In the end, the data collected from the UHC sample represents 13.7% (26/190) of the data available for analysis in the study.

Table 4.1.1.3.1 Data collection summary

	AHA	CMSA	UHC	Aggregate
Target pool	440	*	175	*
Respondents	134	31	27	192
Response rate	30.5%	*	15.4%	*
Deleted responses	1	0	1	2
Total available for data analysis	133	31	26	190
Percentage of the data available for analysis	70%	16.3%	13.7%	100%

* Unable to calculate due to an uncertain target respondent pool.

4.1.2 Testing *a priori* sample aggregation

The fact that multiple sample frames and data collection methods have been employed (Erdos, 1970), makes an analysis of the characteristics of each sample useful in examining any potential bias that may exist inherent in the aggregated data. Further, a thorough understanding of the aggregate sample used for data analysis is important in enhancing appropriate generalizability. Therefore, statistical tests were conducted to explore the demographic characteristics of each of the three samples. These examinations offer the greatest value to the researcher when key demographic variables of relevance to the study are the target of assessment.

As discussed throughout, a primary focus for this study rests on coordination mechanisms employed to align activities in the decentralized healthcare delivery supply chain (see Shah et al., 2008). Coordination mechanisms consist of instruments such as financial and/or contractual arrangements (Ganeshan et al., 1998; Li and Wang, 2007; Sahin and Robinson, 2002: Tsay, 1999). For hospitals, these financial or contractual coordination mechanisms take the form of employment relationships with their admitting/attending physicians in an attempt to align upstream activities and entering into contractual relationships with payers (e.g., the CMS or private insurance companies) which manage the financial administration of healthcare on behalf of patients downstream. These payers have unique guidelines or standards for the care their members receive and as such influence the delivery of healthcare within a hospital. This makes the assessment of a hospital's payer mix relevant to understanding the procedural activities associated with a particular patient. Another coordination (mechanism) trend for hospitals in recent years has been to merge together, creating an affiliated health system. This 'system affiliation' approach has been posited to increase integration of the healthcare delivery supply chain and serve to coordinate healthcare delivery, thereby improving outcomes (Evans, 2008). These three coordination mechanisms – physician employment, insurance payer mix, and system affiliation – were also identified as key issues during the Q-sort pilot test.

These three demographic variables have therefore been selected to examine upstream coordination mechanisms (the 'percentage of employed physicians'), focal firm coordination mechanisms (affiliation with a health system), and downstream coordination mechanisms (patient 'payer mix'). These demographic variables have been examined for statistical differences among the three samples using two statistical tests; Analysis of Variance (ANOVA) and the chi-square test.

ANOVA is a "statistical technique used to determine whether samples from two or more groups come from populations with equal means (i.e., Do the group means differ significantly?)" Hair et al., (2006: p. 384). This test enables the researcher to identify statistical differences within as well as between groups. ANOVA is often used in the Operations Management literature to investigate differences among respondent groups (see Qi et al., 2009; Naor et al., 2010). ANOVA is useful for interval (continuous) data and is therefore an appropriate choice to analyze the 'percentage of employed physicians' variable which was measured using a 6-point scale and the ‘payer mix’ variables which were measured using a true continuous scale. Table 4.1.2.1 illustrates the results of the ANOVA analysis. In interpreting ANOVA results, significant F-values (> 3.84 for a significance level of .05) indicate that “differences are present between the groups,” (Hair et al., 2006: p. 392). None of the F-values in the present study indicate that the ANOVA models are significant. Further, Scheffe pairwise comparisons of the variables are also not significant. Together, this provides evidence that there are no statistical differences among the AHA, CMSA, and UHC samples for the ‘percentage of employed physicians’ variable or the ‘payer mix’ variables.

Table 4.1.2.1. Analysis of variance of demographic variables.

Demographic Variable	**Study Sample** ***n = 190***	**AHA Sample** ***n = 133***	**CMSA Sample** ***n = 31***	**UHC Sample** ***n = 26***	***F*** **Value**
% of employed admitting / attending physicians [a]	$\mu = 2.12$	$\mu = 2.00$	$\mu = 2.39$	$\mu = 2.42$	1.23 [n/s]
Payer mix: % of CMS [b]	$\mu = 54.82$	$\mu = 55.04$	$\mu = 55.59$	$\mu = 52.17$	0.38 [n/s]
Payer mix: % of Private Insurance [b]	$\mu = 29.10$	$\mu = 29.32$	$\mu = 27.69$	$\mu = 30.00$	0.22 [n/s]
Payer mix: % of Self-pay [b]	$\mu = 8.30$	$\mu = 8.14$	$\mu = 10.44$	$\mu = 7.62$	1.65 [n/s]

[n/s] indicates not statistically significant.
[a] 0 = <5%, 1 = 6-15%, 2 = 16-35%, 3 = 36-65%, 4 = > 65%, 5 = 100% closed physician panel.
[b] indicates questions for which an open response field was used.
Scheffe pairwise comparison was used.

The ‘system affiliation’ variable is dichotomous in nature (0 = an independent hospital, 1 = the hospital is part of a system) and produces nominal data. As such, it is not appropriate to attempt to calculate a mean for this variable, rendering ANOVA useless in its analysis. However, the “chi-square is a standardized measure of actual cell frequencies compared to expected cell frequencies,” making this an appropriate test for nominal variables (Hair et al., 2006: p. 665). Therefore, a chi-square test was used to examine differences among the sample with regard to the 'system affiliation' demographic variable. Table 4.1.2.2 illustrates the results of the chi-square analysis.

Table 4.1.2.2. Chi-square analysis of the three samples.

Demographic Variable	**AHA Sample**	**CMSA Sample**	**UHC Sample**
System affiliation			
Independent (coded 0)			
expected	46.1	10.8	9.1
observed	46.0	8.0	12.0
Part of a system (coded 1)			
expected	85.9	20.2	16.9
observed	132.0	31.0	26.0
$X^2 = 2.58$, df = 2, $p > 0.05$			

The results produce $X^2 = 2.58$, df = 2, $p > .05$ with an actual p-value of .276 which provides evidence that there is no statistical differences among the three samples with regard to system affiliation. The ANOVA and chi-square testing provide support that the three samples are the same with regard to the use of potential coordination mechanisms. Given these findings, the three samples were aggregated into one sample (n=190) for further analysis, instrument validation, and hypothesis testing.

4.1.3 Sample characteristics

Table 4.1.3.1 displays the sample characteristics of respondents in terms of hospital type, location, size, and employment characteristics. The sample contains representation from tertiary, community, critical access and county hospitals, with the majority being community hospitals (60%). This is to be expected as the AHA reports that 86% of hospitals in the USA fall into this category (5,010/5,815) (AHA, 2010b). "Community hospitals are defined as all nonfederal, short-term general, and other special hospitals," (AHA, 2010b). The majority of respondents are located in urban settings (62%). This is also to be expected as according to the 2007 AHA annual survey, 62.4% of hospitals in the USA are located in of urban settings. The representation of For-profit hospitals in this study (15%) is also in line with the AHA which estimates that these facilities make up about 20% (982/5,010) of the hospitals in the USA (AHA, 2010b). Hospital size was measured by the number of beds (Meyer and Collier, 2001; Jha et al., 2009) and number of employees. Approximately 30% of respondents in this study represent hospitals with between 0-99 beds, while 43% are from hospitals with 100-399 beds, and the remaining 25% represent large hospitals with more than 400 beds. This is consistent with the data collection attempt of 4,814 hospitals by Jha et al., (2009) which was comprised of 43% 100-399 beds hospitals. The distribution of hospital employment is fairly balanced once considering hospitals with more than 250 employees. Finally, organization of labor was measured by union status of each hospital's clinical employees. In this sample, 78% of hospitals have not unionized clinical employees.

Table 4.1.3.2 displays the sample characteristics of respondents in terms of activity, teaching status, and acuity. Activity was measured using the annual number of adjusted discharges as an expert judge in the Q-sort pilot opined that this has become a more popular measure of hospital activity than admissions statistics. This sample provides a balanced representation of hospitals with no adjusted discharges category representing less than 12% or more than 20% of the sample. Activity was also measured by annual revenue. Here the revenue categories were adopted from the Internal Revenue

Service's *Exempt Organizations Hospital Compliance Project Final Report.* The sample is reasonably balance among the various annual revenue categories with 43% of respondents generating less than US$100M and 41% generating more than US$100M. It should be noted that 17% of hospitals did not respond to this question, most likely owing to the clinical focus of the respondent's position. The sample is fairly balanced in terms of teaching status with 27% of respondents representing major teaching hospitals, 31% representing minor teaching hospitals, and the balance of 42% responding from nonteaching hospitals. While balanced among the categories, this sample may not be representative of the USA hospital population. Jha et al. (2009) in a much larger study attempting to collect data from 4,814 hospitals found that only 4%-7% of hospitals can be classified as major teaching hospitals, while 16% are minor teaching hospitals, and 77%-80% are nonteaching hospitals. This is discussed further in the Limitations section in Chapter Six. Finally, when attempting to measure hospital care delivery outcomes as is the case in the present study, it is important to measure the level of acuity (severity of illness) of a hospital's patients. This belief is common in the medical literature and was shared by some of the Q-sort judges. As such, the acuity of a hospital's patients was measured using Case Mix Index (CMI). According to the Center for Medicare and Medicaid Services (CMS), CMI "represents the average diagnosis-related group (DRG) relative weight for that hospital. It is calculated by summing the DRG weights for all Medicare discharges and dividing by the number of discharges," (CMS, 2010). In this sample, CMI was reasonably balanced among the respondents.

Table 4.1.3.3 displays the sample characteristics of respondents in terms of coordination mechanisms consisting of system affiliation, physician employment, and payer mix. These were discussed in detail in section 4.1.2 earlier. This sample contains 65% representation from hospitals which are part of a system, while 35% are independent. This is slightly higher, yet consistent with the AHA statistics which suggest that approximately 57% (2,868/5,010) of community hospitals are part of a system (AHA, 2010b). The percentage of employed admitting/attending physicians is reasonably balanced across the sample with the possible exception of 100% closed systems which represent 7% of the sample. This is likely to be indicative of the population however, as closed systems (e.g., Kaiser Permanente) remain relatively unique (Shapiro, 2003). Finally, the means were provided for four general payers thought to be common to most hospitals: 1) CMS, 2) private insurance companies, 3) self-pay patients, and 4) uncompensated care.

Table 4.1.3.3 displays the sample characteristics of the individual respondents in terms of his or her job title. To reiterate, the four targeted respondents were VP or Director of Case Management, Chief Nursing Officer (or VP or Director), VP or Director of Patient Care Services, and VP or Director of Quality Initiatives. These positions comprise the top five places in terms of frequency of respondent type. Together these targeted positions account for 55% of the respondents. There is also a relatively large group of respondents (26%) that marked 'other' for job title on the survey. An open field was provided for respondents to clarify this selection. The following titles were among those provided in the open field; Chief Quality Officer, Corporate Compliance Officer, Patient Safety Officer, Information Officer, Administrative Officer, VP of Clinical and Business Integration, VP of Professional Services, Associate VP of Nursing, Associate VP of Quality Improvement, Director of Medical Staff Affairs, Director of

Biostatistics/Clinical Data Warehouse, Manager of Medical Management, Manager, of Performance Measurement, Program Manager of Care Management, and Senior Director of Quality, among others. Of the 50, 34 of the job titles provided in the ‘other’ category contained some reference to VP, Director, or Manager. In addition, to ensure that the respondents were qualified to answer the survey, most respondents who emailed the research team to participate in the drawing was asked to comment on their ability to answer the survey questions. None indicated that they were unqualified of uncomfortable answering the questions.

4.3.1.1 Sample characteristics: type, location, size, and employment

Characteristics	Respondents
Hospital type	
Tertiary care center	45 (24%)
Community hospital	113 (60%)
Critical access hospital	23 (12%)
County hospital	7 (4%)
Location*	
Urban	117 (62%)
Rural	70 (37%)
Ownership status	
For-profit hospital	29 (15%)
Non-profit hospital	140 (74%)
Public hospital	18 (10%)
Size – number of beds	
< 49	19 (10%)
50-99	38 (20%)
100-199	33 (17%)
200-399	50 (26%)
> 400	47 (25%)
Size – number of employees	
< 250	11 (6%)
251-750	51 (27%)
751-1,500	41 (22%)
1,501-3,000	42 (22%)
> 3,001	43 (23%)
Union status of clinical employees	
Union	40 (21%)
Non-union	148 (78%)

* Hospitals from 41 states participated in the study.
Note: Numbers represent frequency, followed by the percentage of the sample in parentheses.

4.3.1.2 Sample characteristics: activity, teaching status, and acuity

Characteristics	Respondents
Activity – number of adjusted discharges	
< 1,500	23 (12%)
1,500-4,500	33 (17%)
4,501-10,000	37 (20%)
10,001-20,000	37 (20%)
> 20,001	38 (20%)
Did not report.	22 (12%)
Activity – annual revenue	
< $25M	40 (21%)
$25M-$100M	41 (22%)
$100M-$250M	25 (13%)
$250M-$500M	22 (12%)
> $500M	30 (16%)
Did not report.	32 (17%)
Teaching status	
Major teaching hospital	52 (27%)
Minor teaching hospital	58 (31%)
Nonteaching hospital	79 (42%)
Patient Acuity – Case Mix Index	
< 1.0	8 (4.2%)
1.01-1.25	47 (25%)
1.26-1.40	42 (22%)
1.41-1.70	43 (23%)
> 1.71	33 (17%)
Did not report.	17 (9%)

Note: Numbers represent frequency, followed by the percentage of the sample in parentheses.

4.3.1.3 Sample characteristics: coordination mechanisms

Characteristics	Respondents
System affiliation	
Independent hospital	66 (35%)
Part of a system	123 (65%)
Percentage of employed physicians (admitting/attending)	
< 5%	41 (22%)
6%-15%	39 (21%)
16%-35%	26 (14%)
36%-65%	34 (18%)
> 66%, but not 100%	34 (18%)
100% - closed system	14 (7%)
Payer mix*	
Center for Medicare/Medicaid Services 162 reported.	$\mu = 54.8\%$
Private Insurance 162 reported.	$\mu = 29.1\%$
Self-pay patients 161 reported.	$\mu = 8.3\%$
Uncompensated care 156 reported.	$\mu = 9.2\%$

* The mean response is reported.
Note: Numbers represent frequency, followed by the percentage of the sample in parentheses.

4.3.1.4 Sample characteristics: job titles of individual respondents

Characteristics	Respondents
Job title	
Director of Case Management	35 (18%)
Chief Nursing Officer	21 (11%)
Vice President of Patient Care Services	16 (8%)
Director of Quality Initiatives	14 (7%)
Director of Nursing	9 (5%)
Quality Assurance Manager	9 (5%)
Director of Patient Care Services	7 (4%)
Chief Operating Officer	4 (2%)
Unit Manager	4 (2%)
Chief Executive Officer	2 (1%)
Vice President of Quality Initiatives	2 (1%)
Vice President of Medical Affairs	1 (1%)
Vice President of Case Management	1 (1%)
Other	50 (26%)
Did not report.	15 (8%)

Note: Numbers represent frequency, followed by the percentage of the sample in parentheses.

4.1.4 Non-response bias testing

Non-response bias is a significant challenge in survey research. Individuals who reply to a survey are typically those most interested in or have strong feelings about the topic. "If persons who respond differ substantially from those who do not, the results do not directly allow one to say how the entire sample would have responded – [thus, non-response bias testing is] certainly an important step before the sample is generalized to the population," (Armstrong and Overton, 1977: p. 396).

However, "Podsakoff et al. (2003) argue that biases are also reduced through the use of high quality scales, and by temporal, proximal, psychological, or methodological separation of measurements," (Swink and Song, 2007: p. 210). With this in mind, the rigorous instrument development process described herein was intended to contribute to bias reduction. Still others argue that with strong response rates, such as that enjoyed by this study (particularly for those who agreed to participate in the survey), reasonably assure generalizability exists thereby reducing the need for non-response bias testing[4] (Flynn et al. 1990; McFadden et al., 2009). These opinions notwithstanding, this study tests key characteristics captured in the sample data from the respondents to the same characteristics of those who chose not to respond (non-respondents). Therefore, recognizing that the use of known values can be very useful in non-response bias testing (Armstrong and Overton, 1977) this study captured key data elements from non-respondent hospitals for testing juxtaposed to respondent hospitals.

[4] Flynn et al. (1990) suggest that response rates of 50-60% ensure generalizability. McFadden et al. (2009) make this claim based on their collection of 59.3% of responses from hospital executives who previously agreed to participate in their survey. Applying this calculation methodology to the present study produces a 51.5% response rate.

Two statistical tests commonly employed in the Operations Management literature for non-response bias testing are t-tests (see Swafford et al., 2006) and the chi-square test (Meyer and Collier, 2001). The t-test was employed herein to examine mean differences in terms of bed size (similar to Meyer and Collier, 2001). This examined differences between the respondent group (n=190) and the non-respondent group, in other words, those hospitals that declined to participate in the AHA sample (n=75). Data was provided for non-respondents by the AHA. Table 4.1.4.1 displays the result of the t-tests for bed size. The t-value of -0.57 is not significant indicating that no statistical difference exists between the respondents and non-respondents based upon bed size.

Table 4.1.4.1. T-test of respondents and non-respondents for bed size

Group and means	**Bed size**
Respondents (n = 187)	μ = 2.36
Non-respondents (n = 75)	μ = 2.27
t-value	-0.57 $^{n/s}$

$^{n/s}$ indicates not statistically significant.
Scale: 0=1-49; 1=50-99; 2=100-199; 3=200-399; 4=>400

Chi-square tests were performed on the dichotomous binary variable collected during the survey for hospital type (tertiary, community, critical access, or county hospital) as well as for membership in a hospital system. Non-respondent data for hospital type was gathered through internet research while data for system affiliation membership was provided from the AHA. These data were subjected to chi-square analysis to examine differences between respondents and non-respondents. Table 4.1.4.2 displays the results. No statistical differences were found between the respondents and non-respondents providing evidence of an absence of non-response bias in the data.

Table 4.1.4.2. Chi-square analysis for non-response bias

Demographic Variable	Non-respondents	Respondents
Hospital type		
Tertiary		
Expected	16	42
observed	13	45
	$X^2 = 1.27$, df = 1, $p > 0.05$	
Community		
Expected	45	113
observed	46	114
	$X^2 = 0.77$, df = 1, $p > 0.05$	
Critical access		
Expected	9	24
observed	10	23
	$X^2 = 0.74$, df = 1, $p > 0.05$	
County		
Expected	4	10
observed	7	7
	$X^2 = 3.43$, df = 1, $p > 0.05$	
System affiliation		
Part of a system		
expected	49	123
observed	49	123
	$X^2 = 0.002$, df = 1, $p > 0.05$	

4.2 Instrument validation

Following aggregation of the samples and testing for response bias, the sample data is ready for instrument validation and hypothesis testing. This section describes the procedures employed during the instrument validation process and the consequent statistical results.

4.2.1 Structural Equation Modeling (SEM)

The primary aim of this study is to test hypothesized relationships among antecedents and consequences of value density in the healthcare delivery supply chain. The testing of these relationships is predicated on use of valid and reliable measures for these constructs. Toward this end, the researcher maintains two goals at this point; 1) the validation of the measurement instruments, and 2) the testing of the hypothesized relationships. Anderson and Gerbing (1998) refer to this as the two step process. First, the researcher examines the measurement properties of the variables under study, what is referred to as the measurement model. This is followed by the assessment of the relationships among variables, referred to as the structural model.

Structural Equation Modeling (SEM) has proven to be a very useful statistical method for assessing measurement as well as structural models. SEM allows the "distinction between the measurement model, which relates the constructs to their measures, and the structural model which relates the constructs to each other," (Jarvis et al. 2003: p. 199). The foundation of SEM lies in two multivariate techniques: factor analysis and multiple regression (Hair et al., 2006). Specifically, "it examines the structure of interrelationships expressed in a series of equations, similar to a series of multiple regression equations," (Hair et al., 2006: p. 711). Owing to these traits, SEM was selected as the analysis technique for the assessment of the measurement and structural models under study.

4.2.2 Selection of the measurement model approach (reflective and formative models)

The constructs conceptualized in this study are unobservable or not directly measurable. In other words, these constructs are latent factors which are represented by multiple measures (Hair et al., 2006). These variables are measured using items (or survey questions) which are intended to capture a specific dimension of the variable

(Churchill, 1979). See figure 4.2.2.1. In this example, the variables (or constructs) are measured using survey questions 1 through 6; whereby the 'reflective' variable is measured using survey questions 1, 2, and 3, and the 'formative' variable is measured using survey questions 4, 5, and 6.

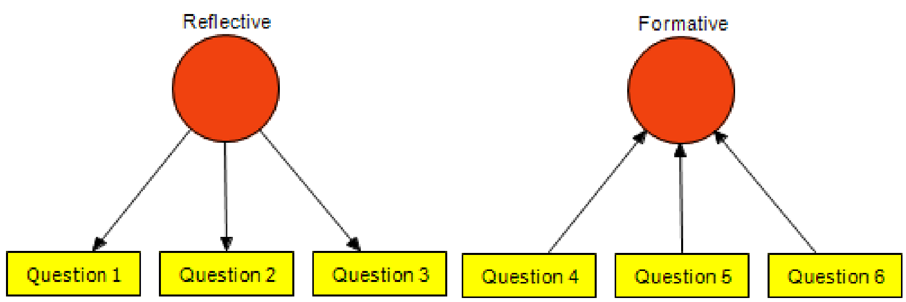


Figure 4.2.2.1. Hypothetical reflective and formative measurement models

Figure 4.2.2.1 also highlights two different approaches employed in measurement theory; reflective and formative measurement. The unique and differing traits of reflective and formative measurement models are displayed in table 4.2.2.1.

Table 4.2.2.1. Key differing traits of reflective and formative measurement (Jarvis et al., 2003)

Reflective models	**Formative models**
Direction of causality is from construct to measure	Direction of causality is from measure to construct
Measures are expected to be correlated (measures should demonstrate internal consistency or reliability)	Measures are not expected to be correlated (internal consistency is not inherently implied)
Deleting an indicator item (survey question) from the measurement model does not alter the meaning of the construct	Deleting an indicator item (survey question) from the measurement model may alter the meaning of the construct

Reflective variables are in essence mirrored by their measurement items. As stated by Jarvis et al. (2003; p. 200) "the underlying latent [reflective] construct causes the observed variation in the measures (Bollen, 1989; Nunnally, 1978)." This is indicated by the direction of the arrows. See figure 4.2.2.1. In other words, the direction of causality is from the construct to the measure (Jarvis et al., 2003). This means that changes in the reflective latent variable will cause "all of its measures to reflect this change," (Petter et al., 2007: p. 624). As such, "reflective indicators of a principle factor latent construct should be internally consistent and, because all the measures are assumed to be equally valid indicators of the underlying construct, any two measures that are equally reliable are interchangeable," (Jarvis et al., 2003: p. 200). In this example (figure 4.2.2.1), if question 1 were removed from the reflective variable, it would not cause change to the variable.

On the other hand, formative constructs are represented by a combination of multiple measures (MacCallum and Browne, 1993). In contrast to reflective measures where a change in the construct affects the underlying measures (survey items), formative constructs operate differently in that changes in the formative measures affect changes in the underlying construct (Jarvis et al., 2003). Petter et al. (2007: p. 624) provide a useful example of a formative construct in describing organizational performance.

> *"One example of a formative construct could be organizational performance operationalized using three measures: productivity, profitability, and market share. Each measure captures differing aspects of organizational performance, and as a result, this operationalization of the construct is formative. In this instance, the combination of these variant measures defines the construct of organizational performance."*
> *(Petter et al., 2007: p. 624).*

In the example from Petter et al. (2007), if productivity were removed as a measurement item of organizational performance, it would affect a change in the definition of organizational performance to include only profitability and market share. This would conceptualize an entirely new construct. This is displayed in figure 4.2.2.2.

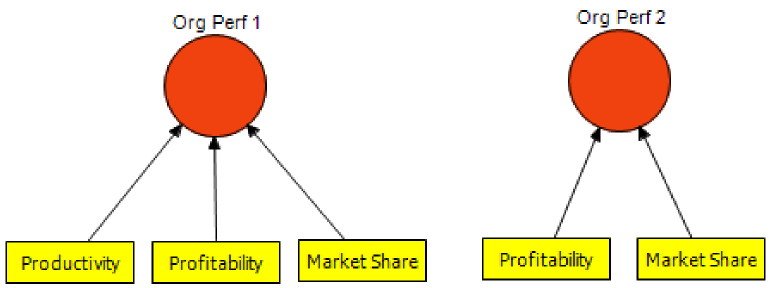


Figure 4.2.2.2. Two distinct formative conceptualizations of organization performance

Noticeably in this example, formative indicator items can express the individual dimensions of the latent construct which they measure and may or may not be related to one another. As such, "covariation among the indicators is not necessary or implied by formative models," (Jarvis et al., 2003: p. 203). This is an important distinction from reflective models which require covariation amongst measurement items in order to achieve interchangeability. It is this requirement of reflective models which produces the opportunity to measure the internal consistency or reliability of the construct. It follows then that "internal consistency or reliability is unimportant [in formative models] because measures [items] are examining different facets of the construct," (Petter et al., 2007: p. 626) and thus may not be related to one another.

Jarvis et al., (2003) provide guidance for researchers in determining the appropriate measurement approach when using SEM. The authors suggest four overarching questions which direct the researcher in assessing the fundamental nature of the phenomena under study in order to select the appropriate measurement approach. See table 4.2.2.2.

Table 4.2.2.2. Decision rules for determining reflective or formative measurement (adapted from Jarvis et al., 2003)

Decision rules	**Formative models**	**Reflective models**
1 Direction of causality from construct to measure implied by the conceptual definition	Direction of causality is from items to construct	Direction of causality is from construct to items
1a *Are the measurement items (1) defining characteristics or (2) expressions of the construct?*	Items are defining characteristics of the construct	Items are manifest expressions of the construct
1b *Would changes in the items cause changes in the construct?*	Changes in the items should cause changes in the construct	Changes in the items should not cause changes in the construct
1c *Would changes in the construct cause changes in the indicator items?*	Changes in the construct do not cause changes in the items	Changes in the construct do cause changes in the items
2 Interchangeablility of the items	Items need not be interchangeable	Items should be interchangeable
2a *Should the items have the same or very similar content?*	Items need not have the same or very similar content	Items should have the same or very similar content
2b *Do the items share a common theme?*	Items need not share a common theme	Items should share a common theme
2c *Would deleting one item alter the conceptual domain of the construct?*	Deleting an item may alter the conceptual domain of the construct	Deleting an item should not alter the conceptual domain of the construct
3 Covariation among items	It is not necessary for items to covary with one other	Items are expected to covary
3a *Should a change in one of the items be associated with changes that occur in the other items?*	Not necessarily	Required
3b *Should measures demonstrate internal consistency (reliability)?*	Not necessarily	Required
4 Nomological net of the construct items	Nomological net for the items may differ	Nomological net for the items should not differ
4a *Are the items expected to have the same antecedents and consequences?*	Items are not required to have the same antecedents and consequences	Items must have the same antecedents and consequences

The first set of questions is related to the direction of causality between the items and the construct for which they are intended to measure. "For formative measurement models, the direction of causality flows from the measures to the construct, and it flows from the construct to the measures for reflective measurement models," (Jarvis et al., 2007: p. 203). This is illustrated in figure 4.2.2.1. The next set of questions deals with the interchangeability of the items of a construct. "The indicators need not be interchangeable for formative measurement models but should be for reflective measurement models," (Jarvis et al., 2007: p. 203). The third set of questions address the covariation among indicator items. "Covariation among indicators is not necessary or implied by formative models, but covariation among the indicators is a necessary condition for reflective models," (Jarvis et al., 2003: p. 203). The final set of questions leads the researcher to investigate the nomological net of the construct items. A nomological net is a group of variables which are posited to share relationships "based on theory or prior research," (Hair et al., 2006: p. 138). These consist of antecedents and consequences of the variable under study. This final set of questions seeks to understand whether or not the variables (or measurement items) share the same set of antecedents and consequences. "For the reflective indicator model, since all of the indicators reflect the same underlying construct and are assumed to be interchangeable, they should all have the same antecedents and consequences. However, for the formative indicator model, because the measures do not necessarily capture the same aspects of the construct's domain and are therefore not necessarily interchangeable, there is no reason to expect them to have the same antecedents and consequences," (Jarvis et al., 2003: p. 203).

In applying the four question filter of Jarvis et al. (2003) to the conceptualized constructs and hypothesized relationships posited in this study, a distinction emerges with regard to the appropriate measurement approach. The higher order constructs are conceptualized as formative models, while the first order measurement models are conceptualized as reflective constructs.

Consider the integrative information and resource strategy higher order construct for example. Its first order models (leagile supply chain strategy, patient-focused IS strategy, Physician-focused IS strategy, and operational IS strategy) are all distinct dimensions of an integrative information and resource strategy and the omission of any one dimension would alter the construct's definition, changing its meaning in this study (criterion 1: formative). This is similar to the earlier example of the Petter et al. (2007) organizational performance variable. When productivity was removed it fundamentally alter the meaning or definition of the variable. Likewise, the dimensions of the integrative information and resource strategy construct are clearly not interchangeable. For example, the content of the patient-focused IS strategy does not overlap significantly with the operational IS strategy variable. Therefore, the deletion of either the patient-focused IS strategy variable or the operational IS strategy variable would alter the conceptual domain of the construct (criterion 2: formative). Next, the first order constructs of integrative information and resource strategy may or may not covary. These represent different types of strategies guiding efforts in different functional areas of the firm and as such, they may or may not be related. The literature guides the development of this construct based on the notion that supply chain deals with the management of information and resources (Lambert and Cooper, 2000) but these are not necessarily correlated (criterion 3: formative). Finally, in investigating the nomological net of these first order constructs, it is clear that they likely share different antecedents and consequences (criterion 4: formative). For example, why would a patient-focused IS strategy be linked to trust among the hospital's medical staff (one of the first order antecedents) or strategic physician partnership (one of the first order consequences)? However, a physician-focused IS strategy is likely to be linked to trust among the hospital's medical staff (one of the first order antecedents) and strategic physician partnership (one of the first order consequences). These assessments form a common theme for all of the higher order constructs; Partner Relationship, Integrative Information and Resource Strategy, Entrepreneurial Culture, Integrative Supply Chain Practices, Value Dense Environment, Supply Chain Performance, and Healthcare Delivery Capability. Therefore, the criteria of the Jarvis et al. (2003) filter leads the researcher to model the higher order constructs as formative.

Conversely, when assessing the first order constructs against the Jarvis et al. (2003) filters, it becomes apparent that these are best modeled as reflective measurement models. Consider the Leagile strategy first order construct. Its conceptual definition and measurement items are displayed in table 4.2.2.3.

Table 4.2.2.3. Conceptual definition and measurement items for leagile strategy

Conceptual definition: the extent to which a hospital encourages those involved in providing patient care to continuously improve processes by eliminating waste and non-value added activities, while understanding the needs of patients, being adaptable to change, and able to provide responsive, personalized care.
Measurement items: LA1: In care delivery, our hospital leadership encourages: process improvement. LA2: In care delivery, our hospital leadership encourages: elimination of waste. LA3: In care delivery, our hospital leadership encourages: understanding of patient needs. LA4: In care delivery, our hospital leadership encourages: adapting to change. LA5: In care delivery, our hospital leadership encourages: providing personalized care.

In considering criterion 1 from the Jarvis et al. (2003), it can be argued that the indicators items for Leagile strategy are affected by the latent construct. For example, if hospital leadership encourages Leagile activities it will be reflected in the proposed measurement items. However, if one of the items is deleted from the set it will not fundamentally alter the definition of leaglie. Consider the deletion of *'LA2: In care delivery, our hospital leadership encourages: elimination of waste.'* While the elimination of waste is clearly a core concept within the Lean literature, if this item were omitted, it would not fundamentally alter the leagile construct because *'LA1: In care delivery, our hospital leadership encourages: process improvement'* does overlap and capture much of the essence of LA2. This is also true of *'LA3: In care delivery, our hospital leadership encourages: understanding of patient needs.'* If it were eliminated, much of its trait would be captured by *'LA5: In care delivery, our hospital leadership encourages: providing personalized care*' (criterion 1: reflective). Likewise, it is reasonable to argue that to a large extent, these items could be interchangeable, measuring equal amounts of the Leagile strategy (criterion 2: reflective). Owing to the notion that these measurement items overlap in meaning, and ultimately to some extent in measurement, it would be expected that they would share some statistical covariance (criterion 3: reflective).[5] Finally, with regard to their nomological net, it is reasonable to expect that these items will share many of the same antecedents and consequences. For example, one would expect that all of the measurement items could be linked to the use of Lean principles as a consequence of the Leagile strategy (criteria 4: reflective. These assessments form a common theme for all of the first order constructs. Therefore, the

[5] Evidence will be provided later in this chapter in support of the correlation among these items.

criteria of the Jarvis et al. (2003) filter leads the researcher to model the first order constructs as reflective. This results in what Jarvis et al. (2003) refer to as a 'type II' model with reflective first order constructs serving as latent measures for formative second order constructs.

4.2.3 Assessment methodology for reflective measurement models

The researcher's ability to produce meaningful scientific findings rests on the use of valid and reliable measurement instruments. Validity is a measure of the instruments ability to measure the 'true' concept intended by the designer. Reliability on the other hand, is a measure "of the degree to which a set of indicators of a latent construct is internally consistent based on how highly interrelated the indicators are. In other words, it represents the extent to which they all measure the same thing," (Hair et al., 2006: p. 712). Reliable instruments produce measurement results which are consistent over time and populations. As such, a construct cannot be valid if it fails to be reliability, while that same construct can be reliable in the absence of validity (Gordis, 2009).

Bagozzi (1980) and Bagozzi and Phillips (1982) suggest that the key validity and reliability indicators for reflective measurement models consist of content validity, convergent validity, discriminant validity, and reliability. While content validity is assessed through comprehensive literature review (Nunnally, 1978), SEM provides rigorous statistical tests to examine construct convergent validity, discriminant validity, and reliability (Bagozzi, 1980; Fornell and Larcker, 1981; Gerbing and Anderson, 1988; Jarvis et al., 2003). Thus, Confirmatory Factor Analysis (CFA) incorporating Statistical Package for the Social Sciences (SPSS) 15.0 and Analysis of Moment Structures

(AMOS) 5.0 was employed to evaluate the properties of the measures addressing the latent first order constructs in this study. This technique has been suggested as an appropriate technique for theoretical model testing (Hair, et al., 2006) and is an acceptable approach for assessing the convergent and discriminant validity of the constructs under study.

Content validity assesses the representativeness of each measurement item in relation to its theoretically posited construct. A construct is said to possess content validity when the items of the construct sufficiently cover the domain of that construct (Kerlinger, 1978; Churchill, 1979). Content validity is examined through a comprehensive literature review (Nunnally, 1978), an evaluation of the measurement items by expert judges such as other academic researchers or practitioners, and/or through Q-sort testing (Moore and Banbasat, 1991). This study employed all three procedures to ensure the content validity of the constructs under study. This is detailed in chapters 2 and 3.

Convergent validity assesses the extent to which the measurement items in one construct come together to form a single common dimension. As stated, confirmatory methods using AMOS are employed by this study to assess the validity of the first order measurement models. Model fit statistics assess how well the sample data fit the hypothesized model. "Measurement model validity depends on the 'goodness of fit' for the measurement model" (Hair et al., 2006: p. 745). The goodness of fit (GFI), adjusted goodness of fit (AGFI), and root mean square residual (RMR) indices are provided for each first order measurement model (Hair et al., 2006; Liao, 2008). Generally, GFI values > 0.85 (preferably > 0.90) and AGFI > 0.80 are considered acceptable measures for model fit (Hadjistavropoulos et. al., 1999; Hair et. al., 1998). RMR is an error fit indicator and as such lower values represent adequacy in the model. RMR values < 0.05 indicate good fit while values < 0.08 represent reasonably acceptable errors of approximation (Browne and Cudeck, 1993). RMR values < 0.10 indicate mediocre fit, and those > 0.10 indicate poor fit (MacCallum et. al., 1996). This study also employs the comparative fit index (CFI) and the normed fit index (NFI), given that these are widely accepted as incremental model fit indices which consider values > 0.90 to be associated with acceptable model fit (Hair et al., 2006).

In CFA, the average variance extracted (AVE) among a set of construct items may also be used as an indicator of convergence and as such AVE is also provided for each first order measurement model (Fornell and Larcker, 1981; Hair et al., 2006). Hair et al. (2006) suggest that value of 0.5 or higher (>0.5) is an adequate measure of convergence and as such will represent the target threshold for convergent validity in this study.

Discriminant validity examines the extent to which the measurement items form a unique dimension of a construct which is independent of all other dimensions (Bagozzi and Phillips, 1982). Discriminant validity is assessed in CFA by pairing constructs and comparing AVE to the square of the correlation estimates between the two constructs. Fornell and Larcker (1981) suggest that this is an appropriate approach, by which if the AVE estimate is greater than the squared correlation estimate, discriminant validity exists (Hair et al., 2006). The single-factor/two-factor (pairwise) X^2 test is also used to provide evidence of discriminant validity (Segars, 1997). This consists of three steps. First, two dimensions in one construct are modeled to form a correlated model and the X^2 value of this two-factor model is recorded. Next, a single factor with all of the hypothesized measurement items from those two dimensions is tested and the X^2 value is recorded. Finally, the two recorded values are compared and discriminant validity is supported if the difference in the two X^2 values (df = 1) is significant at the $p < 0.05$ level (Joreskog, 1971). The result of the single-factor/two-factor (pairwise) X^2 is provided for each first order construct.

Reliability is the extent to which a construct can produce the same results in repeated attempts. Cronbach's alpha (α) is provided as a measure of reliability for each first order construct. This study employs a reliability threshold for Cronbach's α of > 0.70. Although the generally accepted value for Cronbach's α is 0.70 to 0.80 in confirmatory research (Field, 2005), others suggest that values > 0.60 are acceptable for newly developed scales such as those examined herein (Nunnally, 1978). The targeted CFA statistical cut-off values employed in this study are summarized in table 4.2.3.1.

Table 4.2.3.1. Summary of statistical cut-off values for measurement models

GFI	AGFI	RMR	CFI	NFI	AVE	α
> 0.85	> 0.80	< 0.10	> 0.90	> 0.90	> 0.50	> 0.70

Upon confirmation of each first order construct's validity and reliability, many of the first order constructs are modeled as linear composite measures in the formative structural model (MacCallum and Browne, 1993; Rai et al., 2006; Petter et al., 2007). When appropriate to preserve theoretically hypothesized measurement relationships, a priori specified groups of first order constructs have been aggregated to form composite measures. The structural model will be discussed in chapter 5.

4.2.4 Measurement model analysis and results

The measurement model validation results for the each of the seven constructs will be provided in subsections 4.2.4.1 through 4.2.4.7.

4.2.4.1 Partner Relationship

Convergent validity and reliability: The twelve items for Partner Relationship and their corresponding codes are listed in table 4.2.4.1.1. The lambdas for these items are provided immediately following each surviving item. AVE and Cronbach's α values (for reliability testing) for the final measurement model are displayed following the construct name. The items have been sequentially deleted in the CFA using AMOS in an effort to improve convergent validity while preserving the content validity of the construct.

TRT3 has been deleted to improve model fit. Upon review and discussion with practitioners it has been determined that respect for the confidentiality of patient information among physicians is simply expected in the course of normal operations and is not a measure of trust. The initial model fit for the commitment dimension demonstrated adequate model fit and was not modified. SV3 has been deleted from the shared vision construct. Upon review it was determined that SV3 was not a good fit with the other SV items as 'collaboration' infers action whereas the other items are more closely related to vision. The initial model fit indexes and final model fit indexes are provided in the table. All of the model fit values as well as the AVE values indicate adequate convergent validity for each dimension of the construct. Additionally, the

Cronbach's α values provide sufficient evidence of reliability for each dimension of the construct.

Table 4.2.4.1.1. Partner Relationship Measurement Model

<table>
<tr><td colspan="4">Partner Relationship: Trust (final AVE=.65, α=.83)</td></tr>
<tr><th>Coding</th><th>Item</th><th>Initial Model Fit</th><th>Final Model Fit</th></tr>
<tr><td colspan="2">Our admitting/attending physicians have:</td><td rowspan="5">GFI= 0.934
AGFI= 0.668
RMR= 0.034
CFI= 0.908
NFI= 0.904</td><td rowspan="5">GFI= 0.936**
AGFI= 0.863
RMR= 0.028
CFI= 0.958
NFI= 0.944</td></tr>
<tr><td>TRT1</td><td>been honest in dealing with our staff. (λ=.97)</td></tr>
<tr><td>TRT2</td><td>been open in dealing with our staff. (λ=.77)</td></tr>
<tr><td>TRT3*</td><td>respect for the confidentiality of patient information. (deleted)</td></tr>
<tr><td>TRT4</td><td>earned our confidence through their clinical practices. (λ=.65)</td></tr>
<tr><td colspan="4">Partner Relationship: Commitment (final AVE=.70, α=.90)</td></tr>
<tr><td colspan="2">Our admitting/attending physicians:</td><td rowspan="5">GFI= 0.998
AGFI= 0.990
RMR= 0.004
CFI= 1.00
NFI= 0.998</td><td rowspan="5">No change</td></tr>
<tr><td>COM1</td><td>make an effort to work with our staff. (λ=.82)</td></tr>
<tr><td>COM2</td><td>are willing to provide assistance to our staff. (λ=.83)</td></tr>
<tr><td>COM3</td><td>abide by their commitments. (λ=.84)</td></tr>
<tr><td>COM4</td><td>exert effort to maintain our relationship. (λ=.85)</td></tr>
<tr><td colspan="4">Partner Relationship: Shared Vision (final AVE=.67, α=.85)</td></tr>
<tr><td colspan="2">Our admitting/attending physicians share our:</td><td rowspan="5">GFI= 0.948
AGFI= 0.739
RMR= 0.025
CFI= 0.953
NFI= 0.949</td><td rowspan="5">GFI= 0.970**
AGFI= 0.936
RMR= 0.025
CFI= 0.991
NFI= 0.976</td></tr>
<tr><td>SV1</td><td>patient care beliefs. (λ=.92)</td></tr>
<tr><td>SV2</td><td>patient care objectives. (λ=.83)</td></tr>
<tr><td>SV3*</td><td>emphasis on collaboration in patient care. (deleted)</td></tr>
<tr><td>SV4</td><td>interest in improvements that benefit patients. (λ=.70)</td></tr>
<tr><td colspan="4">* Item deleted during purification.
** The overall model fit indexes were tested using a correlated model including this construct and the Commitment construct; the lambdas for each of the three items are significant at p <0.001.</td></tr>
</table>

Discriminant validity: Table 4.2.4.1.2 displays the results of the single-factor/two-factor (pairwise) X^2 test for discriminant validity. The differences in chi-square values for each pair of dimensions are all significant at $p < 0.001$ (df = 1, critical value = 12.875), providing sufficient evidence of discriminant validity.

Table 4.2.4.1.2. Partner Relationship – discriminant validity assessment (pairwise comparison of X^2 values).

	COM			SV		
	Cor.	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**
TRT	47.5	152.3	***104.8***	31.7	150.0	***118.3***
COM				20.4	127.9	***107.5***

Cor. = Correlated Model; Sin. = Single Factor Model; Δ = Difference between the Correlated Model and Single Factor Models. (df = 1, critical value = 12.873).

Figure 4.2.4.1.1 displays the variable correlations. While this is not a necessary condition for formative models (the structural model), it does suggest that there is some relationship among these dimensions of Partner Relationship. Following Rai et al. (2006), linear composites were then calculated using the multivariate means for Trust, Commitment, and Shared Vision. "The multivariate mean is based on the summated mean values of items and offers the advantage of being replicable across samples," (Rai et al., 2006: p. 234). Further, this approach is recommended by Hair et al. (1995) when measures have been developed and transferability is the aim. Thus, these linear composites were then used as measures in the formative structural model.

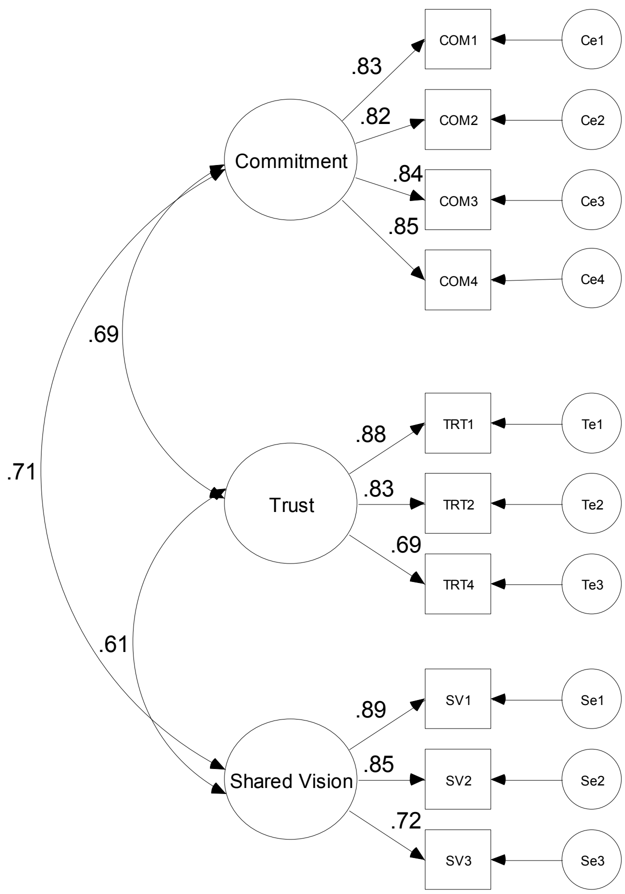


Figure 4.2.4.1.1. Correlated model for Partner Relationship

4.2.4.2 Integrative Information & Resource Strategy

Convergent validity and reliability: The eighteen items for Integrative Information and Resource Strategy and their corresponding codes are listed in table 4.2.4.2.1. The lambdas for these items are provided immediately following each surviving item. AVE and Cronbach's α values (for reliability testing) for the final measurement model are displayed following the construct name. The items have been sequentially deleted in the CFA using AMOS in an effort to improve convergent validity while preserving the content validity of the construct.

Table 4.2.4.2.1. Integrative Information & Resource Strategy Measurement Model

Coding	Item	Initial Model Fit	Final Model Fit
Integrative Information & Resource Strategy: Leagile Strategy *(final AVE=.66, α=.90)*			
In care delivery, our hospital leadership encourages:		GFI= 0.981 AGFI= 0.942 RMR= .010 CFI= 0.993 NFI= 0.984	No change
LA1	process improvement. (λ=.81)		
LA2	elimination of waste. (λ=.74)		
LA3	understanding of patient needs. (λ=.88)		
LA4	adapting to change. (λ=.84)		
LA5	providing personalized care. (λ=.78)		
Integrative Information & Resource Strategy: Patient-focused IS Strat. *(final AVE=.68, α=.89)*			
In care delivery, our hospital places importance on the use of IT to:		GFI= 0.993 AGFI= 0.964 RMR= 0.014 CFI= 0.998 NFI= 0.994	No change
PIS1	recognize the patient's needs. (λ=.90)		
PIS2	ensure that clinical milestones are met for specific patient needs. (λ=.92)		
PIS3	respond quicker to patient needs. (λ=.73)		
PIS4	improve relationships with patients. (λ=.73)		
Integrative Information & Resource Strategy: Physician-focused IS Strat. *(final AVE=.66, α=.88)*			
Our hospital places importance on the use of IT to:		GFI= 0.905 AGFI= 0.716 RMR= 0.028 CFI= 0.924 NFI= 0.917	GFI= 0.984 AGFI= 0.920 RMR= 0.011 CFI= 0.991 NFI= 0.986
DIS1	share information with physicians. (λ=.88)		
DIS2	improve communication with physicians. (λ=.85)		
DIS3	communicate the status of orders (i.e., diagnostics) with physicians. (λ=.78)		
DIS4*	integrate plans of treatment with physicians. *(deleted)*		
DIS5	develop stronger relationships with physicians. (λ=.75)		
Integrative Information & Resource Strategy: Operational IS Strategy *(final AVE=.82, α=.93)*			
Our hospital places importance on the use of IT to reduce:		GFI= 0.928 AGFI= 0.642 RMR= 0.019 CFI= 0.964 NFI= 0.961	GFI= 0.977** AGFI= 0.951 RMR= 0.024 CFI= 0.999 NFI= 0.986
OIS1*	time to process orders (i.e., labs). *(deleted)*		
OIS2	cost to process orders. (λ=.89)		
OIS3	cost of administration. (λ=.91)		
OIS4	cost of delivering care. (λ=.92)		

* Item deleted during purification.
** The overall model fit indexes were tested using a correlated model including this construct and the Patient-focused IS Strategy construct; the lambdas for each of the three items are significant at $p < 0.001$.

The initial model fit for the Leagile Strategy and Patient-focused IS Strategy dimensions demonstrated adequate model fit and were not modified. DIS4 has been deleted to improve model fit as it was determined to be slightly ambiguous juxtaposed to the other items. OIS1 has been deleted to improve model fit and was determined to be not directly associated with the items dealing with cost. The initial model fit indexes and final model fit indexes are provided in the table. All of the model fit values as well as the AVE values indicate adequate convergent validity for each dimension of the construct. Additionally, the Cronbach's α values provide sufficient evidence of reliability for each dimension of the construct.

Discriminant validity: Table 4.2.4.1.2 displays the results of the single-factor/two-factor (pairwise) X^2 test for discriminant validity. The differences in chi-square values for each pair of dimensions are all significant at $p < 0.001$ (df = 1, critical value = 13.412), providing sufficient evidence of discriminant validity.

Table 4.2.4.2.2. Integrative Information & Resource Strategy – discriminant validity assessment (pairwise comparison of X^2 values).

	LA			PIS			DIS		
	Cor.	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**
OIS	39.6	446.7	***407.1***	14.4	263	***248.6***	23.6	383.0	***359.4***
LA				30.8	352.2	***321.4***	42.9	392.0	***349.1***
PIS							43.6	341.9	***298.3***
Cor. = Correlated Model; Sin. = Single Factor Model; Δ = Difference between the Correlated Model and Single Factor Models. (df = 1, critical value = 13.412).									

The Integrative Information and Resource Strategy construct was conceptualized with two dimensions: 1) Leagile SC Strategy and 2) IS for Comprehensiveness Strategy. This was discussed in section 2.7. See also table 2.7.1. IS for Comprehensiveness Strategy is comprised of three dimensions: 1) Patient-focused IS Strategy, 2) Physician-focused IS Strategy, and 3) Operational IS Strategy. Figure 4.2.4.2.1 displays the variable correlations for the IS for Comprehensiveness Strategy. The variable correlations suggest that there is some relationship among these dimensions of IS for Comprehensiveness. The final measurement models for Patient-focused IS Strategy, Physician-focused IS Strategy, and Operational IS Strategy were then used to develop multivariate means which have been aggregated in a composite measure for use in the formative structural model.

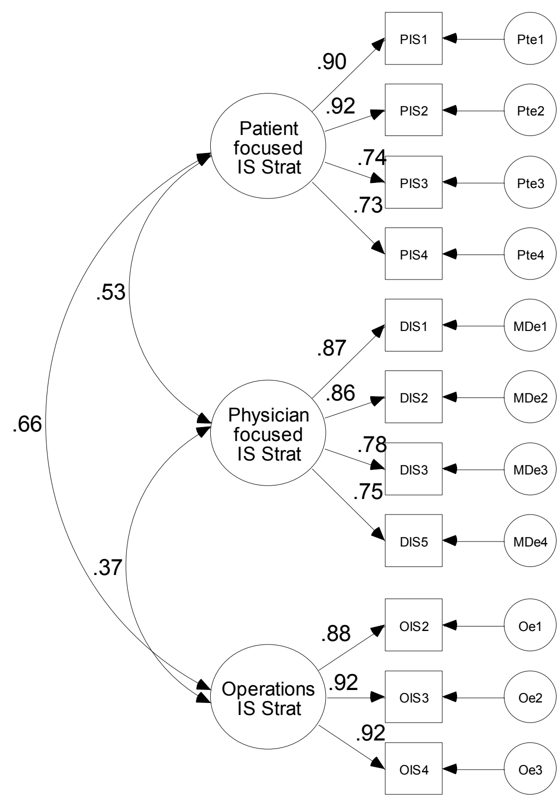


Figure 4.2.4.2.1. Correlated model for IS for Comprehensiveness Strategy

The final measurement model for Leagile SC Strategy was also used to develop a multivariate mean for measurement in the formative structural model. Again see Rai et al. (2006). The correlation between these composite measures is displayed in figure 4.2.4.2.2. While this is not a necessary condition for formative models (the structural model), it does suggest that there is some relationship among the two dimensions of Integrative Information and Resource Strategy.

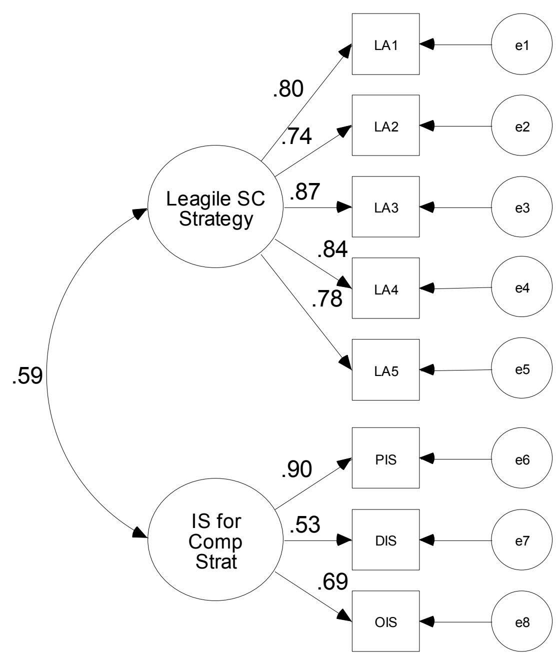


Figure 4.2.4.2.2. Correlated model for IS for Comprehensiveness and Leagile Strategy

4.2.4.3 Entrepreneurial Culture

Convergent validity and reliability: The twenty items for entrepreneurial culture and their corresponding codes are listed in table 4.2.4.3.1. The lambdas for these items are provided immediately following each surviving item. AVE and Cronbach's α values (for reliability testing) for the final measurement model are displayed following the construct name. The items have been sequentially deleted in the CFA using AMOS in an effort to improve convergent validity while preserving the content validity of the construct.

The initial model fit for the Proactiveness, Autonomy, Motivation, and Innovativeness dimensions demonstrated adequate model fit and were not modified. ECC3 has been deleted to improve model fit as it was determined that it likely overlaps with ECC1. The initial model fit indexes and final model fit indexes are provided in the table. All of the model fit values as well as the AVE values indicate adequate convergent validity for each dimension of the construct. Additionally, the Cronbach's α values provide sufficient evidence of reliability for each dimension of the construct.

Discriminant validity: Table 4.2.4.3.2 displays the results of the single-factor/two-factor (pairwise) X^2 test for discriminant validity. The differences in chi-square values for each pair of dimensions are all significant at $p < 0.001$ (df = 1, critical value = 13.831), providing sufficient evidence of discriminant validity.

Table 4.2.4.3.1. Entrepreneurial Culture Measurement Model

Coding	Item	Initial Model Fit	Final Model Fit
Entrepreneurial Culture: Proactiveness *(final AVE=.78, α=.93)*			
Our hospital:		GFI= 0.970 AGFI= 0.852 RMR= 0.015 CFI= 0.984 NFI= 0.981	No change
ECP1	takes action to anticipate future market conditions. (λ=.87)		
ECP2	tries to prospectively affect the environment to enhance external relationships to improve our performance in the market. (λ=.91)		
ECP3	seeks new opportunities because market conditions are changing. (λ=.92)		
ECP4	builds capabilities to cope with emerging demands. (λ=.83)		
Entrepreneurial Culture: Autonomy *(final AVE=.70, α=.90)*			
At our hospital:		GFI= 0.974 AGFI= 0.870 RMR= 0.023 CFI= 0.983 NFI= 0.980	No change
ECA1	employees are encouraged to envision new ideas for services. (λ=.91)		
ECA2	management encourages independent activity by employees to improve patient care. (λ=.84)		
ECA3	identifying new business ideas is the concern of all employees. (λ=.73)		
ECA4	employees are encouraged to develop ideas for improving services. (λ=.87)		
Entrepreneurial Culture: Competitive Aggressiveness *(final AVE=.75, α=.89)*			
We:		GFI= 0.960 AGFI= 0.798 RMR= 0.035 CFI= 0.970 NFI= 0.967	GFI= 0.967** AGFI= 0.930 RMR= 0.018 CFI= 0.988 NFI= 0.977
ECC1	directly challenge our competitors. (λ=.81)		
ECC2	are responsive to maneuvers of our rivals. (λ=.92)		
ECC3*	can be said to be aggressive toward our competitors. *(deleted)*		
ECC4	respond to the actions of our competitors. (λ=.86)		
Entrepreneurial Culture: Motivation *(final AVE=.70, α=.90)*			
At our hospital, employees:		GFI= 0.999 AGFI= 0.995 RMR= 0.003 CFI= 1.00 NFI= 0.999	No change
ECM1	have high motivation towards work. (λ=.88)		
ECM2	are a group of hard working individuals. (λ=.73)		
ECM3	are very ambitious. (λ=.82)		
ECM4	have a “can do” attitude towards work. (λ=.90)		

Table 4.2.4.3.1. Entrepreneurial Culture Measurement Model Continued

Entrepreneurial Culture: Innovativeness *(final AVE=.72, α=.91)*			
Our hospital:		GFI= 0.974 AGFI= 0.872 RMR= 0.023 CFI= 0.986 NFI= 0.982	No change
ECI1	is known as an innovator among hospitals in our region. (λ=.86)		
ECI2	promotes new, innovative services. (λ=.91)		
ECI3	provides leadership in creating new services. (λ=.85)		
ECI4	is on the leading edge in creating new technologies. (λ=.78)		
* Item deleted during purification. ** The overall model fit indexes were tested using a correlated model including this construct and the Proactiveness construct; the lambdas for each of the three items are significant at p <0.001.			

Table 4.2.4.3.2. Entrepreneurial Culture – discriminant validity assessment (pairwise comparison of X^2 values).

	ECP			ECA			ECC			ECM		
	Cor.	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**
ECI	55.8	391.7	***335.9***	50.9	436.8	***385.9***	19.4	250.2	***230.8***	30.2	422.1	***391.9***
ECP				36.2	269.8	***233.6***	25.8	236.0	***210.2***	26.4	417.2	***390.8***
ECA							20.6	283.8	***263.2***	41.1	348.3	***307.2***
ECC										9.5	325.7	***316.2***
Cor. = Correlated Model; Sin. = Single Factor Model; Δ = Difference between the Correlated Model and Single Factor Models. (df = 1, critical value = 13.831).												

Figure 4.2.4.3.1 displays the variable correlations. While this is not a necessary condition for formative models (the structural model), it does suggest that there is some relationship among these dimensions of Entrepreneurial Culture. The final measurement models for Proactiveness, Autonomy, Competitive Aggressiveness, Motivation, and Innovativeness were then used to develop multivariate means for use as linear composite measures in the formative structural model (Rai et al., 2006).

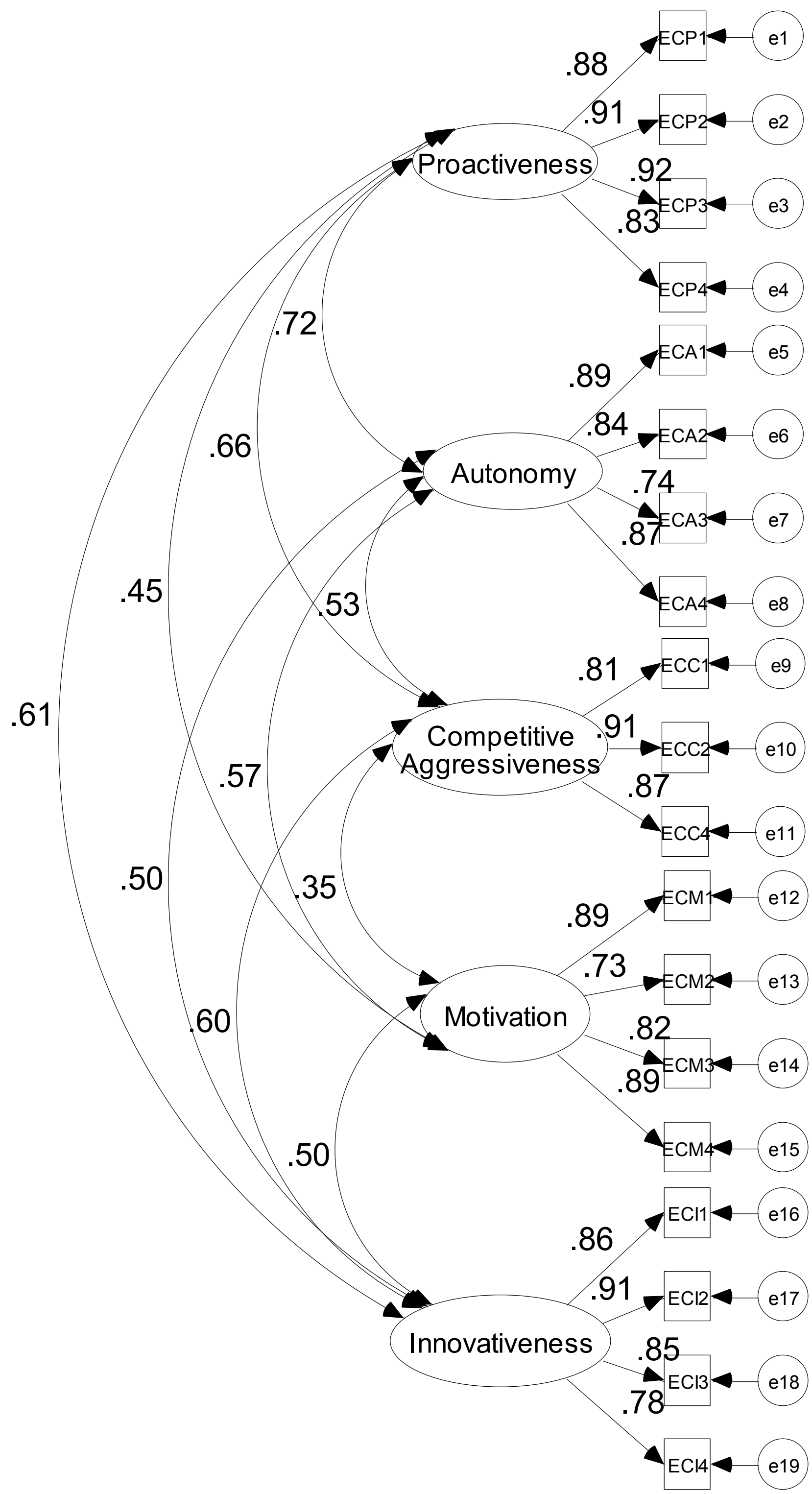


Figure 4.2.4.3.1. Correlated model for Entrepreneurial Culture

4.2.4.4 Integrative Supply Chain Practices

Convergent validity and reliability: The fifty-three items for Integrative SC Practices and their corresponding codes are listed in table 4.2.4.4.1 (which is a 2 page table). The lambdas for these items are provided immediately following each surviving item. AVE and Cronbach's α values (for reliability testing) for the final measurement model are displayed following the construct name. The items have been sequentially deleted in the CFA using AMOS in an effort to improve convergent validity while preserving the content validity of the construct.

The initial model fit for the Lean Principles, Patient Relationship, Strategic Physician Partnership, and Information Sharing dimensions demonstrated adequate model fit and were not modified. RF1 and RF6 have been deleted to improve model fit as a review of the wording of these items reveals that they do not appear to be as closely related to actual patient care as the other items. ECD1, ECD5, ECD6, and ECD7 have been deleted to improve model fit as these appear to capture phenomena which are less directly related to patient care in the inpatient setting than is true for the remaining items. For example, information about patient demographics, discharge summaries, and advanced directives are less likely to influence patient care during an inpatient stay than would information about problem (complaint) lists, nursing assessments, or physicians notes. ERV5 has been deleted to improve model fit most likely because it overlaps with the other items. While ERV6 demonstrates a low lambda value (.43), the item has been retained owing to its theoretical measurement significance. CPOE4 and CPOE5 have been deleted to improve model fit because these items (consultants reports and nursing orders) would not typically be 'ordered,' but instead would reside in the electronic chart.

The remaining items (CPOE1-lab tests, CPOE2-radiology reports, and CPOE3-medications) are all likely candidates to be ‘ordered’ using a CPOE system.

Table 4.2.4.4.1. Integrative SCM Practices Measurement Model

Integrative SCM Practices: IT Use for Asset Management *(final AVE=.69, α=.90)*			
Coding	***Item***	***Initial Model Fit***	***Final Model Fit***
We use RFID to:			
RF1*	track mobile medical equipment used in patient care (e.g., wheelchairs, incubators, surgical instruments, and pumps). *(deleted)*	GFI= 0.857	GFI= 0.964
RF2	track medications used in patient care. (λ=.69)	AGFI= 0.667	AGFI= 0.820
RF3	locate materials needed during patient care. (λ=.86)	RMR= 0.079	RMR= 0.043
RF4	monitor patient movement and location. (λ=.90)	CFI= 0.901	CFI= 0.977
RF5	coordinate medical treatment wherever patients go during care delivery. (λ=.87)	NFI= 0.892	NFI= 0.973
RF6*	monitor expiration dates of medications used in patient care. *(deleted)*		
Integrative SCM Practices: EMR for Clinical Documentation[6] *(final AVE=.56, α=.77)*			
We use EMR to capture:			
ECD1*	patient demographics. *(deleted)*		
ECD2	physician notes. (λ=.67)	GFI= 0.875	GFI= 0.974**
ECD3	nursing assessments. (λ=.72)	AGFI= 0.749	AGFI= 0.943
ECD4	problem lists. (λ=.78)	RMR= 0.068	RMR= 0.021
ECD5*	medication lists. *(deleted)*	CFI= 0.816	CFI= 0.996
ECD6*	discharge summaries. *(deleted)*	NFI= 0.793	NFI= 0.985
ECD7*	advanced directives. *(deleted)*		
Integrative SCM Practices: EMR for Results Viewing *(final AVE=.73, α=.88)*			
We use EMR to view:			
ERV1	lab results. (λ=.96)	GFI= 0.828	GFI= 0.956
ERV2	radiology reports. (λ=.97)	AGFI= 0.599	AGFI= 0.869
ERV3	radiology images. (λ=.80)	RMR= 0.044	RMR= 0.025
ERV4	diagnostic test results. (λ=.98)	CFI= 0.902	CFI= 0.985
ERV5*	diagnostic test images. *(deleted)*	NFI= 0.897	NFI= 0.981
ERV6	consultant reports. (λ=.43)		
Integrative SCM Practices: EMR for Computerized Physician Order Entry *(final AVE=.87, α=.95)*			
We use EMR to order:			
CPOE1	laboratory tests. (λ=1.0)	GFI= 0.770	GFI= 0.983**
CPOE2	radiology tests. (λ=.99)	AGFI= 0.310	AGFI= 0.954
CPOE3	medications. (λ=.80)	RMR= 0.115	RMR= 0.031
CPOE4*	consultants reports. *(deleted)*	CFI= 0.913	CFI= 0.999
CPOE5*	nursing orders. *(deleted)*	NFI= 0.910	NFI= 0.994

[6] ECD1, ECD5 and ECD6 form a factor with model fit statistics of GFI=.93, AGFI=.81, RMR=.05, and α=.66.

Table 4.2.4.4.1. Integrative SCM Practices Measurement Model Continued

Integrative SCM Practices: EMR for Decision Support *(final AVE=.75, α=.92)*			
Our EMR systems provides us with:		GFI= 0.816 AGFI= 0.570 RMR= 0.066 CFI= 0.894 NFI= 0.887	GFI= 0.979 AGFI= 0.897 RMR= 0.019 CFI= 0.990 NFI= 0.987
EDS1*	clinical guidelines. *(deleted)*		
EDS2	clinical reminders. (λ=.71)		
EDS3	drug allergy alerts. (λ=.91)		
EDS4	drug-drug interactions alerts. (λ=.97)		
EDS5	drug-lab interactions alerts. (λ=.86)		
EDS6*	drug diagnosing support. *(deleted)*		
Integrative SCM Practices: Lean Principles *(final AVE=.56, α=.86)*			
We engage in efforts to improve patient care by:		GFI= 0.939 AGFI= 0.818 RMR= 0.036 CFI= 0.933 NFI= 0.923	No change
L1	standardizing work (care pathways). (λ=.81)		
L2	creating seamless linkages among clinicians at each process handoff. (λ=.77)		
L3	using simple and direct pathways that ensure resource availability during patient care. (λ=.81)		
L4	promoting decision making based on scientifically derived evidence. (λ=.69)		
L5	eliminating waste and non-value added activities. (λ=.64)		
Integrative SCM Practices: Patient Relationship *(final AVE=.58, α=.81)*			
We:		GFI= 0.995 AGFI= 0.976 RMR= 0.006 CFI= 1.00 NFI= 0.994	No change
PS1	set service expectations with patients. (λ=.64)		
PS2	monitor patient satisfaction. (λ=.85)		
PS3	have a system for managing patient complaints. (λ=.76)		
PS4	have a program dedicated to improving patient satisfaction. (λ=.78)		
Integrative SCM Practices: Strategic Physician Partnership *(final AVE=.70, α=.90)*			
With our admitting/attending physicians:		GFI= 0.999 AGFI= 0.995 RMR= 0.003 CFI= 1.00 NFI= 0.999	No change
SPR1	we regularly partner to solve problems. (λ=.81)		
SPR2	we partner to improve quality (i.e., through CMEs). (λ=.80)		
SPR3	we partner on continuous improvement initiatives. (λ=.89)		
SPR4	we partner in planning and goal-setting. (λ=.83)		
Integrative SCM Practices: Information Sharing *(final AVE=.60, α=.88)*			
Our admitting/attending physicians:		GFI= 0.943 AGFI= 0.830 RMR= 0.029 CFI= 0.953 NFI= 0.945	No change
ISH1	receive information from us about changing patient needs. (λ=.64)		
ISH2	share patient information with us. (λ=.73)		
ISH3	keep us informed about issues that affect care delivery. (λ=.71)		
ISH4	share information with us that helps establish treatment plans. (λ=.88)		
ISH5	work with our staff to keep each other informed about changes that may affect care delivery. (λ=.90)		

Table 4.2.4.4.1. Integrative SCM Practices Measurement Model Continued

Integrative SCM Practices: Information Quality *(final AVE=.71, α=.91)*			
Information exchange between our admitting/attending physicians and us is:			
IQ1	timely. (λ=.84)	GFI= 0.931	GFI= 0.987
IQ2	accurate. (λ=.79)	AGFI= 0.793	AGFI= 0.936
IQ3	complete. (λ=.87)	RMR= 0.018	RMR= 0.009
IQ4	adequate. (λ=.88)	CFI= 0.963	CFI= 0.994
IQ5*	reliable. *(deleted)*	NFI= 0.957	NFI= 0.990
* Item deleted during purification. ** The overall model fit indexes were tested using a correlated model including this construct and the EMR for Results Viewing construct; the lambdas for each of the three items are significant at *p* <0.001.			

EDS1 has been deleted to improve model fit as it likely overlaps with EDS2 (clinical reminders). EDS2 (clinical reminders) are driven by established clinical guidelines, measured in EDS1. EDS6 (drug diagnosis support) has been deleted to improve model fit most likely because its trait is captured more directly in EDS3 (drug allergy alerts), EDS4 (drug-drug interactions alerts), and EDS5 (drug-lab interactions alerts). IQ5 has been deleted to improve mode fit as it overlaps with IQ1, IQ2, IQ3, and IQ4.

The initial model fit indexes and final model ft indexes are provided in the table. All of the model fit values as well as the AVE values indicate adequate convergent validity for each dimension of the construct. Additionally, the Cronbach's α values provide sufficient evidence of reliability for each dimension of the construct.

Discriminant validity: Tables 4.2.4.4.2 through 4.2.4.4.4 display the results of the single-factor/two-factor (pairwise) X^2 test for discriminant validity. The differences in chi-square values for each pair of dimensions are all significant at p < 0.001 (df = 1, critical value = 15.137), providing sufficient evidence of discriminant validity.

Table 4.2.4.4.2. Integrative SC Practices – discriminant validity assessment (pairwise comparison of X^2 values).

	RF			ECD			ERV			CPOE		
	Cor.	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**
EDS	41.1	627.9	***586.8***	40.3	137.8	***97.5***	36.7	643.3	***606.6***	47.9	1066.2	***1018.3***
L	68.0	416.5	***348.5***	44.7	198.4	***153.7***	57.2	434.5	***377.3***	46.6	446.3	***399.7***
PS	33.7	338.3	***304.6***	14.7	176.5	***161.8***	20.5	300.9	***280.4***	10.9	1103.7	***1092.8***
SPR	31.9	494.8	***462.9***	12.4	164.5	***152.1***	42.7	481.7	***439.0***	6.0	1099.7	***1093.7***
ISH	70.3	564.7	***494.8***	39.7	191.0	***151.3***	85.1	573.7	***488.6***	49.5	1143.0	***1093.5***
IQ	31.4	524.1	***492.7***	25.2	182.7	***157.5***	30.6	506.0	***475.4***	13.1	1105.9	***1092.8***
RF				34.1	184.7	***150.6***	33.0	1076.9	***1043.9***	37.5	1112.7	***1075.2***
ECD							18.1	175.5	***157.4***	28.9	165.0	***136.1***
ERV										18.9	1109.8	***1090.9***

Cor. = Correlated Model; Sin. = Single Factor Model; Δ = Difference between the Correlated Model and Single Factor Models. (df = 1, critical value = 15.137).

Table 4.2.4.4.3. Integrative SC Practices – discriminant validity assessment (pairwise comparison of X^2 values).

	EDS			L			PS			SPR		
	Cor.	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**
L	92.7	411.5	***318.8***									
PS	34.8	319.7	***284.9***	69.9	250.7	***180.8***						
SPR	21.1	470.7	***449.6***	72.3	362.3	***290.0***	24.4	261.0	***236.6***			
ISH	65.5	542.5	***477.0***	97.8	432.3	***334.5***	61.7	321.1	***259.4***	75.7	302.1	***226.4***
IQ	30.0	512.7	***482.7***	54.6	402.5	***347.9***	17.6	301.0	***283.4***	19.2	435.4	***416.2***

Cor. = Correlated Model; Sin. = Single Factor Model; Δ = Difference between the Correlated Model and Single Factor Models. (df = 1, critical value = 15.137).

Table 4.2.4.4.4. Integrative SC Practices – discriminant validity assessment (pairwise comparison of X^2 values).

	ISH											
	Cor.	**Sin.**	**Δ**									
IQ	58.2	223.3	***165.1***									

Cor. = Correlated Model; Sin. = Single Factor Model; Δ = Difference between the Correlated Model and Single Factor Models. (df = 1, critical value = 15.137).

Integrative SC Practices has been conceptualized with six dimensions: 1) Strategic Physician Partnership, 2) Patient Relationship, 3) Information Sharing, 4) Information Quality, 5) Lean Principles, and 6) IS Enable Processes. See table 2.9.1. The IS Enabled Processes dimension has been conceptualized to have two dimensions for the management of information (Comprehensive EMR Use) and resources (IT for Asset Management). Please refer to section 2.9 for a detailed discussion of this conceptualization. Comprehensive EMR Use has been conceptualized with four dimensions: 1) EMR for Clinical Documentation, 2) EMR for Results Viewing, 3) EMR for CPOE, and 4) EMR for Decision Support. Again, please refer to section 2.9 for a detailed discussion of this conceptualization and definitions.

Figure 4.2.4.4.1 displays the variable correlations for the dimensions of Comprehensive EMR Use (EMR for Clinical Documentation, EMR for Results Viewing, EMR for CPOE, and EMR for Decision Support). These correlations are all significant ($p < 0.01$) with the exception of the relationship between EMR for Results Viewing and EMR for CPOE. In sum, this suggests that there are some relationships among the conceptualized dimensions of Comprehensive EMR Use. The final measurement models for EMR for Clinical Documentation, EMR for Results Viewing, EMR for CPOE, and EMR for Decision Support have been used to develop multivariate factor means which have been aggregated in a linear composite measure. This linear composite measure for Comprehensive EMR Use has been correlated with IT for Asset Management, which was conceptualized as the second dimension of IS Enabled Processes in section 2.9. Figure 4.2.4.4.2 displays the variable correlation (significant at $p < 0.01$) for IS Enabled Processes which is comprised of the Comprehensive EMR Use dimension and IT for Asset Management dimension. These dimensions have been aggregated and a multivariate mean has been used to calculate a linear composite for use in the formative structural model.

Next, figure 4.2.4.4.3 displays the variable correlations for the six conceptualized dimensions of Integrative SC Practices. While correlation is not a necessary condition for formative models (the structural model), it does suggest that there is some relationship among these dimensions of Integrative SC Practices. The final measurement models for IS Enabled Processes, Lean Principles, Patient Relationship, Strategic Physician Partnership, Information Sharing, and Information Quality were then used to develop multivariate means for use as composite measures in the formative structural model.

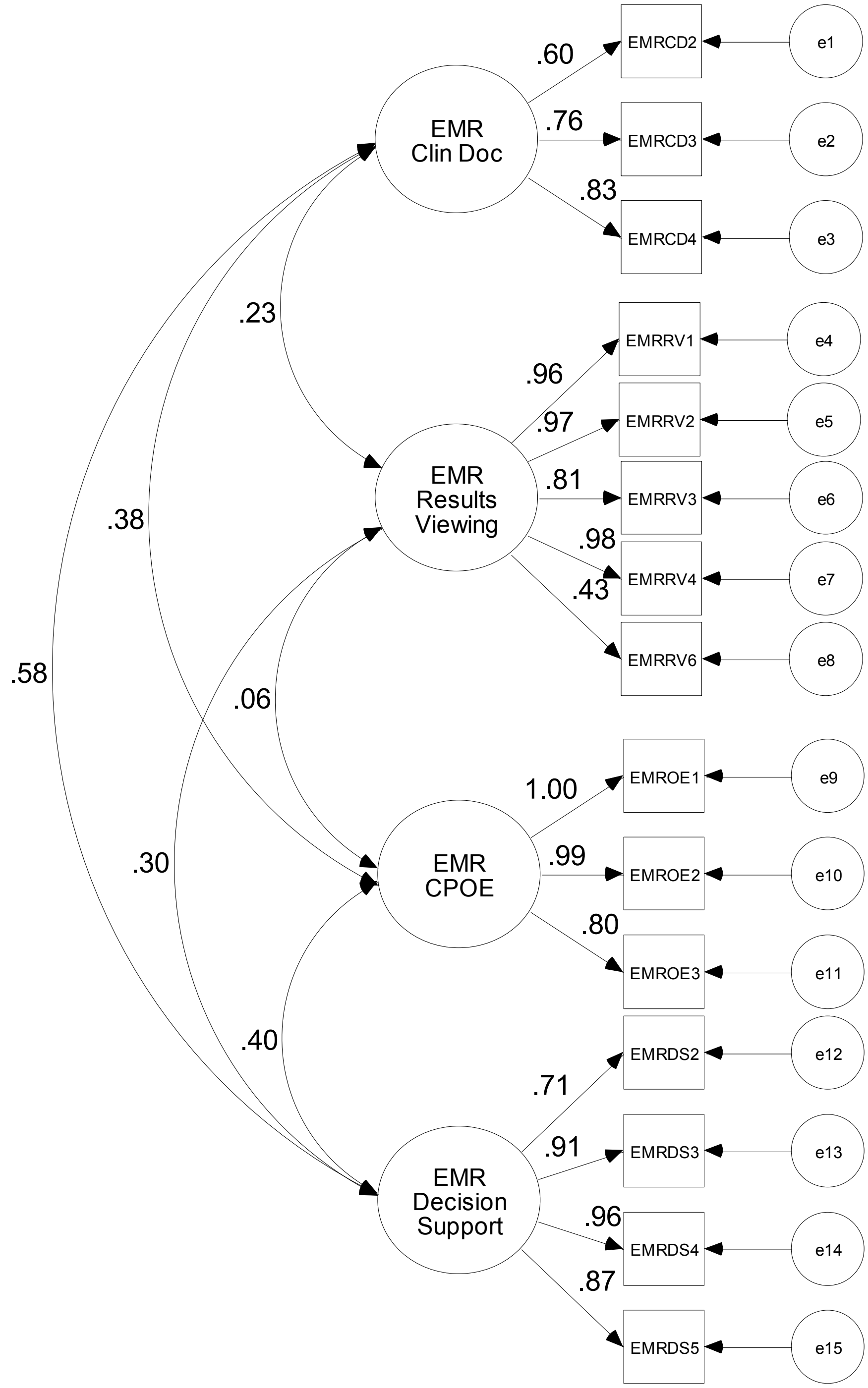


Figure 4.2.4.4.1. Correlated model for Comprehensive EMR Use

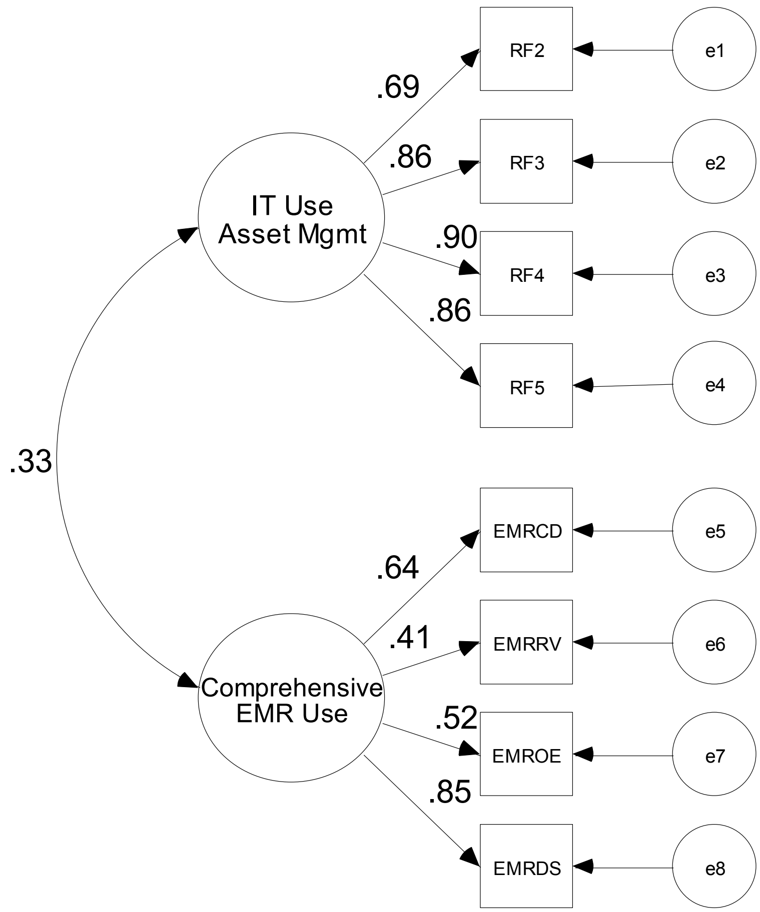


Figure 4.2.4.4.2. Correlated model for Comprehensive EMR Use and IT for Asset Management

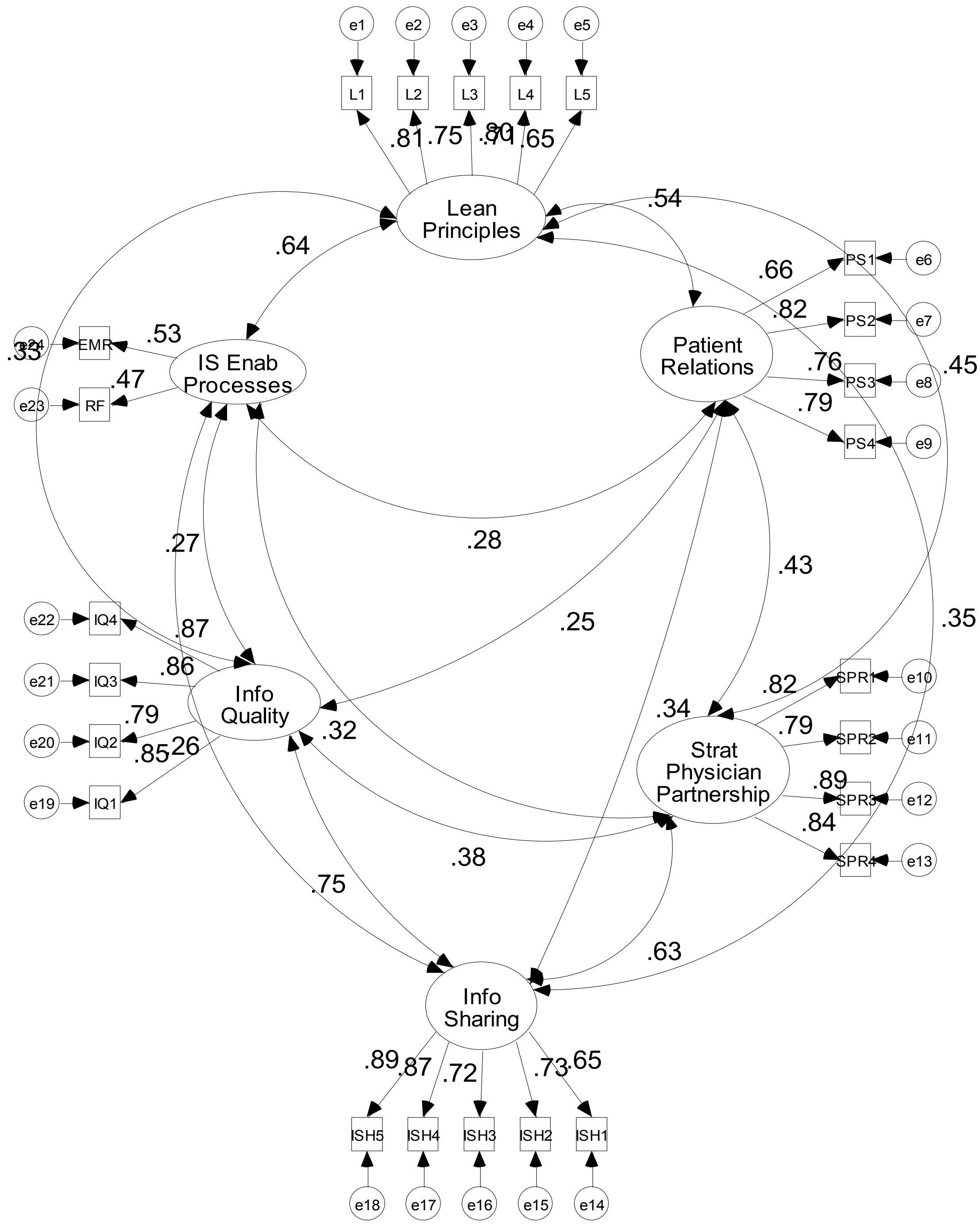


Figure 4.2.4.4.3. Correlated model for Integrative SC Practices

4.2.4.5 Value Dense Environment

Convergent validity and reliability: The fourteen items for the Value Dense Environment construct and their corresponding codes are listed in table 4.2.4.5.1. The lambdas for these items are provided immediately following each surviving item. AVE and Cronbach's α values (for reliability testing) for the final measurement model are displayed following the construct name. The items have been sequentially deleted in the CFA using AMOS in an effort to improve convergent validity while preserving the content validity of the construct.

VDW1 (physicians orders), VDW2 (consultants reports), and VDW6 (treatment protocols) have been deleted to improve model fit as it was determined that these were likely viewed by respondents as operand knowledge generated by actors outside of the hospital (focal firm). Given that the respondent was answering the questionnaire from the perspective of the hospital, this distinction may have caused the respondent to believe that 'their staff' would not find utility in items such as consultant reports and treatment protocol as those are used primarily by physicians in treating patients. VDH4 (competence) has been deleted to improve model fit as it overlaps with the remaining three items. VDR4 (facilities) has been deleted to improve model fit as it was not likely viewed as a resource directly related to patient care as would likely be the case with the remaining items. The initial model fit indexes and final model fit indexes are provided in the table. All of the model fit values as well as the AVE values indicate adequate convergent validity for each dimension of the construct. Additionally, the Cronbach's α values provide sufficient evidence of reliability for each dimension of the construct.

Table 4.2.4.5.1. Value Dense Environment Measurement Model

Value Dense Environment: Operand Knowledge[7] *(final AVE=.76, α=.88)*			
Coding	***Item***	***Initial Model Fit***	***Final Model Fit***
When caring for a particular patient, care providers have ample access to:			
VDW1*	physicians orders. *(deleted)*	GFI= 0.767	GFI= 0.970**
VDW2*	consultants reports. *(deleted)*	AGFI= 0.456	AGFI= 0.920
VDW3	previous nursing assessments. (λ=.69)	RMR= 0.061	RMR= 0.019
VDW4	radiology reports. (λ=.93)	CFI= 0.844	CFI= 0.988
VDW5	lab reports. (λ=.97)	NFI= 0.836	NFI= 0.979
VDW6*	treatment protocols. *(deleted)*		
Value Dense Environment: Operant Knowledge *(final AVE=.85, α=.95)*			
When caring for a particular patient, care providers in our hospital have the needed:		GFI= 0.891	GFI= 0.971**
VDH1	skills. (λ=.96)	AGFI= 0.453	AGFI= 0.924
VDH2	knowledge. (λ=.88)	RMR= 0.011	RMR= 0.016
VDH3	ability. (λ=.93)	CFI= 0.952	CFI= 0.991
VDH4*	competence. *(deleted)*	NFI= 0.950	NFI= 0.983
Value Dense Environment: Resources *(final AVE=.77, α=.90)*			
When caring for a particular patient, care providers in our hospital have ready access to the needed:		GFI= 0.909	GFI= 0.970***
VDR1	equipment. (λ=.79)	AGFI= 0.543	AGFI= 0.920
VDR2	medications. (λ=.83)	RMR= 0.023	RMR= 0.019
VDR3	supplies. (λ=.99)	CFI= 0.924	CFI= 0.988
VDR4*	facilities. *(deleted)*	NFI= 0.921	NFI= 0.979
* Item deleted during purification. ** The overall model fit indexes were tested using a correlated model including this construct and the Resources construct; the lambdas for each of the three items are significant at p <0.001. *** The overall model fit indexes were tested using a correlated model including this construct and the Operand Knowledge construct; the lambdas for each of the three items are significant at p <0.001.			

Discriminant validity: Table 4.2.4.5.2 displays the results of the single-factor/two-factor (pairwise) X^2 test for discriminant validity. The differences in chi-square values for each pair of dimensions are all significant at $p < 0.001$ (df = 1, critical value = 12.873), providing sufficient evidence of discriminant validity.

[7] VDW1, VDW2, and VDW6 form a factor with model fit statistics of GFI=.92, AGFI=.79, RMR=.05, and α=.83 when assessed as a correlated model with VDW3, VDW4, and VDW5.

Table 4.2.4.5.2. Value Dense Environment – discriminant validity assessment (pairwise comparison of X^2 values).

	VDH			VDR		
	Cor.	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**
VDW	11.6	382.7	***371.1***	18.0	365.5	***347.5***
VDH				17.3	340.8	***323.5***
Cor. = Correlated Model; Sin. = Single Factor Model; Δ = Difference between the Correlated Model and Single Factor Models. (df = 1, critical value = 12.873).						

Figure 4.2.4.5.1 displays the variable correlations. While this is not a necessary condition for formative models (the structural model), it does suggest that there is some relationship among these dimensions of Value Dense Environment. The final measurement models for Operand Knowledge (VDW), Operant Knowledge (VDH), and Resources (VDR) were then used to develop multivariate means for use as linear composite measures in the formative structural model (Rai et al., 2006).

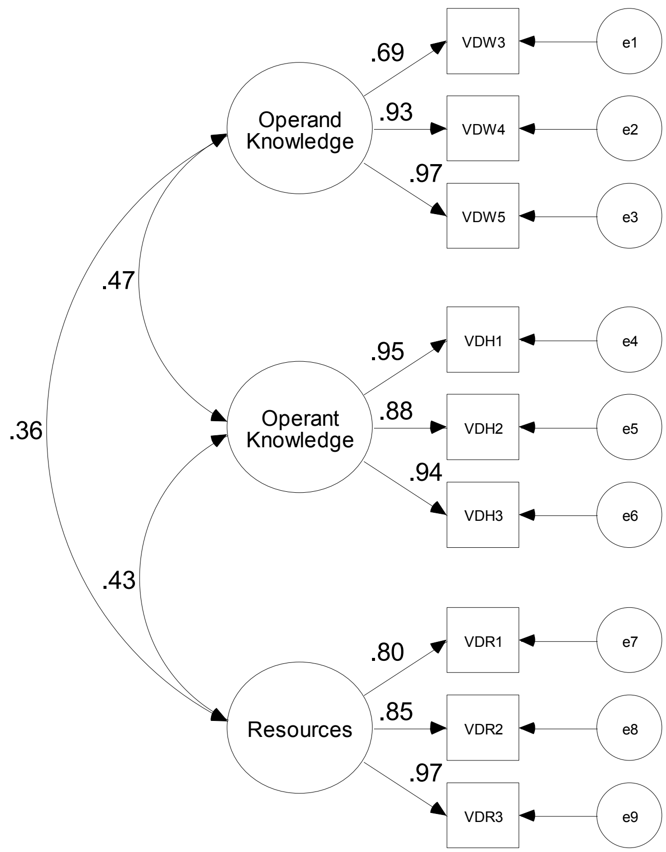


Figure 4.2.4.5.1. Correlated model for Value Dense Environment

4.2.4.6 Supply Chain Performance

Convergent validity and reliability: The twenty items for Supply Chain Performance and their corresponding codes are listed in table 4.2.4.6.1. The lambdas for these items are provided immediately following each surviving item. AVE and Cronbach's α values (for reliability testing) for the final measurement model are displayed following the construct name. The items have been sequentially deleted in the CFA using AMOS in an effort to improve convergent validity while preserving the content validity of the construct.

The initial model fit for the Patient Responsiveness, Physician Performance, and Partnership Quality dimensions demonstrated adequate model fit and were not modified. F1 has been deleted to improve model fit as it was determined that it likely overlaps with the other items. I4 has been deleted to improve model fit as it may have been viewed as ambiguous by the respondents when compared to the other items. The initial model fit indexes and final model fit indexes are provided in the table. All of the model fit values as well as the AVE values indicate adequate convergent validity for each dimension of the construct. Additionally, the Cronbach's α values provide sufficient evidence of reliability for each dimension of the construct.

Discriminant validity: Table 4.2.4.6.2 displays the results of the single-factor/two-factor (pairwise) X^2 test for discriminant validity. The differences in chi-square values for each pair of dimensions are all significant at $p < 0.001$ (df = 1, critical value = 13.412), providing sufficient evidence of discriminant validity.

Table 4.2.4.6.1. Supply Chain Performance Measurement Model

SC Performance: Flexibility *(final AVE=.61, α=.80)*			
Coding	***Item***	***Initial Model Fit***	***Final Model Fit***
Our patient care team is able to:		GFI= 0.907 AGFI= 0.534 RMR= 0.045 CFI= 0.846 NFI= 0.843	GFI= 0.953** AGFI= 0.898 RMR= 0.046 CFI= 0.976 NFI= 0.962
F1*	rapidly adjust service capacity in response to changes in patient demands. *(deleted)*		
F2	introduce large numbers of service improvements/variations. (λ=.71)		
F3	handle rapid introduction of new services. (λ=.99)		
F4	adapt when patient demands vary greatly to still provide high quality care. (λ=.60)		
SC Performance: Integration *(final AVE=.76, α=.89)*			
In our hospital:		GFI= 0.958 AGFI= 0.790 RMR= 0.049 CFI= 0.970 NFI= 0.966	GFI= 0.985** AGFI= 0.968 RMR= 0.016 CFI= 1.00 NFI= 0.991
i1	there is a high level of communication among all functions. (λ=.90)		
i2	there is a high level of coordination among all functions. (λ=.97)		
i3	cross-functional teams which include admitting/attending physicians are integrated for process design and improvement. (λ=.73)		
i4*	information systems are integrated. *(deleted)*		
SC Performance: Patient Responsiveness *(final AVE=.79, α=.94)*			
Our hospital:		GFI= 0.997 AGFI= 0.985 RMR= 0.003 CFI= 1.00 NFI= 0.998	No change
R1	fulfills patients' needs on time. (λ=.92)		
R2	has short order-to-service time. (λ=.89)		
R3	has fast patient response time. (λ=.86)		
R4	is responsive to patients' needs. (λ=.88)		
SC Performance: Physician Performance *(final AVE=.61, α=.84)*			
Our admitting/attending physicians provide:		GFI= 0.993 AGFI= 0.965 RMR= 0.009 CFI= 0.998 NFI= 0.993	No change
DP1	timely services (e.g., rounding) to patients. (λ=.57)		
DP2	dependable services to patients. (λ=.91)		
DP3	high quality services to patients. (λ=.82)		
DP4	an appropriate level of services to patients. (λ=.79)		
SC Performance: Partnership Quality *(final AVE=.56, α=.83)*			
We and our admitting/attending physicians have:		GFI= 0.988 AGFI= 0.940 RMR= 0.015 CFI= 0.991 NFI= 0.985	No change
PQ1	a profitable relationship. (λ=.64)		
PQ2	a harmonious relationship. (λ=.75)		
PQ3	a relationship which meets each others business objectives. (λ=.89)		
PQ4	a relationship which meets each others patient care objectives. (λ=.69)		

* Item deleted during purification.
** The overall model fit indexes were tested using a correlated model including this construct and the Patient Responsiveness construct; the lambdas for each of the three items are significant at p <0.001.

Table 4.2.4.6.2. Supply Chain Performance – discriminant validity assessment (pairwise comparison of X^2 values).

	F			I			R			DP		
	Cor	**Sin**	**Δ**	**Cor**	**Sin**	**Δ**	**Cor**	**Sin**	**Δ**	**Cor**	**Sin**	**Δ**
PQ	19.2	132.1	***112.9***	16.7	190.3	***173.6***	51.5	206.6	***155.1***	50.6	153.4	***102.8***
F				34.0	125.5	***91.5***	34.8	179.8	***145***	21.2	192.2	***171***
I							10.0	286.4	***276.4***	19.8	310.2	***290.4***
R										30.1	221.4	***191.3***
Cor. = Correlated Model; Sin. = Single Factor Model; Δ = Difference between the Correlated Model and Single Factor Models. (df = 1, critical value = 13.412).												

Figure 4.2.4.6.1 displays the variable correlations. While this is not a necessary condition for formative models (the structural model), it does suggest that there is some relationship among these dimensions of Supply Chain Performance. The final measurement models for Flexibility, Integration, Patient Responsiveness, Physician Performance, and Partnership Quality were then used to develop multivariate means for use as linear composite measures in the formative structural model (Rai et al., 2006).

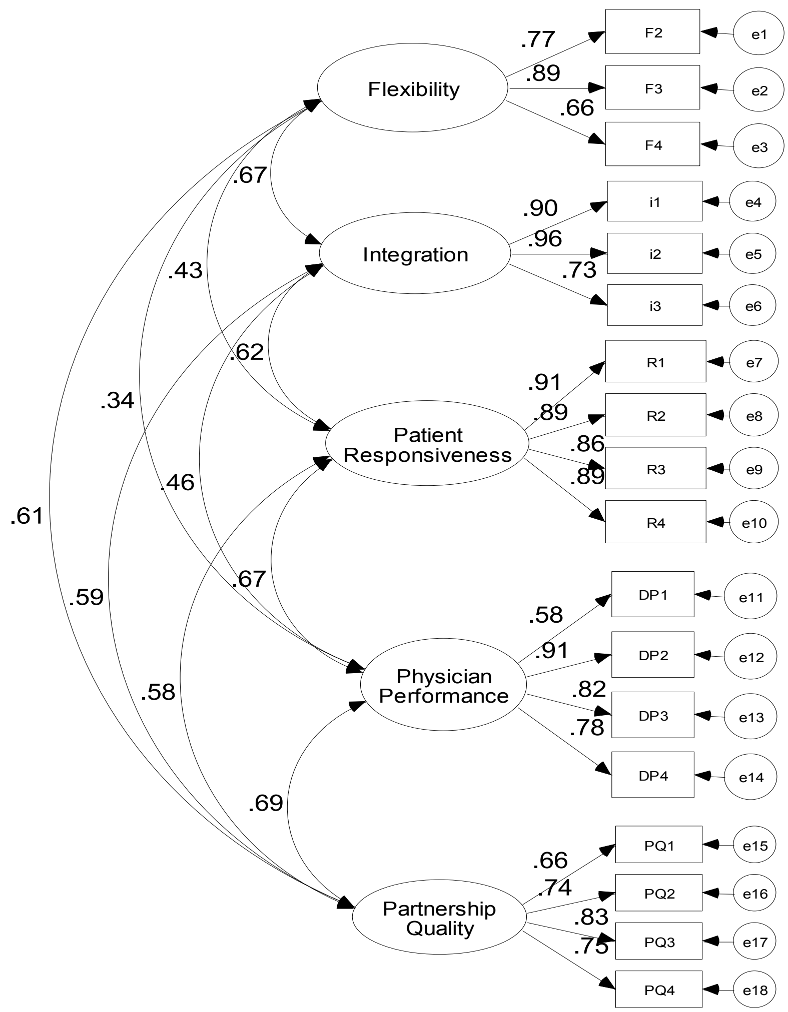


Figure 4.2.4.6.1. Correlated model for Supply Chain Performance

4.2.4.7 Healthcare Delivery Capability

Convergent validity and reliability: The twenty-three items for Healthcare Delivery Capability and their corresponding codes are listed in table 4.2.4.7.1. The lambdas for these items are provided immediately following each surviving item. AVE and Cronbach's α values (for reliability testing) for the final measurement model are displayed following the construct name. The items have been sequentially deleted in the

CFA using AMOS in an effort to improve convergent validity while preserving the content validity of the construct.

Table 4.2.4.7.1. Healthcare Delivery Capability Measurement Model

Coding	Item	Initial Model Fit	Final Model Fit
Healthcare Delivery Capability: Safety *(final AVE=.89, α=.97)*			
Compared to our competing hospitals, we are better able to minimize:		GFI= 0.975 AGFI= 0.876 RMR= 0.006 CFI= 0.993 NFI= 0.992	No change
SF1	diagnostic errors. (λ=.95)		
SF2	treatment errors. (λ=.99)		
SF3	preventive errors. (λ=.96)		
SF4	equipment failure errors. (λ=.86)		
Healthcare Delivery Capability: Effectiveness *(final AVE=.56, α=.83)*			
Compared to our competing hospitals, we achieve:		GFI= 0.912 AGFI= 0.735 RMR= 0.037 CFI= 0.905 NFI= 0.896	GFI= 0.970 AGFI= 0.851 RMR= 0.023 CFI= 0.964 NFI= 0.958
EFC1	a lower risk adjusted mortality rate. (λ=.67)		
EFC2	a lower nosocomial infection rate. (λ=.85)		
EFC3	a lower level of acuity (better outcomes) for nosocomial infections which do develop. (λ=.84)		
EFC4	fewer unplanned readmissions. (λ=.60)		
EFC5*	effective healthcare delivery. *(deleted)*		
Healthcare Delivery Capability: Patient Centeredness *(final AVE=.80, α=.94)*			
Compared to our competing hospitals, our patients feel that we are more:		GFI= 0.922 AGFI= 0.766 RMR= 0.014 CFI= 0.966 NFI= 0.961	GFI= 0.992 AGFI= 0.958 RMR= 0.005 CFI= 0.998 NFI= 0.995
PC1*	respectful of their preferences. *(deleted)*		
PC2	responsive to their medical needs. (λ=.85)		
PC3	respectful of their personal values. (λ=.88)		
PC4	responsive to their complaints. (λ=.90)		
PC5	responsive to their requests. (λ=.95)		
Healthcare Delivery Capability: Timeliness *(final AVE=.72, α=.90)*			
Compared to our competing hospitals, our efforts have resulted in:		GFI= 0.992 AGFI= 0.960 RMR= 0.010 CFI= 0.998 NFI= 0.994	No change
T1	lower average length of stay (ALOS). (λ=.67)		
T2	shorter wait times for our patients. (λ=.86)		
T3	fewer delays for those involved in patient care. (λ=.92)		
T4	timely delivery of patient care. (λ=.92)		
Healthcare Delivery Capability: Efficiency *(final AVE=.67, α=.88)*			
Compared to our competitors, we do a better job of:		GFI= 0.914 AGFI= 0.742 RMR= 0.043 CFI= 0.931 NFI= 0.924	GFI= 0.999 AGFI= 0.993 RMR= 0.005 CFI= 1.00 NFI= 0.999
EFI1	attaining high equipment utilization. (λ=.70)		
EFI2	eliminating waste of supplies. (λ=.91)		
EFI3	eliminating waste of energy. (λ=.92)		
EFI4	holding down inpatient costs. (λ=.73)		
EFI5*	attaining higher labor productivity. *(deleted)*		
* Item deleted during purification.			

The initial model fit for the Safety and Timeliness dimensions demonstrated adequate model fit and were not modified. EFC5 has been deleted to improve model fit as it was determined that it likely overlaps with the other items. PC1 (respectful of their [patient] preferences) has been deleted to improve model fit as it likely overlaps with PC5 (responsive to their [patient] requests). EFI5 has been deleted to improve model fit as it likely overlaps with the other items. The initial model fit indexes and final model fit indexes are provided in the table. All of the model fit values as well as the AVE values indicate adequate convergent validity for each dimension of the construct. Additionally, the Cronbach's α values provide sufficient evidence of reliability for each dimension of the construct.

Discriminant validity: Table 4.2.4.7.2 displays the results of the single-factor/two-factor (pairwise) X^2 test for discriminant validity. The differences in chi-square values for each pair of dimensions are all significant at $p < 0.001$ (df = 1, critical value = 13.412), providing sufficient evidence of discriminant validity.

Table 4.2.4.7.2. Healthcare Delivery Capability – discriminant validity assessment (pairwise comparison of X^2 values).

	SF			EFC			PC			T		
	Cor.	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**	**Cor.**	**Sin.**	**Δ**
EFI	56.6	389.5	***332.9***	61.6	198.8	***137.3***	35.8	381.9	***346.1***	36.4	235.0	***198.6***
SF				49.6	228.1	***178.5***	38.6	674.5	***653.9***	34.6	518.5	***483.9***
EFC							52.2	244.1	***191.9***	42.8	189.0	***146.2***
PC										39.1	438.3	***399.2***

Cor. = Correlated Model; Sin. = Single Factor Model; Δ = Difference between the Correlated Model and Single Factor Models. (df = 1, critical value = 13.412).

Figure 4.2.4.7.1 displays the variable correlations. While this is not a necessary condition for formative models (the structural model), it does suggest that there is some relationship among these dimensions of Healthcare Delivery Capability. The final measurement models for Safety, Effectiveness, Patient Centeredness, Timeliness, and Efficiency were then used to develop multivariate means for use as linear composite measures in the formative structural model (Rai et al., 2006).

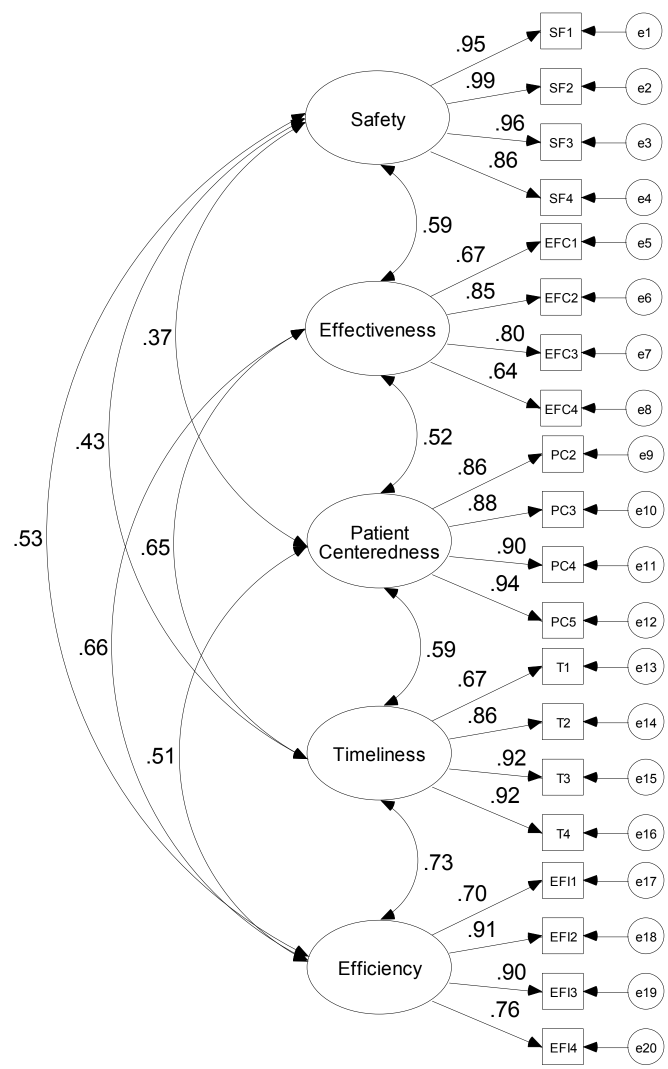


Figure 4.2.4.7.1. Correlated model for Healthcare Delivery Capability

4.2.5 AVE test of discriminant validity

Scholars suggest a second test of discriminant validity which tests the factor AVE values juxtaposed the squared correlations among the factors (Segars, 1997). Evidence of discriminant validity exists if the AVE of each construct is greater than the square of the correlations (Braunscheidel and Suresh, 2009). An acceptable alternative suggests that the square root of a construct's AVE should be greater than the correlations between constructs (Fornell and Larcker, 1981; Koufteros, 1999; Koufteros et al., 2001). Table 4.2.5.1 displays the correlations between all latent constructs. The square root of the AVE for each construct is bolded and can be found on the diagonal. Each is greater than the value of the correlations in its corresponding row and column. This provides evidence in support of discriminant validity as none of the factors share more variance with any other factors, than with its own manifest items.

Table 4.2.5.1 Correlations and Discriminant Validity Testing of First Order Constructs

	TRT	COM	SV	PIS	DIS	OIS	LA	ECP	ECA	ECC	ECM	ECI	ECD	ERV	CPOE	EDS	RF	LNP	PS	SPR	ISH	IQ	VDW	VDH	VDR	F	I	R	DP	PQ	SF	EFC	PC	T	EFI
TRT	**0.806**																																		
COM	0.626	**0.837**																																	
SV	0.565	0.650	**0.819**																																
PIS	0.203	0.202	0.087	**0.825**																															
DIS	0.285	0.288	0.241	0.473	**0.812**																														
OIS	0.161	0.152	0.076	0.624	0.346	**0.906**																													
LA	0.236	0.179	0.174	0.497	0.356	0.377	**0.812**																												
ECP	0.147	0.160	0.154	0.360	0.317	0.254	0.597	**0.883**																											
ECA	0.268	0.195	0.128	0.476	0.291	0.347	0.704	0.661	**0.837**																										
ECC	0.105	0.105	0.133	0.284	0.234	0.283	0.377	0.605	0.478	**0.866**																									
ECM	0.380	0.285	0.242	0.348	0.273	0.223	0.454	0.419	0.526	0.311	**0.837**																								
ECI	0.219	0.211	0.219	0.408	0.276	0.308	0.376	0.560	0.463	0.537	0.446	**0.849**																							
ECD	0.155	0.163	0.043	0.261	0.266	0.213	0.083	0.091	0.112	0.093	0.138	0.176	**0.748**																						
ERV	0.204	0.142	0.155	0.179	0.216	0.138	0.148	0.257	0.165	0.233	0.167	0.317	0.201	**0.854**																					
CPOE	0.051	0.066	-0.020	0.137	0.060	0.220	0.166	0.029	0.126	0.022	0.017	0.150	0.367	0.090	**0.933**																				
EDS	0.109	-0.016	-0.035	0.340	0.316	0.294	0.273	0.198	0.291	0.112	0.182	0.303	0.530	0.285	0.437	**0.866**																			
RF	0.048	-0.071	-0.015	0.414	0.151	0.370	0.166	0.193	0.199	0.109	0.146	0.265	0.189	0.021	0.167	0.285	**0.831**																		
LNP	0.297	0.213	0.248	0.450	0.371	0.317	0.528	0.519	0.509	0.346	0.503	0.456	0.193	0.237	0.079	0.407	0.279	**0.748**																	
PS	0.134	0.187	0.207	0.357	0.267	0.232	0.494	0.518	0.535	0.452	0.487	0.483	0.101	0.284	0.042	0.230	0.072	0.496	**0.762**																
SPR	0.412	0.478	0.465	0.362	0.477	0.277	0.382	0.371	0.317	0.285	0.386	0.422	0.193	0.244	0.029	0.190	0.083	0.400	0.395	**0.837**															
ISH	0.521	0.619	0.472	0.345	0.457	0.229	0.259	0.235	0.261	0.177	0.316	0.314	0.213	0.165	0.025	0.184	0.043	0.322	0.351	0.592	**0.775**														
IQ	0.585	0.560	0.488	0.235	0.227	0.031	0.175	0.175	0.214	0.113	0.281	0.232	0.172	0.236	0.059	0.158	0.041	0.298	0.234	0.359	0.658	**0.843**													
VDW	0.255	0.207	0.221	0.305	0.286	0.290	0.300	0.264	0.273	0.175	0.242	0.378	0.319	0.373	0.154	0.324	0.133	0.316	0.349	0.319	0.256	0.242	**0.872**												
VDH	0.353	0.383	0.366	0.288	0.244	0.178	0.282	0.274	0.279	0.198	0.384	0.374	0.091	0.234	0.103	0.091	0.038	0.303	0.329	0.322	0.411	0.394	0.443	**0.922**											
VDR	0.152	0.259	0.292	0.279	0.217	0.161	0.405	0.318	0.347	0.155	0.281	0.271	0.083	0.202	-0.005	0.132	0.125	0.420	0.390	0.243	0.324	0.318	0.368	0.442	**0.877**										
F	0.327	0.324	0.322	0.385	0.326	0.323	0.316	0.322	0.365	0.249	0.403	0.396	0.235	0.173	0.083	0.297	0.234	0.448	0.286	0.463	0.443	0.356	0.241	0.265	0.330	**0.781**									
I	0.333	0.348	0.296	0.396	0.426	0.291	0.383	0.380	0.407	0.302	0.418	0.484	0.211	0.207	0.151	0.325	0.246	0.473	0.403	0.525	0.485	0.370	0.329	0.334	0.414	0.637	**0.872**								
R	0.377	0.492	0.417	0.294	0.268	0.174	0.435	0.360	0.377	0.344	0.523	0.325	0.118	0.156	0.025	0.199	0.096	0.417	0.451	0.473	0.499	0.453	0.233	0.357	0.481	0.439	0.567	**0.889**							
DP	0.522	0.593	0.470	0.149	0.240	-0.002	0.170	0.185	0.194	0.116	0.406	0.230	0.159	0.141	-0.064	0.103	-0.015	0.303	0.286	0.332	0.579	0.584	0.276	0.456	0.412	0.319	0.392	0.605	**0.781**						
PQ	0.467	0.580	0.528	0.105	0.239	0.059	0.175	0.188	0.157	0.152	0.387	0.302	0.175	0.122	0.050	0.127	0.043	0.260	0.213	0.459	0.547	0.515	0.149	0.279	0.243	0.516	0.506	0.534	0.589	**0.748**					
SF	0.287	0.254	0.285	0.180	0.252	0.111	0.299	0.311	0.247	0.330	0.267	0.408	0.120	0.271	0.127	0.202	0.140	0.363	0.282	0.364	0.266	0.278	0.238	0.327	0.234	0.318	0.353	0.345	0.298	0.307	**0.943**				
EFC	0.283	0.334	0.378	0.145	0.210	0.069	0.259	0.299	0.277	0.320	0.228	0.353	0.079	0.272	-0.045	0.151	0.029	0.328	0.278	0.352	0.341	0.344	0.219	0.289	0.320	0.320	0.263	0.419	0.386	0.331	0.561	**0.748**			
PC	0.238	0.318	0.353	0.125	0.250	-0.035	0.210	0.198	0.230	0.200	0.340	0.236	0.078	0.274	-0.066	0.234	-0.031	0.256	0.361	0.287	0.375	0.384	0.139	0.266	0.297	0.243	0.286	0.539	0.369	0.373	0.375	0.508	**0.894**		
T	0.379	0.433	0.389	0.188	0.134	0.075	0.274	0.227	0.276	0.205	0.309	0.251	0.069	0.227	-0.018	0.148	0.057	0.369	0.301	0.277	0.474	0.468	0.090	0.327	0.270	0.295	0.302	0.497	0.472	0.412	0.422	0.590	0.541	**0.849**	
EFI	0.341	0.308	0.344	0.257	0.253	0.230	0.355	0.336	0.350	0.344	0.361	0.393	0.059	0.222	0.054	0.274	0.121	0.488	0.352	0.312	0.399	0.357	0.161	0.334	0.314	0.447	0.492	0.492	0.408	0.393	0.540	0.621	0.504	0.671	**0.819**

* Square Root of each variables AVE is on the diagonal.

4.2.6 Instrument validation summary

In summary, the seven constructs in this study demonstrate adequate reliability and validity with respect to content validity, convergent validity, and discriminant validity. These results are summarized in table 4.2.6.1. These measures are now ready for modeling in the formative structural model for hypothesis testing. As described, the modeling process involved developing linear composites which were calculated using the multivariate means for the first order constructs (Rai et al., 2006). "The multivariate mean is based on the summated mean values of items and offers the advantage of being replicable across samples," (Rai et al., 2006: p. 234). Further, this approach is recommended by Hair et al. (1995) when measures have been developed and transferability is the aim. Thus, these linear composites were then used as measures in the formative structural model. The details of this process have been provided in the discussion of the validation of each construct in subsections 4.2.4.1 through 4.2.4.7. The results of the structural model (hypothesis) testing are discussed in chapter 5.

Table 4.2.6.1. Summary of measurement models (final model fit displayed)

Construct	Target value:	GFI	AGFI	RMR	CFI	NFI	AVE	α
		> 0.85	> 0.80	< 0.10	> 0.90	> 0.90	> 0.50	> 0.70
Partner relationship								
Trust †		0.936	0.863	0.028	0.958	0.944	0.65	0.83
Commitment **		0.998	0.990	0.004	1.00	0.998	0.70	0.90
Shared vision †		0.970	0.936	0.025	0.953	0.976	0.67	0.85
Integrative information & resource strategy								
Leagile strategy **		0.981	0.942	0.010	0.998	0.994	0.66	0.90
Patient-focused IS strategy **		0.993	0.964	0.014	0.998	0.994	0.68	0.89
Physician-focused IS strategy		0.984	0.920	0.011	0.991	0.986	0.66	0.88
Operational IS strategy †		0.977	0.951	0.024	0.999	0.986	0.82	0.93
Entrepreneurial culture								
Proactiveness **		0.970	0.852	0.015	0.984	0.981	0.78	0.93
Autonomy **		0.974	0.870	0.023	0.983	0.980	0.70	0.90
Competitive aggressiveness †		0.967	0.930	0.018	0.988	0.977	0.75	0.89
Motivation **		0.999	0.995	0.003	1.00	0.999	0.75	0.89
Innovativeness **		0.974	0.872	0.023	0.986	0.982	0.72	0.91
Integrative SC practices								
IT use for asset management		0.964	0.820	0.043	0.977	0.973	0.69	0.90
EMR for clinical documentation †		0.974	0.943	0.021	0.996	0.985	0.56	0.77
EMR for results viewing		0.956	0.869	0.025	0.985	0.981	0.73	0.88
EMR for CPOE †		0.983	0.954	0.031	0.990	0.994	0.87	0.95
EMR for decision support		0.979	0.897	0.019	0.990	0.987	0.75	0.92
Lean principles **		0.939	0.818	0.036	0.933	0.923	0.56	0.86
Patient relationship **		0.995	0.976	0.006	1.00	0.994	0.58	0.81
Strategic physician relationship **		0.999	0.995	0.003	1.00	0.999	0.70	0.90
Information sharing **		0.943	0.830	0.029	0.953	0.945	0.60	0.88
Information quality		0.987	0.936	0.009	0.994	0.990	0.71	0.91
Value dense environment								
Operand knowledge †		0.970	0.920	0.019	0.998	0.979	0.76	0.88
Operant knowledge †		0.971	0.924	0.016	0.991	0.983	0.85	0.95
Resources †		0.970	0.920	0.019	0.988	0.979	0.77	0.90
Supply Chain performance								
SC flexibility †		0.953	0.898	0.046	0.976	0.962	0.61	0.80
SC integration †		0.985	0.968	0.016	1.00	0.991	0.76	0.89
Patient responsiveness **		0.997	0.985	0.003	1.00	0.998	0.79	0.94
Physician performance **		0.993	0.965	0.009	0.998	0.993	0.61	0.84
Partnership quality ***		0.988	0.940	0.015	0.991	0.985	0.56	0.83
Healthcare delivery capability								
Safety **		0.975	0.876	0.006	0.993	0.992	0.89	0.97
Effectiveness		0.970	0.851	0.023	0.964	0.958	0.56	0.83
Patient centeredness		0.992	0.958	0.005	0.998	0.995	0.80	0.94
Timeliness **		0.992	0.960	0.010	0.998	0.994	0.72	0.90
Efficiency		0.999	0.993	0.005	1.00	0.999	0.67	0.88

† Indicates that the model fit indexes were tested using a correlated model including this construct and another from the higher order construct; all items are significant at $p < 0.001$. This is because three items were left in the target construct requiring correlated model testing in AMOS.
** Indicates that the initial model fit was not modified.

CHAPTER 5: STRUCTURAL MODEL ANALYSIS AND RESULTS

This chapter describes the procedures used in testing the formative structural model, the aim of which is hypothesis testing. Thus, the focus of this chapter is on the evaluation of the predictions theorized in chapter two. As was the case with the measurement model in chapter four, SEM was employed for statistical analysis. SEM is considered a more rigorous approach for assessing predictive validity than other statistical methods such as correlation (Joreskog, 1970). This analysis was performed using the statistical application SMART Partial Least Squares (PLS) version 2.0 M3 (Ringle et al., 2005).

The proposed model is reviewed in section 5.1. This is followed by a discussion of the rationale for using PLS in section 5.2, and the methodology for assessing formative structural models in section 5.3. Next, the measurement and structural model results are presented in section 5.4 and discussed in section 5.5 where a summary is also provided.

5.1 Proposed model

For the convenience of those reading this study, Figure 5.1.1 repeats the theoretical model in figure 2.5.1. The model features seven constructs. The model begins with the exogenous variable, Partner Relationship (PR), and is followed by six endogenous variables conceptualized as Integrative Information and Resource Strategy (IIRS), Entrepreneurial Culture (EC), Integrative Supply Chain Practices (ISCP), Value Dense Environment (VDE), Supply Chain Performance (SCP), and Healthcare Delivery Capability (HCDC).

The model contains nine hypotheses which were theorized in chapter two. Hypothesis 1 is the relationship of PR → IIRS; Hypothesis 2 is the relationship of PR → EC; Hypothesis 3 is the relationship IIRS → ISCP; Hypothesis 4 is the relationship of EC → ISCP; Hypothesis 5 is the relationship of ISCP → VDE; Hypothesis 6 is the relationship of ISCP → SCP; Hypothesis 7 is the relationship of VDE → SCP; Hypothesis 8 is the relationship of VDE → HCDC; and Hypothesis 9 is the relationship of SCP → HCDC.

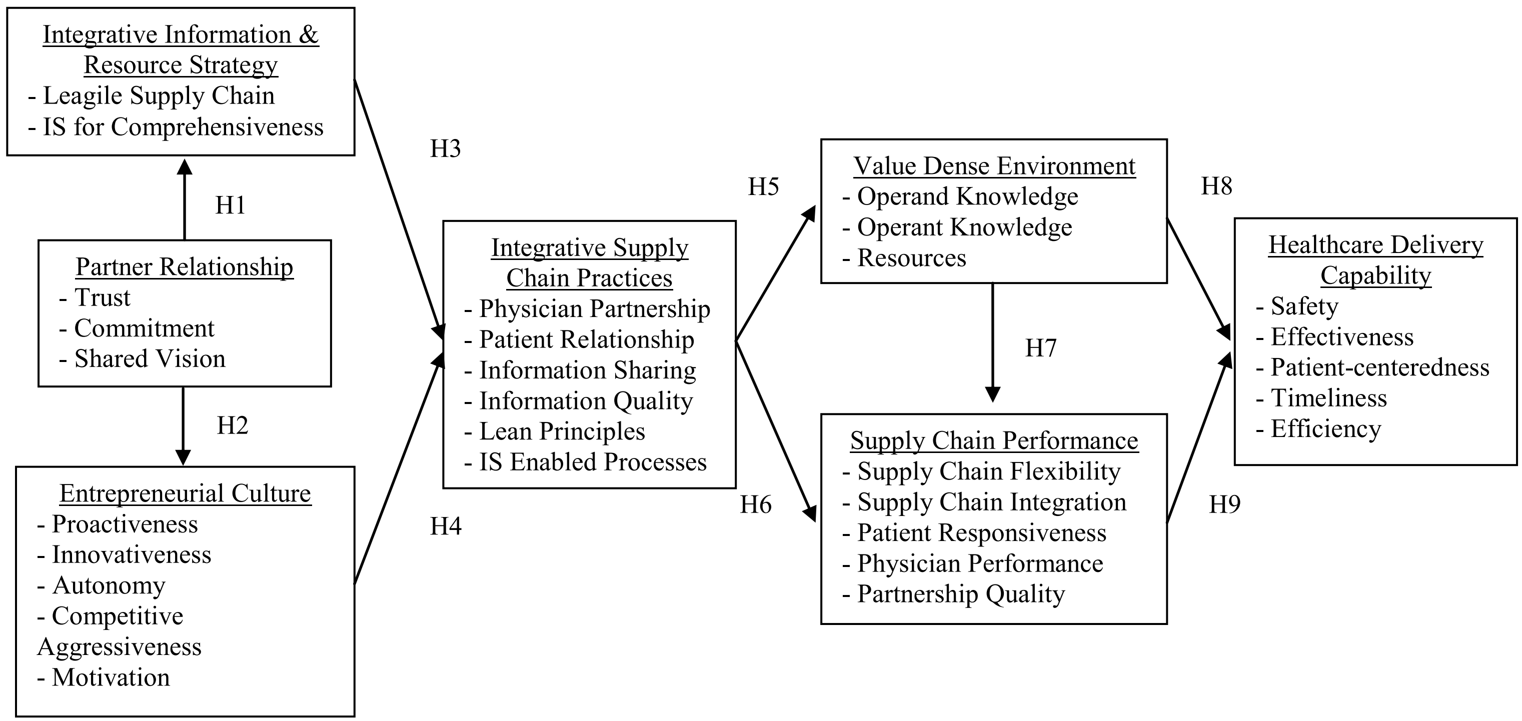


Figure 5.1.1. Theoretical model

5.2 Rationale for PLS

PLS differs from co-variance based SEM (CBSEM) techniques (e.g., AMOS and LISREL) in that it is a components-based approach to structural modeling (Chin et al., 2003; Henseler et al., 2009). In PLS, the structural and measurement models are comprised of multiple relational collections. First is the measurement model, referred to as the outer model (measurement items are on the outside of the model), which specifies relationships between unobserved latent variables and their related observed variables. Second is the structural model, referred to as the inner model (these are the relationships modeled on the inside of the model), which specifies relationships among latent variables (see Henseler et al., 2009). Hsu et al. (2006) provide a detailed description of these relational sets.

PLS has long been employed in Operations Management research (see Sambamurthy & Chin, 1994; and Lee, 1997) and its general popularity is growing (Henseler et al., 2009). Recent examples of similar studies include Braunscheidel and Suresh (2009) who used PLS to examine the influence of internal and external integration on supply chain agility, and Rosenzweig (2009) who explored relationships among e-collaboration, operational performance, and business performance. The increased popularity of PLS may be owing to its advantages over co-variance based SEM approaches in studies: (1) exploring new theoretical bases, (2) analyzing smaller sample sizes, (3) testing complex models, (4) possessing a predictive orientation, and 5) testing formative models (Fornell, 1982; Hsu et al., 2006; Henseler et al., 2009).

The present study is characterized by these traits. With regard to theoretical grounding, value co-creation is a nascent line of thinking from the service-dominant logic

(SDL) movement which is just gaining momentum with OM scholars (see Schmenner et al., 2009). In a rare empirical study of value co-creation, Zhang and Chen (2008: p. 242) observe that "research on co-creation… …is still in an early stage." Next with regard to sample size, PLS is suggested to be a more appropriate tool for modest samples sizes (e.g., around 200) as co-variance based SEM solutions can "require several hundred or even thousands of observations," (Boomsma and Hoogland, 2001; Henseler et al., 2009: p. 291). This may in part explain the motivation of Braunscheidel and Suresh (2009), who employed PLS in an analysis of data collected from 218 supply chain professionals. This sample size is comparable to that of the present study (n = 190).

PLS is also an appropriate SEM approach for complex models and those testing higher -order constructs (Venaik et al., 2005). The present study examines a complex structural model featuring seven latent constructs, all of which are of the higher order variety. The measurement model examines the linear compositions of 132 manifest items (140 manifest items when testing for common method bias post hoc) which is nearly double that employed in Braunscheidel and Suresh's (2009) model containing approximately 70 measurement items. Additionally, PLS was selected owing to the notion that "the methodology assists researchers who focus on the explanation of endogenous constructs," (Henseler et al., 2009: p. 282). Such a focus is shared by the present author herein who seeks to inform the relationships among six endogenous constructs precipitated by the posited coordination mechanism, Partner Relationship. Finally, "PLS can handle both reflective and formative measurement models," (Henseler et al., 2009: p. 283). This is a paramount advantage for PLS as it is the only statistical package that possesses the capability to test formative models. Thus, following direction from Fornell (1982), PLS was employed given that "…the component-based SEM technique [PLS] is primarily for predictive analysis in situations of high complexity but low theoretical information (Hsu et al., 2006: p. 359)."

5.3 Methods for assessing formative structural models

As introduced in section 5.2, "…publications addressing CBSEM (e.g., Rigdon, 1998) often refer to structural models and measurement models or (observed) indicator variables; whereas those focusing on PLS path modeling (e.g., Lohmöller, 1989) use the terms inner model and outer model or manifest variables for similar elements of the causal model," (Henseler et al., 2009: p. 284). Therefore, like CBSEM, the evaluation of both the measurement and structural aspects of PLS path models is possible. However, a key difference between component-based and CBSEM techniques is that "PLS does not use fit indices," (Braunscheidel and Suresh, 2009: p. 128). That said, PLS does provide an array of tests for formative models capable of revealing interesting and useful insights for scholars and practitioners alike.

Measurement 'outer' model assessments can be made by examining the relationships among the indicators and their respective latent constructs in terms of the t-values of their loadings for statistical significance. While the focus of formative modeling rests on the theorizing of the relationship between an indicator and its respective formative construct, statistical significance can provide additional evidence of the relationship in support of the theorized measurement model.

The assessment of formative structural models is conducted by evaluating: 1) the estimates of the path coefficients, 2) the R^2 of the endogenous variables, and 3) the effect size (f^2) of the hypothesized relationships (Henseler et al., 2009). See table 5.3.1. "For PLS, a good model fit [for the structural 'inner' model] is established with significant path coefficients [and] acceptably high R^2 values," (Braunscheidel & Suresh, 2009: p. 128).

Table 5.3.1 Assessment indexes for formative structural models (adapted from Henseler et al., 2009)

Criterion	Description/explanation
R^2 of endogenous latent variables	R^2 values provide the percentage of explained variance of endogenous latent variables (Barclay et al., 1995; Chin and Gopal, 1995). Suggested thresholds are 0.19 for weak, 0.33 for moderate, and 0.67 for substantial explanation (Chin, 1998). Values of 0.165 have been found acceptable at early stages of path models (Braunscheidel and Suresh, 2009), while 0.186 and 0.197 has been accepted at latter stages (Rai et al., 2006).
Path coefficients	The coefficient estimates should be examined for sign, magnitude, and statistical significance (t-value) (Henseler et al., 2009).
Total effects	The sum of the direct and indirect effects among latent variables is useful in interpreting variable relationships, and should be sizable (Albers, 2009).
Effect size using Cohen's (1988) f^2	$f^2 = (R^2_{\text{included}} - R^2_{\text{excluded}}) / (1 - R^2_{\text{included}})$. Suggested thresholds are 0.02 for small, 0.15 for medium, and 0.35 for large effects (Cohen, 1988).

R^2 provides an index of the predictive power of path models by examining the explain variance of the dependent endogenous variable (Barclay et al., 1995; Chin and Gopal, 1995). Chin (1998) describes R^2 values as *weak* at 0.19, *moderate* at 0.33, and *substantial* at 0.67. It should be noted however, that R^2 value are heavily influenced by the number of antecedent variables modeled in a predictive relationship, thus lower values can be expected when only one or two antecedent variables are modeled (Henseler et al., 2009). As such, R^2 values of 0.165 (16.5% explained variance) have been found to be acceptable at early stages in path models (Braunscheidel and Suresh, 2009), while R^2 values of 0.186 and 0.197 (18.6% and 19.7% explained variance respectively) have been adequate at latter stages (Rai et al., 2006).

Next, "the estimated values for the path relationships in the structural model should be evaluated in terms of sign, magnitude, and significance," (Henseler et al., 2009: p. 303). In addition to the path coefficients however, it is useful to explore the total effects of the variables in a path model (Albers, 2009). "This new paradigm copes with a frequent observation in PLS [as well as CBSEM] that [in] path modeling the standardized inner path model coefficients decline with an increased number of indirect relationships, especially when mediating latent variables have a suppressor effect on the direct path," (Henseler et al., 2009: p. 304). Therefore, the total effects can be useful in validating the relationships among variables which are modeled to be mediated by one or more variables, and consequently are at different stages in a path model.

Finally, the effect in the path model can be assessed to examine the effect size (f^2), using Cohen's (1988) f^2. "The effect size is calculated as the increase in the R^2 relative to the proportion of variance of the endogenous latent variable that remains unexplained," (Henseler et al., 2009: 304). Cohen (1988) prescribes values of 0.02 for small, 0.15 for medium, and 0.35 for large effect sizes.

5.4 Path model results

This section describes the testing procedures and the consequent results of model test using the criteria described in section 5.3. Results are provided for the measurement and structural relationships under study in subsections 5.4.2 and 5.4.3 respectively. Additionally, the results of post hoc testing to assess the potential effects of common method bias (CMB) (Podsakoff et al., 2003) is provided in subsection 5.4.4.

5.4.1 Data analysis procedures

As discussed in chapter four, the structural model was specified using the formative approach (Jarvis et al., 2003). Seven latent constructs were measured using linear composite measures (multivariate factor means) which is a common approach for complex models such as the model hypothesized for testing herein (Jin, 2008; Byrne, 2001). The seven latent formative constructs were linked by nine hypotheses in a structural equation model which was tested using PLS.

The bootstrapping procedure was employed to develop estimates of the statistical significance of the theorized model parameters. "Bootstrap analysis was done with 500 subsamples and path coefficients were reestimated using each of these samples," (Rai et al., 2006: p. 235). The case count was set to 190 to match the sample size of the study. The author then employed "bootstrap samples of 250 and 1000 to assess that stability of the parameter estimates," (Rosenzweig et al., 2009: p. 468). This produced consistent results across the 250, 500, and 1000 bootstrap samples providing evidence of model stability. "The vector of parameter estimates was used to compute parameter means, standard errors, significance of path coefficients, [and] indicator loadings," (Rai et al., 2006: p. 235). This describes the recommended method for estimating the statistical significance of indicator loadings and path coefficients (Löhmoeller, 1984).

5.4.2 Measurement 'outer' model results

The results from measurement ('outer') model testing are displayed in table 5.4.2.1. An analysis of the statistical significance of the indicator or 'outer' loadings suggests that all of the indicators are statistically significant on their respective latent construct at $p < 0.001$. This provides further evidence in support of the theorized measurement conceptualizations described in chapter two and the instrument validation procedures discussed in chapter four.

Next, each construct dimension was assessed for multicollinearity, as high multicollinearity "could mean that the indicator's information is redundant," (Henseler et al., 2009: p. 302). Essentially, this means that two or more dimensions of the construct substantially overlap in domain measurement. One test for multicollinearity consists of an examination of the correlations among the variables. Variable correlations have been displayed earlier in table 4.2.5.1. While some of the variables are highly correlated (e.g., the Autonomy and Proactiveness dimensions of the Entrepreneurial Culture construct at a coefficient of 0.66), all are well below the 0.90 cutoff as a measure of collinearity suggested by Hair et al. (2006).

Table 5.4.2.1. Measurement 'outer' model results

Indicator relationship	Coefficient	T-stat	VIF†
Partner Relationship			
Commitment	0.79***	6.94	2.09
Shared Vision	0.66***	4.72	1.86
Trust	0.93***	14.50	1.77
Integrative Information & Resource Strategy			
IS for Comprehensiveness Strategy	0.88***	16.13	1.35
Leagile SC Strategy	0.85***	14.76	1.35
Entrepreneurial Culture			
Proactiveness	0.69***	8.99	2.35
Autonomy	0.76***	10.17	2.08
Competitive Aggressiveness	0.51***	5.77	1.75
Motivation	0.84***	15.07	1.49
Innovative	0.76***	11.34	1.73
Integrative SC Practices			
Lean Principles	0.77***	16.37	1.61
Patient Relationship	0.72***	12.72	1.44
Physician Relationship	0.69***	12.32	1.72
Information Sharing	0.71***	12.81	2.41
Information Quality	0.61***	8.61	1.81
IS Enabled Processes	0.41***	4.89	1.15
Value Dense Environment			
Operand Knowledge *(Know What)*	0.61***	5.70	1.30
Operant Knowledge *(Know How)*	0.80***	11.84	1.40
Resources	0.85***	14.66	1.30
Supply Chain Performance			
Flexibility	0.70***	10.81	1.87
Integration	0.80***	14.15	2.09
Patient Responsiveness	0.87***	20.67	2.04
Physician Performance	0.74***	11.99	1.89
Partnership Quality	0.66***	10.90	1.95
Healthcare Delivery Capability			
Safety	0.65***	7.01	1.60
Effectiveness	0.69***	7.29	2.08
Patient Centeredness	0.73***	8.30	1.57
Timeliness	0.78***	9.70	2.13
Efficiency	0.89***	17.55	2.31

*** Significant at $p < 0.001$

† values of 5 to 10 or higher indicate problematic multicollinearity (O'Brien, 2007).

Researchers also suggest that assessing the degree of multicollinearity among formative measures can be achieved by calculating the variance inflation factor (VIF) for each dimension of the target construct (Diamantopoulos and Winklhofer, 2001; Cassel et al., 2000; Grewal et al., 2004). VIF values begin at a minimum value of 1, with values higher than 5 or 10 indicating problematic levels of multicollinearity (see O'Brien, 2007; or Henseler et al., 2009). The VIF values for all construct dimensions are displayed in table 5.4.2.1. All of the values fall well within the guidelines for acceptability at < 5 to 10.

5.4.3 Structural 'inner' model results

The structural model results from testing are displayed in figure 5.4.3.1 and a summary of the results is provided in table 5.4.3.1. The values displayed in figure 5.4.3.1 include the path coefficients and corresponding t-values. To reiterate, good model fit is established with acceptably high R^2 values and significant path coefficients (Braunscheidel and Suresh, 2009). Overall, the model demonstrates good fit when considering these criteria. Five of the seven latent constructs demonstrate an R^2 values above .33 which Chin (1998) suggests indicates moderate explanatory power. The two latent constructs which do not display sufficient R^2 values are located at the initial stages of the model and are therefore it is not surprisingly that these offer low explanatory power (Henseler et al., 2009).

Eight of the nine hypothesized path coefficients provide strong statistical evidence of positive relationships among the variables under study. Hypotheses 1, 2, 3, 4, 5, 6, 7, and 9 are all supported by statistically significant path coefficients, significant f^2 values, and significant total effect coefficients on the dependent variable HCDC. The significant path coefficients support the hypothesized linkages among the variables. The significant f^2 values indicate that the effect sizes are meaningful and the significant total effect coefficients signal that the constructs in the model are appropriate for the phenomena under study. While Hypothesis 8 is not supported by a significant path coefficient, it does offer a small f^2 value which in and of itself is not meaningful to the hypothesis, does offer diminutive evidence of a contribution to the model. Finally, it is also worth noting that all of the indicator loadings are highly statistically significant. See table 5.4.2.1. Taken together this evidence suggests that the overall model fit is satisfactory. An analysis of the findings will be provided in section 5.5.

Table 5.4.3.1. Summary of structural model results

Hypothesized relationship	Direct Path Coef.	Direct Path T-stat	R^2 value†	f^2 value††	Total Effect Coef. †††	Total Effect T-stat	Supported
H1: PR ⟶ IIRS	0.32***	4.30	0.09: n/s [a]	0.10: S	0.16***	4.16	Moderate
H2: PR ⟶ EC	0.41***	5.97	0.14: n/s [a]	0.16: M	0.16***	4.16	Moderate
H3: IIRS ⟶ ISCP	0.34***	5.03	0.57: M	0.16: M	0.17***	4.51	Strong
H4: EC ⟶ ISCP	0.51***	7.62	0.57: M	0.33: M	0.26***	5.06	Strong
H5: ISCP ⟶ VDE	0.60***	11.76	0.34: M	0.52: L	0.50***	9.11	Strong
H6: ISCP ⟶ SCP	0.62***	8.74	0.57: M	0.49: L	0.50***	9.11	Strong
H7: VDE ⟶ SCP	0.22***	3.03	0.57: M	0.07: S	0.21***	2.63	Strong
H8: VDE ⟶ HCDC	0.07 *n/s*	0.94	0.41: M	0.02: S	0.21***	2.63	Indirect [b]
H9: SCP ⟶ HCDC	0.61***	7.44	0.41: M	0.37: L	0.61***	7.44	Strong

*** significant at $p < 0.01$; ** significant at $p < 0.05$; *n/s* is not significant.
† R^2 displayed for dependent variable in each hypothesized relationship; "n/s" indicates not significant while "M" indicates a moderate explanation according to Chin (1998).
†† f^2 displayed for effect size of the independent variable in each hypothesized relationship; "S" indicates a small effect, "M" indicates a medium effect, and "L" indicates a large effect according to Cohen (1988).
††† indicates the total effect of the independent variable on the Healthcare Delivery Capability variable (HCDC).
[a] denotes that similar studies have reported R^2 values below Chin (1998) "weak" threshold. See Rai et al. (2006) and Braunscheidel and Suresh (2009) for examples.
[b] denotes that the interpretation of H8 and H9 indicates that VDE has an indirect relationship with HCDC, mediated by SCP.

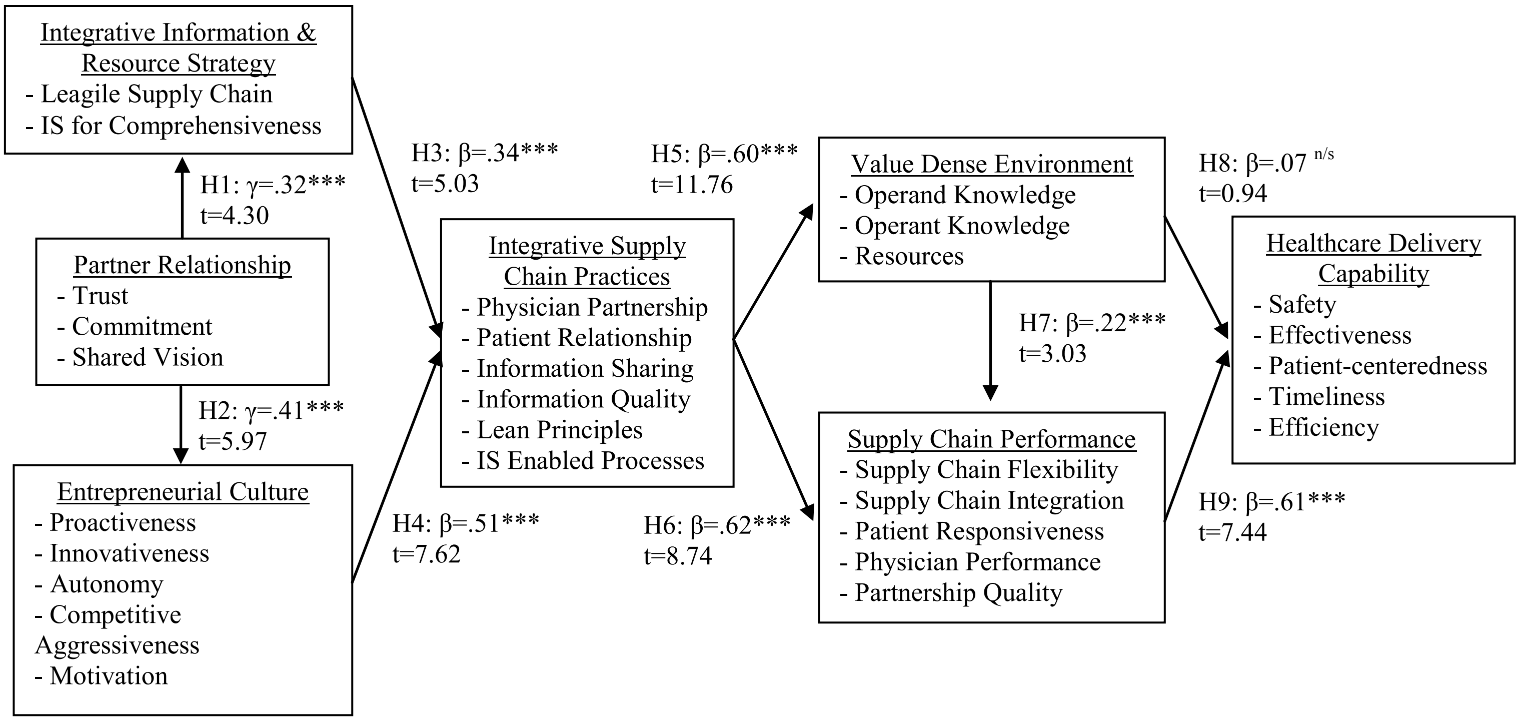


Figure 5.4.3.1. Structural model results

5.4.4 Post hoc testing for Common Method Bias

Notwithstanding the many advantages of survey research discussed in chapter three, the data collection method is susceptible to common method bias (CMB) when seeking responses from only one respondent per firm (in studies when the unit of analysis is at the firm level). This same fate befalls the present study. CMB is essentially the tendency of the survey respondent to "edit their responses to be more socially desirable, lenient, acquiescent, and consistent with how they think the researcher wants them to respond," (Podsakoff et al., 2003: p. 888).

Proactive attempts were undertaken to minimize CMB in this study. Following the guidance of Podsakoff et al. (2003), respondents were provided the opportunity to respond to the survey anonymously. Additionally, the questions measuring the predictor and criterion variables were segmented into different sections of the survey instrument. Similar 'procedural remedies' have been employed by other Operations Management researchers (see Rosenzweig, 2009). In addition to these steps, items associated with a previously validated scale were added to the survey instrument to allow the researcher to 'control' for social desirability bias (SDB). Podsakoff et al. (2003) advocate for statistical analysis techniques which enable the researcher to control for such biases.

The scale was developed and validated by Manning et al. (2009) and has been designed to capture what the authors' refer to as Agent's Socially Desirable Responding (ASDR). This is defined as "organizational informants' tendencies to present the firm favorably with respect to norms and standards," (Manning et al. 2009: p. 33). The instrument is an 8-item refinement of the longstanding work of Paulhus (1984) who developed the Balanced Inventory of Desirable Responding (BIDR) as well as the

Marlowe – Crowne Social Desirability Scale (Crowne and Marlowe, 1960). These previous scales are much longer than the ASDR which make them problematic for response rates and have been suggested to be potentially ineffective in organizational level studies (Moorman and Podsakoff, 1992; Spector, 1987). The original items of the ASDR scale are displayed in table 5.4.4.1 with the necessary minor modifications to suit the context of this study displayed in brackets.

Table 5.4.4.1. Conceptual definition and measurement items for ASDR (Manning et al., 2009)

Conceptual definition:
Organizational informants' tendencies to present the firm favorably with respect to norms and standards.

Measurement items*:
SDR1: None of the managers at me firm [hospital] feel dissatisfied with their jobs.
SDR2: Different functional areas within my firm [hospital], such as marketing and production [the billing department and clinical operations], sometimes lack cohesion or unity. [a]
SDR3: At my company [hospital], all of the employees are outstanding performers.
SDR4: Sometimes my firm [hospital] fails to exercise good judgment. [a]
SDR5: Managers at my firm [hospital] are sometimes afraid to voice their disagreement with a higher level manager's ideas. [a]
SDR6: Employees at my company [hospital] are always trustworthy.
SDR7: At my company [hospital], hiring decisions have always been based only on qualifications.
SDR8: My firm [hospital] has downplayed an event that customers [patients] might view as negative. [a]

* Manning et al. (2009) employed a 7-point scale anchored by "not true" and "very true." The scale employed by the present study was a 5-point Likert scale anchored by "strongly agree" and "strongly disagree."
[a] indicates reverse coded items.

Manning et al. (2009: p. 42) developed and validated the 8-item ASDR scale, providing evidence that it "acts as an effective control variable for SDB in organizational settings." Given this, as well as the authors' recommendation to use the scale to control for spurious relationships (Manning et al. 2009), the ASDR items were modeled as a formative measurement model for a control variable which was linked to each of the seven latent constructs in the structural model described in section 5.4.3. The same data analysis procedures described in section 5.4.1 were employed.

The results are displayed in table 5.4.4.2. With regard to measurement, as was the case with Rosenzweig's (2009) attempt to test for CMB, "all path loadings of the hypothesized indicators with their respective constructs remain statistically significant [at $p < 0.001$]." In testing the structural model, Hypotheses 3, 4, 5, 6, 7, and 9 remain statistically significant at the $p < 0.01$ level and consequently remain supported. Hypothesis 2 is statistically significant and consequently remains supported, but at the $p < 0.05$ level. Hypothesis 1 is statistically significant at the $p < 0.1$ level. While this is often not considered to be a strong finding in top journals, the t-value is 1.92 which is approaching the threshold for significance at the $p < 0.05$ level (t-value = 1.96) which is commonly accepted as statistical support. Hypothesis 8 was not significant in the original model and the same is true in the control model. These results, by in large, suggest that the relationships hypothesized herein remain supported when controlled for CMB.

Table 5.4.4.2.Summary of path model results controlled for common method bias

Hypothesized relationship	**Control Model Coefficient**	**Control Model T-stat**	**Control Model R^2 value†**	**Original Model Coefficient**	**Original Model T-stat**
H1: PR ⟶ IIRS	0.14*	1.92	0.19	0.32***	4.30
H2: PR ⟶ EC	0.19**	2.52	0.30	0.41***	5.97
H3: IIRS ⟶ ISCP	0.28***	4.19	0.59	0.34***	5.03
H4: EC ⟶ ISCP	0.42***	5.29	0.59	0.51***	7.62
H5: ISCP ⟶ VDE	0.56***	8.37	0.34	0.60***	11.76
H6: ISCP ⟶ SCP	0.53***	6.84	0.59	0.62***	8.74
H7: VDE ⟶ SCP	0.20***	2.68	0.59	0.22***	3.03
H8: VDE ⟶ HCDC	0.06 *n/s*	0.81	0.48	0.07 *n/s*	0.94
H9: SCP ⟶ HCDC	0.45***	4.58	0.48	0.61***	7.44
CMB1: ASDR ⟶ PR	0.42***	6.24	0.18		
CMB2: ASDR ⟶ IIRS	0.38***	4.86	0.19		
CMB3: ASDR ⟶ EC	0.46***	6.50	0.30		
CMB4: ASDR ⟶ ISCP	0.22***	3.31	0.59		
CMB5: ASDR ⟶ VDE	0.06*n/s*	0.68	0.34		
CMB6: ASDR ⟶ SCP	0.17**	2.41	0.59		
CMB7: ASDR ⟶ HCDC	0.31***	4.13	0.48		

† R^2 displayed for dependent variable in each hypothesized relationship.
*** significant at $p < 0.01$; ** significant at $p < 0.05$; * significant at $p < 0.1$; *n/s* is not significant.

5.5 Discussion of hypotheses

The proposed model has eight statistically significant hypotheses at the $p < 0.01$ level. These are Hypotheses 1, 2, 3, 4, 5, 6, 7, and 9. Hypothesis 8 was not statistically significant. An overall analysis of the R^2 values, path coefficients, total effects and the f^2 values for effect size suggests good model fit. See table 5.4.3.1. These tests provide not only statistical validation of the model and proposed hypotheses, but are also capable of lending valuable insights for researchers and practitioners. These insights are now discussed as the statistical results are interpreted for each hypothesis. These discussions are organized by dependent variable for interpretational enrichment (Liao, 2008). This section begins with hypothesis 1.

Hypothesis 1: *Partner relationship is positively associated with a hospital's integrative information and resource strategy.*

The statistical analysis displayed in table 5.4.3.1 provides moderate support for Hypothesis 1 as three of the four model assessment indexes (path coefficient, R^2, f^2, and the total effect) indicate that PR plays a meaningful role in directly affecting IIRS, and also in indirectly affecting the dependent variable HCDC. The path coefficient between PR and IIRS is found to be highly significant and positive (γ=0.32, t=4.30). This indicates that PR has a direct positive impact on IIRS. The significant factor loadings provide evidence that PR is made up of Trust, Commitment and Shared Vision. This signifies that when PR is high, the relationship between the hospital's admitting/attending physicians can principally be described as honest and open in their dealings with the hospital's clinical staff, having earned the hospital's confidence through their clinical practices. Hypothesis 1 finds that this influences the likelihood that the hospital will adopt an IIRS.

The significant factor loadings on IIRS signify that when a hospital adopts this strategy, leadership will emphasize a Leagile SC Strategy as well as an IS for Comprehensiveness Strategy. See table 5.4.2.1. This implies for example, when PR is high, leadership will emphasize process improvement, elimination of waste, understanding of patient needs, adapting to change, and providing personalized care. With regard to IT, leadership is likely to emphasize: 1) a Patient-focus for IT such as the use of IT to recognize the patient's needs, ensure that clinical milestones are met, respond quicker to patient's needs; 2) a Physician-focus for IT such as the use of IT to share information with physicians, improve communication with physicians, communicate the status of orders and develop stronger relationships with physicians; and 3) an Operational IT focus such as the use of IT to reduce the cost of processing orders, administration, and delivering care.

However, PR is found to explain only 9% (R^2 value) of the variance in IIRS. Further, the effect size for PR on IIRS is considered small (0.10), but still meaningful (Cohen, 1988). Therefore, PR is a antecedent of IIRS, but is one of only a number of phenomena which may drive a hospital to implement a highly 'integrative' strategy. One potential phenomenon worthy of consideration as another antecedent of IIRS is environmental context (Porter, 1996). Another may be product (or in this case service) characteristics (Vonderembse at al., 2006). When considering SDL, some would argue that advancements in IT motivate the desire for integration and could be modeled as an antecedent (Prahalad and Ramaswamy, 2004a; Day, 2006; Callaway and Dobrzykowski, 2009). That said, the inclusion of PR in the model is valuable as evidenced not only by the positive linkage to IIRS, but also by its total effect on HCDC (coefficient = 0.16, $p < 0.01$).

Next is a discussion of the implications related to Hypothesis 2.

> ***Hypothesis 2:*** *Partner relationship is positively associated with a hospital's entrepreneurial culture.*

The statistical analysis displayed in table 5.4.3.1 provides moderate support for Hypothesis 2 as three of the four model assessment indexes (path coefficient, R^2, f^2, and the total effect) indicate that PR plays a meaningful role in directly affecting EC, and also in indirectly affecting the dependent variable HCDC. The path coefficient between PR and IIRS is found to be highly significant and positive (γ=0.41, t=5.97). This indicates that EC has a direct positive impact on IIRS. As discussed with Hypothesis 1, the significant factor loadings provide evidence that PR is made up of Trust, Commitment and Shared Vision. See table 5.4.2.1. This signifies that when PR is high, the relationship between the hospital's admitting/attending physicians can principally be described as honest and open in their dealings with the hospital's clinical staff, having earned the hospital's confidence through their clinical practices. Hypothesis 2 finds that this influences the likelihood that the hospital will develop an EC.

The significant factor loadings on EC provide evidence signifying that when a hospital fosters this culture, it will be characterized by Proactiveness, Innovativeness, Autonomy, Competitive Aggressiveness, and Motivation. See table 5.4.2.1. This suggests for example, that hospitals with admitting/attending physicians who are honest and open in their dealings with the hospital's clinical staff, and who have earned the hospital's confidence through their clinical practices are likely to be known as an innovator among hospitals in their region, promote new and innovative services, provide leadership in creating new services, exist on the leading edge in creating new technologies. These hospitals are also likely to have clinical employees who are highly motivated toward work, hard working, very ambitious, and have a "can do" attitude.

However, PR is found to explain only 14% (R^2 value) of the variance in EC. That said, the effect size for PR on EC is considered medium (0.16) and meaningful (Cohen, 1988). Therefore, PR is an antecedent of EC, but it is one of only a number of phenomena which may drive a hospital to foster this type of culture. The borderline R^2 value (see comparable findings in the Operations Management and IT literature from Rai et al., 2006; Braunscheidel and Suresh, 2009) does encourage the researcher to consider other antecedents of EC. One potential antecedent may be munificence as Jambulingam et al. (2005) suggest that pharmacies displaying the five dimensions of EC conceptualized herein are more likely to perceive growth opportunities than other firms. These pharmacies also view their environment as highly competitive (Jambulingam et al., 2005), making competitive intensity a potential antecedent for hospitals with an EC. In their study of a 'safety culture' in hospitals, McFadden et al. (2009) found that transformational leadership is a positive antecedent. Certainly, transformational leadership could lead to an EC as described herein. That said, the inclusion of PR in the model is valuable as evidenced not only by the positive linkage to EC, but also by its total effect on HCDC (coefficient = 0.16, $p < 0.01$).

Next is a discussion of the implications related to Hypothesis 3 and 4.

> ***Hypothesis 3:*** *Integrative information and resource strategy is positively associated with a hospital's integrative supply chain practices.*
>
> ***Hypothesis 4:*** *Entrepreneurial culture is positively associated with a hospital's integrative supply chain practices.*

The statistical analysis displayed in table 5.4.3.1 provides strong support for Hypothesis 3 as all four model assessment indexes (path coefficient, R^2, f^2, and the total effect) indicate that IIRS plays a meaningful role in directly affecting ISCP, and also in indirectly affecting the dependent variable HCDC. The path coefficient between IIRS and ISCP is found to be highly significant and positive (β=0.34, t=5.03). This indicates that IIRS has a direct positive impact on ISCP. As discussed in the analysis of Hypothesis 1, the significant factor loadings on IIRS provide support that when a hospital adopts this strategy, leadership will emphasize a Leagile SC Strategy as well as an IS for Comprehensiveness Strategy. See table 5.4.2.1. This suggests for example, that when IIRS is high, leadership will emphasize process improvement, elimination of waste, understanding of patient needs, adapting to change, and providing personalized care. With regard to IT, leadership is likely to emphasize: 1) a Patient-focus for IT such as the use of IT to recognize the patient's needs, ensure that clinical milestones are met, respond quicker to patient's needs; 2) a Physician-focus for IT such as the use of IT to share information with physicians, improve communication with physicians, communicate the status of orders and develop stronger relationships with physicians; and 3) an Operational IT focus such as the use of IT to reduce the cost of processing orders, administration, and delivering care. Hypothesis 3 finds that this influences the likelihood that the hospital employees will engage in ISCP.

The statistical analysis displayed in table 5.4.3.1 also provides strong support for Hypothesis 4 as all four model assessment indexes (path coefficient, R^2, f^2, and the total effect) indicate that EC plays a meaningful role in directly affecting ISCP, and also in indirectly affecting the dependent variable HCDC. The path coefficient between EC and ISCP is found to be highly significant and positive (β=0.51, t=7.62). This indicates that EC also has a direct positive impact on ISCP. As discussed in the analysis of Hypothesis 2, the significant factor loadings on EC provide evidence signifying that when a hospital fosters this culture, it will be characterized by Proactiveness, Innovativeness, Autonomy, Competitive Aggressiveness, and Motivation. See table 5.4.2.1. This suggests for example, that hospitals with admitting/attending physicians who are honest and open in their dealings with the hospital's clinical staff, and who have earned the hospital's confidence through their clinical practices are likely to be known as an innovator among hospitals in their region, promote new and innovative services, provide leadership in creating new services, and exist on the leading edge in creating new technologies. These hospitals are also likely to have clinical employees who are highly motivated toward work, hard working, very ambitious, and have a "can do" attitude. Hypothesis 4 finds that this also influences the likelihood that the hospital employees will engage in ISCP.

The significant factor loadings on ISCP provide evidence signifying that when hospital employees engage in these practices, their actions will be characterized by Physician Partnership, Patient Relationship, Information Sharing, Information Quality, Lean Principles, and IS Enabled Processes. See table 5.4.2.1. This suggests for example, that when IIRS and EC are high, hospital employees are likely to act to improve patient care by standardizing work (care pathways), use simple and direct pathways that ensure resource availability during patient care, monitor patient satisfaction, have a program dedicated to improving patient satisfaction, partner on continuous improvement initiatives with admitting/attending physicians, regularly partner with admitting/attending physicians to solve problems, work with admitting/attending physicians to keep each other informed about changes that may affect care delivery, share information with admitting/attending physicians that helps establish treatment plans, exchange information with admitting/attending physicians that is adequate, complete, timely, and accurate, use RFID to monitor patient movement and location, use RFID to coordinate medical treatment wherever patients go during care delivery, use EMR for clinical documentation to capture problem lists and nursing assessments, use EMR to view diagnostic test results, radiology reports, and laboratory results, use EMR for CPOE to order laboratory and radiology tests, and use EMR for decision support to access drug interaction alerts and clinical reminders.

IIRS and EC are found to explain 57% (R^2 value) of the variance in ISCP which is considered to be a moderate explanation and thus meaningful Chin (1998). The effect size for both IIRS on ISCP (0.16) and EC on ISCP (0.33) are considered medium and thus meaningful (Cohen, 1988). It is worth noting however that the effect size of EC on ISCP is substantially greater than that of IIRS on ISCP and is approaching the Cohen (1988) threshold of 0.35 which would be considered a large effect. This is also reflected in a comparison of the beta coefficients of the two independent variables in these relationships (β=0.34 for IIRS and β=0.51 for EC). While EC has a greater influence on ISCP, taken together these findings provide evidence that both IIRS and EC are key antecedents of ISCP. The inclusion of IIRS and EC in the model is valuable as evidenced not only by their positive linkages to ISCP, but also by their total effects on HCDC (coefficient = 0.17, $p < 0.01$ and coefficient = 0.26, $p < 0.01$ respectively).

Next is a discussion of the implications related to Hypothesis 5.

Hypothesis 5: *Integrative supply chain practices are positively associated with a value dense environment.*

The statistical analysis displayed in table 5.4.3.1 provides strong support for Hypothesis 5 as all four model assessment indexes (path coefficient, R^2, f^2, and the total effect) indicate that ISCP plays a meaningful role in directly affecting VDE, and also in indirectly affecting the dependent variable HCDC. The path coefficient between ISCP and VDE is found to be highly significant and positive (β=0.60, t=11.76). This indicates that ISCP has a direct positive impact on VDE. As discussed in the analysis of Hypotheses 3 and 4, the significant factor loadings on ISCP provide support signifying that when hospital employees engage in these practices, their actions will be characterized by Physician Partnership, Patient Relationship, Information Sharing, Information Quality, Lean Principles, and IS Enabled Processes. See table 5.4.2.1. This suggests for example, that when ISCP is high, hospital employees are likely to act to improve patient care by standardizing work (care pathways), use simple and direct pathways that ensure resource availability during patient care, monitor patient satisfaction, have a program dedicated to improving patient satisfaction, partner on continuous improvement initiatives with admitting/attending physicians, regularly partner with admitting/attending physicians to solve problems, work with admitting/attending physicians to keep each other informed about changes that may affect care delivery, share information with admitting/attending physicians that helps establish treatment plans, exchange information with admitting/attending physicians that is adequate, complete, timely, and accurate, use RFID to monitor patient movement and location, use RFID to coordinate medical treatment wherever patients go during care delivery, use EMR for clinical documentation to capture problem lists and nursing assessments, use EMR to view diagnostic test results, radiology reports, and laboratory results, use EMR for CPOE to order laboratory and radiology tests, and use EMR for decision support to access drug interaction alerts and clinical reminders. Hypothesis 5 finds that this influences the likelihood that the hospital employees will function in a VDE.

The significant factor loadings on VDE provide evidence signifying that when a hospital creates this type of environment, it will be characterized by Operand Knowledge (know what), Operant Knowledge (know how), and Resources. See table 5.4.2.1. This suggests for example, that hospitals with high ISCP are likely to have a work environment characterized by care providers who have the skills, ability, and knowledge along with ready access to the supplies, medications, and equipment needed when caring for a particular patient.

ISCP is found to explain 34% (R^2 value) of the variance in VDE which is considered to be a moderate explanation and thus meaningful Chin (1998). The effect size for ISCP on VDE (0.52) is considered large and thus also meaningful (Cohen, 1988). These findings provide evidence that ISCP is a key antecedent of VDE. The inclusion of ISCP in the model is valuable as evidenced not only by its positive linkage to VDE, but also by its total effect on HCDC (coefficient = 0.50, $p < 0.01$).

Next is a discussion of the implications related to Hypotheses 6 and 7.

> ***Hypothesis 6:*** *Integrative supply chain practices are positively associated with a hospital's supply chain performance.*

> ***Hypothesis 7:*** *Value dense environment is positively associated with a hospital's supply chain performance.*

The statistical analysis displayed in table 5.4.3.1 provides strong support for Hypothesis 6 as all four model assessment indexes (path coefficient, R^2, f^2, and the total effect) indicate that ISCP plays a meaningful role in directly affecting SCP, and also in indirectly affecting the dependent variable HCDC. The path coefficient between ISCP and SCP is found to be highly significant and positive (β=0.62, t=8.74). This indicates that ISCP has a direct positive impact on SCP. As discussed in the analysis of Hypotheses

3, 4, and 5, the significant factor loadings on ISCP provide support signifying that when hospital employees engage in these practices, their actions will be characterized by Physician Partnership, Patient Relationship, Information Sharing, Information Quality, Lean Principles, and IS Enabled Processes. See table 5.4.2.1. This suggests for example, that when ISCP is high, hospital employees are likely to act to improve patient care by standardizing work (care pathways), use simple and direct pathways that ensure resource availability during patient care, monitor patient satisfaction, have a program dedicated to improving patient satisfaction, partner on continuous improvement initiatives with admitting/attending physicians, regularly partner with admitting/attending physicians to solve problems, work with admitting/attending physicians to keep each other informed about changes that may affect care delivery, share information with admitting/attending physicians that helps establish treatment plans, exchange information with admitting/attending physicians that is adequate, complete, timely, and accurate, use RFID to monitor patient movement and location, use RFID to coordinate medical treatment wherever patients go during care delivery, use EMR for clinical documentation to capture problem lists and nursing assessments, use EMR to view diagnostic test results, radiology reports, and laboratory results, use EMR for CPOE to order laboratory and radiology tests, and use EMR for decision support to access drug interaction alerts and clinical reminders. Hypothesis 6 finds that this influences the likelihood that the hospital will achieve high SCP.

The statistical analysis displayed in table 5.4.3.1 also provides strong support for Hypothesis 7 as all four model assessment indexes (path coefficient, R^2, f^2, and the total effect) indicate that VDE plays a meaningful role in directly affecting SCP, and also in indirectly affecting the dependent variable HCDC. The path coefficient between VDE and SCP is found to be significant and positive (β=0.22, t=3.03). This indicates that VDE has a direct positive impact on SCP. As discussed in the analysis of Hypotheses 5, the significant factor loadings on VDE provide support that when a hospital creates this type of environment, it will be characterized by Operand Knowledge (know what), Operant Knowledge (know how), and Resources. See table 5.4.2.1. This suggests for example, that hospitals with high VDE are likely to have a work environment characterized by care providers who have the skills, ability, and knowledge along with ready access to the supplies, medications, and equipment needed when caring for a particular patient. Hypothesis 7 finds that this also influences the likelihood that the hospital will achieve high SCP.

The significant factor loadings on SCP provide evidence signifying that when hospital achieves high SCP, it will be characterized by high levels Flexibility, Integration, Patient Responsiveness, Physician Performance, and Partnership Quality. See table 5.4.2.1. This suggests for example, that hospitals with high SCP are likely to be characterized as having patient care teams that are able to handle the rapid introduction of new services, introduce large numbers of service improvements/variations, adapt when patient demands vary greatly to still provide high quality care, achieve high levels of coordination and communication among all functions, fulfill patients' needs on time and be responsive to patients' needs, and have admitting/attending physicians who provide dependable, high quality services to patients.

ISCP and VDE are found to explain 57% (R^2 value) of the variance in SCP which is considered to be a moderate explanation and thus meaningful Chin (1998). The effect size for ISCP on SCP (0.49) is considered large, while the effect size of VDE on SCP (0.07) is considered small but still meaningful (Cohen, 1988). Clearly, the effect size of ISCP on SCP is substantially greater than that of VDE on SCP. This is also reflected in a comparison of the beta coefficients of the two independent variables in these relationships (β=0.62 for ISCP and β=0.22 for VDE). While ISCP has a greater influence on SCP, taken together these findings provide evidence that both ISCP and VDE are key antecedents of SCP. The inclusion of ISCP and VDE in the model is valuable as evidenced not only by their positive linkages to SCP, but also by their total effects on HCDC (coefficient = 0.50, $p < 0.01$ and coefficient = 0.21, $p < 0.01$ respectively).

Next is a discussion of the implications related to Hypothesis 8 and 9.

> ***Hypothesis 8:*** *Value dense environment is positively associated with healthcare delivery capability.*

> ***Hypothesis 9:*** *Supply chain performance is positively associated with healthcare delivery capability.*

The statistical analysis displayed in table 5.4.3.1 provides negligible support for Hypothesis 8 when interpreting the four model assessment indexes (path coefficient, R^2, f^2, and the total effect). The results indicate that VDE does not play a direct role in affecting HCDC. The path coefficient between VDE and HCDC is not found to be significant (β=0.07, t=0.94). Likewise, the effect size (0.02) is considered to be small. However, as discussed in the analysis of Hypothesis 7, the total effects coefficient for VDE on HCDC is significant and positive (coefficient = 0.21, $p < 0.01$), thereby indicating that a positive association does exist, albeit not a direct relationship. This will be further explained as Hypothesis 9 is analyzed.

The statistical analysis displayed in table 5.4.3.1 also provides strong support for Hypothesis 9 as all four model assessment indexes (path coefficient, R^2, f^2, and the total effect) indicating that SCP plays a meaningful role in directly affecting the dependent variable HCDC. The path coefficient between SCP and HCDC is found to be significant and positive (β=0.61, t=7.44). This indicates that SCP has a direct positive impact on HCDC. As discussed in the analysis of Hypotheses 6 and 7, the significant factor loadings on SCP provide support that when hospital achieves high SCP, it will be characterized by high levels Flexibility, Integration, Patient Responsiveness, Physician Performance, and Partnership Quality. See table 5.4.2.1. This suggests for example, that hospitals with high SCP are likely to be characterized as having patient care teams that are able to handle the rapid introduction of new services, introduce large numbers of service improvements/variations, adapt when patient demands vary greatly to still provide high quality care, achieve high levels of coordination and communication among all functions, fulfill patients' needs on time and be responsive to patients' needs, and have admitting/attending physicians who provide dependable, high quality services to patients. This is found to mediate the relationship between VDE and HCDC. It is worth reiterating the measurement model results at this point, which support that when a hospital creates a VDE, it is characterized by Operand Knowledge (know what), Operant Knowledge (know how), and Resources. This suggests for example, that hospitals with high VDE are likely to have a work environment characterized by care providers who have the skills, ability, and knowledge along with ready access to the supplies, medications, and equipment needed when caring for a particular patient. While this environment does not in and of itself directly influence a hospital's HCDC, it is impactful through the achievement of SCP. Thus, Hypothesis 9 finds that SCP directly influences the likelihood that the hospital will achieve HCDC, while Hypothesis 8 finds that VDE influences the likelihood that the hospital will achieve HCDC, but indirectly and through SCP.

The significant factor loadings on HCDC provide evidence signifying that when hospital achieves HCDC, its patient care outcomes will be characterized by high levels of Safety, Effectiveness, Patient Centeredness, Timeliness, and Efficiency. See table 5.4.2.1. This suggests for example, that the hospitals patients will feel that the hospital is more responsive to patients' requests, complaints, personal values, and medical needs while the hospital also does a better job of eliminating waste of energy and supplies, holds down inpatient costs, and attains high equipment utilization than competing hospitals.

VDE and SCP are found to explain 41% (R^2 value) of the variance in HCDC which is considered to be a moderate explanation and thus meaningful Chin (1998). The effect size for VDE on HCDC (0.02) is considered small, while the effect size of SCP on HCDC (0.37) is considered to be large and thus more meaningful (Cohen, 1988). Clearly, the effect size of ISCP on SCP is substantially greater than that of VDE on SCP. This is provides evidence of its mediation role as discussed earlier. This mediation relationship is also reflected in a comparison of the beta coefficients of the two independent variables in these relationships (β=0.07$^{n/s}$ for VDE and β=0.61 for SCP). While SCP has the only significant direct influence on SCP (when comparing these two variables), taken together these findings provide evidence that both VDE and SCP are key antecedents of SCP. The inclusion of VDE and SCP in the model is valuable as evidenced by their total effects on HCDC (coefficient = 0.21, $p < 0.01$ and coefficient = 0.61, $p < 0.01$ respectively).

5.5.1 Summary of results

Overall, these results indicate that high levels of partner relationship will lead to high levels of integrative information and resources strategy and an entrepreneurial culture. In turn, high levels of integrative information and resource strategy and entrepreneurial culture will lead to high levels of integrative supply chain practices. High levels of integrative supply chain practices will lead to high levels of a value dense environment and supply chain performance. While high levels of value dense environment will lead to supply chain performance, it does not lead to high levels of healthcare delivery capability, but instead is mediated by the relationship between supply chain performance and healthcare delivery capability.

The next and final chapter will summarize the key contributions of this study, highlight important implications for practitioners and scholars, present some of the study's limitations, and outline future opportunities to continue this line of research.

CHAPTER 6: CONTRIBUTIONS, IMPLICATIONS, LIMITATIONS, AND FUTURE RESEARCH

This chapter discusses the key contributions of this study in section 6.1. It then goes on to highlight important implications for scholars in section 6.2, and implications for practitioners in section 6.3. Section 6.4 presents some of the study's limitations. Finally, section 6.5 concludes the study with a discussion of future opportunities to continue this line of research.

6.1 Contributions

This study developed an integrated model of the healthcare delivery supply chain grounded in SDL. It also collected and analyzed large-scale empirical data from 190 US hospitals, producing a theoretical foundation as well as empirical evidence. In doing so, this research develops one of the first integrated models linking supply chain strategy, practices, performance, and capability, a contribution which is absent in the literature (Li et al., 2006). This is useful as a comprehensive integrative framework with well defined contextual links is absent in the literature. This supply chain study is conceptualized in the downstream healthcare delivery context. While interest in this research area from supply chain, OM, and IT scholars is growing (see Shah et al., 2008; Sinha and Kohnke, 2009; Fredendall et al., 2009; Ilie et al., 2009), the field is largely underrepresented in the literature (Machuca et al., 2007). Finally, this study provides a very early attempt to measure key phenomena related to the nascent theory of SDL using SCM construct measures. Until now, the vast majority of the work in SDL has been conceptual and scholars have suggested empirical studies into this theoretical base (see Zhang and Chen, 2008). Toward this end, this study extends the conceptual work of Normann and Ramirez (1993), Prahalad and Ramaswamy (2004a) (2004b), Prahalad and Krishnan (2008), Vargo et al. (2008), Vargo and Akaka (2009) among others.

This study specifically set out to adopt a supply chain management perspective to inform the overarching research question: *does supply chain management influence value co-creation in a hospital environment where healthcare is delivered?* In doing so, four more granular research questions have been addressed. First, *what are the antecedent partner relationship, integrative information and resource strategy, and entrepreneurial culture characteristics that enable value co-creation through integrative supply chain practices?* Second, *what are the integrative supply chain practices that influence value density and supply chain performance?* Third, *what are the dimensions of supply chain performance and value density (environment) that lead to the development of healthcare delivery capability?* And finally, *what are the relationships among these antecedents and consequences of value density in healthcare delivery?* This study makes a number of contributions in exploring these research questions.

The overarching contribution of this study is the theorization and testing of a comprehensive integrated framework for supply chain practices in a specific and well defined context. This integrative framework was supported in eight of nine hypotheses, providing interpretations which inform all four of the research questions. To begin, through extensive literature review and empirical testing this study provides support for Partner Relationship, Integrative Information and Resource Strategy, and Entrepreneurial Culture as antecedents of Integrative Supply Chain Practices and a Value Dense Environment. Next, this study theorizes and empirically supports six dimensions of

Integrative Supply Chain Management Practices which bring together key dimensions described in the IT and supply chain literature. In addition, the key dimensions of Supply Chain Performance, Value Dense Environment, and Healthcare Delivery Capability have been theorized and empirically supported. Finally, relationships among these variables have been theorized using SDL and empirically supported. A more detailed discussion of this study's contributions follows.

The first contribution of this study is the theorization and confirmative testing of Partner Relationship as a coordination mechanism in the decentralized healthcare delivery supply chain. This extends the work of Shah et al. (2008) and others. This study shows how Partner Relationship can align the interests of admitting/attending physicians with the hospital in the downstream healthcare delivery supply chain. In this way, Partner Relationship serves as a key antecedent in the development of a hospital's integration strategy as well as influences the hospital's culture. This is an important and useful finding in a supply chain context absent of financial and/or contractual coordination mechanisms.

The second contribution is the identification of six supply chain management practices which are contextually grounded. Scholars have posited many different configurations of supply chain management practices (see Dolan, 1996; Tan et al., 1998; Tan et al., 2002; Chen and Paulraj, 2004; Min and Mentzer, 2004; Li et al., 2005; 2006). This is discussed in detail in section 2.2 and displayed in table 2.2.1. A potential driver of these difference configurations is that perhaps not enough attention has been paid by supply chain researchers to the context of study. In other words, contextual elements are likely to have an influence on the nature and composition of supply chain practices (Liao, 2008). This study has made a considerable effort to define the unique context of healthcare delivery in section 2.3. This has been highlighted as an important aim in the literature and is perhaps a contribution to the Operations Management literature in and of itself (see Shah et al., 2008). In doing so, this study conceptualized and then provided empirical evidence in support of six Integrative Supply Chain Practice dimensions drawing on the IT and Supply Chain literature (Physician Partnership, Patient Relationship, Information Sharing, Information Quality, Lean Principles, and IS Enabled Processes). These Integrative Supply Chain Practices were then linked to the Supply Chain Performance of the care delivery team as well as the creation of a Value Dense Environment. These variables have been shown herein to influence a hospital's Healthcare Delivery Capability.

The third contribution of this study rests at the intersection of Supply Chain Management and SDL. As discussed, studies into SDL have largely been conceptual while attempts at empirical measurement have been sparse. Zhang and Chen (2008) provide the notable exception in connecting Mass Customization and SDL. In doing so, the authors highlight the potential to explain value co-creation and SDL through the use of supply chain concepts and measurement scales. Likewise, other researchers have pointed out the opportunity for research at the intersection of Supply Chain/OM and SDL (Schmenner et al.,2009). This study addresses this gap in the literature by conceptualizing and empirically supporting the linkages among Integrative Supply Chain Practices, Value Dense Environment, and Supply Chain Performance. Additionally, these relationships have been nested in a larger nomological net which provides a rich explanation of the antecedents and consequences of value density. As such, the findings from this study with regard to supply chain concepts and value density make a substantial contribution to the nascent foundation which is currently being established for the study of SDL.

The fourth contribution of this study is the development of 35 first order measurement scales. All of the scales were tested through Q-sort pilot testing and large-scale empirical data analysis. While many of these scales are obviously and appropriately rooted in previous literature, the development process was necessary to ensure the appropriateness of these scales in the healthcare context. As such, researchers have a new set of instruments to study SCM in healthcare delivery that have been shown to be valid and reliable.

The fifth set of contributions is of the methodological variety. Following the recommendation of Erdos (1970), this study collected data from three separate sample frames while employing three different procedures for data collection. The samples were tested for inherent biases and evidence was found to support their aggregation. While the value of this particular feature of this study should not be overstated, the use of multiple methods is generally thought to enhance scientific rigor and interpretational richness. The next methodological contribution is the analysis of the reflective measurement models in AMOS, and formative structural model in PLS. This approach was supported by theory and facilitated rich interpretations. In following the recommendations of Henseler et al. (2009) among others, this analysis method enabled statistical and theoretical rigor while revealing rich, granular interpretation of the data beyond that of simple beta path coefficients and t-statistics for significance levels. The final methodological contribution is the post hoc testing for common method bias. Common method bias has emerged as a troublesome challenge which threatens the internal validity of survey research. As such, the successful use of ASDR (Manning et al., 2009) as a control variable in post hoc testing suggests that common method bias can be dealt with effectively, consequently strengthening the validity of survey findings.

6.2 Implications for scholars

This study produced findings with several scholarly implications. SDL, a nascent theoretical lens to the Operations Management field was conceptualized and tested herein (Schmenner et al., 2009). Further SDL, has been applied to a specific context in Operations Management which is ripe for additional research, that of healthcare delivery (Machuca et al., 2007). This study intersects and informs two important gaps in this regard. First, Operations Management scholars have pointed out the cry for new theories with relevant explicative power for use in the supply chain field (Schmenner et al., 2009), with particular interest in healthcare delivery (Shah et al., 2008). Second, SDL researchers have highlighted the need for the development and empirical testing of measurement instruments capable of advancing the current understanding of value co-creation and SDL (Zhang and Chen, 2008). Several, more detailed, contributions have been made in this overarching context.

First, this study revalidates a measure for Partner Relationship (see Li, 2002; Liao, 2008), with minor modifications, in a decentralized context (that of healthcare) and empirically tests it as a posited coordination mechanism in the supply chain. Evidence is presented to suggest that this measure is valid and reliable, and is now available for future use by other scholars. Additionally, these findings provide evidence that Partner Relationship can serve as an antecedent coordination mechanism in decentralized supply chains as an antecedent to both Integrative Information and Resource Strategy and Entrepreneurial Culture. This adds to the potential antecedent coordination mechanisms for decentralized supply chains discussed by Fugate et al. (2006). In a more granular sense, this is highly generalizable to healthcare delivery, but may also be generalizable to other decentralized supply chains in a context dependent fashion. Further, these findings support the link between the relational aspects of economic actor interactions and the entrepreneurial effectuation that can enhance SDL's value co-creation (Callaway and Dobrzykowski, 2009). Specifically, if Trust (shown to be a key dimension of Partner Relationship), can be linked to staff Motivation and Innovativeness (key dimensions of the culture construct), then this may be a first step in unlocking some of the contextually supportive antecedents of SDL.

Second, this is the first study to attempt to conceptualize, develop, measure, and model antecedent and consequential relationships related to the Integrative Information and Resource Strategy of a firm. This is a valuable contribution as its measurement and positive path model relationships provide evidence to advance the notion of Lambert and Cooper (2000) that the management of information (through the use of IT) and resources are related. Additionally, the development of a valid and reliable measure for Leagile SC Strategy provides an empirical measure for the hybrid SC strategy concept put forth for Vonderembse et al. (2006). The development and testing of these measures in the decentralized healthcare delivery supply chain context also offers and new tool for healthcare researchers interested in exploring information and resource management strategies.

Third, this study makes minor modifications to and revalidates the measurement instrument of Jambulingam et al. (2005) for Entrepreneurial Culture. It also places this construct in a nested path model which provides evidence of its key role as an antecedent of Integrative SC Practices. Taken together with the nested model results from the Integrative Information and Resource Strategy variable, this study sheds light on the relationship among strategy, culture, and organizational practices, thereby advancing the work of Roh et al. (2008).

Fourth, borrowing from Li et al. (2005; 2006), Rai et al. (2006), Amini et al. (2007), Tzeng et al. (2008), Jha et al. (2009) and building upon concepts from Shah et al. (2008), this study develops a valid and reliable measure for Integrative SC Practices. As described in section 6.1, the development of this construct with a well defined context has the potential to inform the ambiguity over *'what constitutes SCM practices?'* This is also the first attempt to empirically measure this group of six Integrative SC Practice dimensions in healthcare. Thus, the development of the construct provides other researchers with a valuable measurement scale for future research.

Fifth, from the perspective of SDL, these measures extend the work of Prahalad and Ramaswamy (2004a) who suggest the influence of IT on value co-creation by measuring IS Enabled Processes as a dimension of Integrative SC Practices and linking this construct to Supply Chain Performance and Value Dense Environment. Further, the evidence for Integrative Information and Resources Strategy and Entrepreneurial Culture as antecedents to Integrative SC Practices, and Value Dense Environment and Supply Chain Performance as consequences of Integrative SC Practices delivers multiple contributions. It provides a valuable nested model for the application of Integrative SC

Practices in the healthcare context. Moreover, it serves to link key antecedents and consequences of Value Density from SDL, thereby linking SCM to SDL.

Sixth, this is the first study to attempt the measurement of Value Dense Environment. This measure has been developed and empirical evidence is provided in support of its validity and reliability. Next, the exploration of the linkages among Integrative SC Practices, Value Dense Environment, Supply Chain Performance, and Healthcare Delivery Capability, advances the understanding of SDL phenomena. Specifically, these findings suggest that Integrative Supply Chain Practices can be linked to the creation of a Value Dense Environment which in turn contributes to the Supply Chain Performance of the firm. This linkage between Supply Chain and SDL is valuable to researchers, but perhaps of even greater interest is the absence of support found for a direct relationship between Value Dense Environment and Healthcare Delivery Capability. As discussed, these results indicate that this relationship is mediated by Supply Chain Performance which further informs the nature of the link between SDL and Supply Chain Management. Therefore, this study extends the SDL work of Zhang and Chen (2008) who linked Key Co-creation Activities, 'Customerization' Capability, and Service Capability, by developing and testing a nested model which can be linked to the development of a Value Dense Environment. In doing so, this advances SDL theory and empirical measurement. This also operationalizes the Value Dense Environment concept posited by Normann and Ramirez (1993).

Seventh, this study adapts and revalidates the Supply Chain Performance construct from Li (2002), porting it into the decentralized healthcare delivery context. As discussed, in terms of SDL the construct provides very useful findings in a nested model mediating Value Dense Environment and Healthcare Delivery Capability.

Eighth, this is the first study to attempt the measurement of Healthcare Delivery Capability. This measure was developed and empirical evidence has been provided in support of its validity and reliability. This extends the key aims for healthcare set out by the IOM (2001) by operationalizing this important overall outcomes measure. Next, the exploration of the linkages among Supply Chain Performance and Healthcare Delivery Capability lend support to the notion that SCM concepts and measures have applicability in healthcare delivery.

6.3 Implications for practitioners

This study provides many valuable insights capable of assisting practitioners to improve hospital operations, improve the use of IT in healthcare, improve physician relations, and develop a healthcare delivery capability which results in better Safety, Effectiveness, Patient Centeredness, Timeliness, and Efficiency in healthcare delivery. For practitioners outside of healthcare, these findings may be applicable in the context of decentralized relationships intended to enable, result in, or improve the integrated creation of value.

First, these findings show that Partner Relationship can serve as a coordination mechanism in the decentralized healthcare delivery supply chain by motivating the development of an Integrative Information and Resource Strategy. This infers that the development of Trust, Commitment, and Shared Vision in the hospital's medical staff are key to implementing IS for Comprehensiveness Strategy and/or Leagile SC Strategy.

This lends insight for practitioners as field interviews conducted by the researcher have revealed that hospitals often struggle to engage their medical staff in integrative strategies such as those intended to implement Lean process improvement or EMR systems. These findings suggest, for example, that hospitals with admitting/attending physicians who are honest and open in their dealings with the hospital's clinical staff, and who have earned the hospital's confidence through their clinical practices are better positioned to implement an integrative strategy with regard to Leagile SC and Comprehensive IS use.

Second, Entrepreneurial Culture is found to be precipitated by Partner Relationship. This infers that the establishment of Trust, Commitment, and Shared Vision with the hospital's medical staff may make the hospital's clinical staff (employees) behave in ways which are Proactive, Innovative, Autonomous, Competitively Aggressive, and Motivated. This could be a key finding for practitioners. A concomitant field interview conducted by the researcher with one survey respondent (a Chief Nursing Officer) revealed that among her greatest concerns is understanding *the antecedents of job satisfaction among her nursing staff.* This is a critical issue currently plaguing hospital executives and it is expected to worsen as pressure is realized from the projected shortage of nursing professionals (and physicians). The findings herein address this problem by suggesting that Trust, Commitment, and Shared Vision in the hospital's admitting/attending physicians may serve to motivate the nursing staff. Specifically, the measurement items suggest that hospitals with admitting/attending physicians who are honest and open in their dealings with the hospital's clinical staff, and who have earned the hospital's confidence through their clinical practices may also have clinical employees who are highly motivated toward work, hard working, very ambitious, and have a "can do" attitude.

Furthermore, a field interview conducted with a recently retired hospital system CEO (with purview over a tertiary care hospital and several community hospitals) revealed that 'developing new avenues for revenue generation' was one of the greatest sources of pressure from the Board of Trustees. According to Jambulingam et al. (2005) an innovative orientation can be linked to innovation outcomes. Therefore, it is logical that hospital executives encourage Innovativeness in the organizational culture. The close working relationship of admitting/attending physicians and nurses, along with the influence that these physicians have over the performance of the hospital (Smeltzer and Ramanathan, 2002), and the pressure for new sources of revenue faced by hospital executives makes the potential link between Partner Relationship and Innovativeness a valuable finding for practitioners. Specifically, the items suggest that hospitals with admitting/attending physicians who are honest and open in their dealings with the hospital's clinical staff, and who have earned the hospital's confidence through their clinical practices may be known as an innovator among hospitals in their region, promote new and innovative services, provide leadership in creating new services, exist on the leading edge in creating new technologies.

Third, Integrative Supply Chain Practices are shown herein to result from an Integrative Information and Resource Strategy as well as an Entrepreneurial Culture. For practitioners, this means that these organizational elements can deliver highly integrated care delivery practices consisting of better Physician Partnerships, Patient Relationships, Information Sharing, Information Quality, use of Lean Principles, and IS Enabled

Processes. One specific, plausible example may be that when hospital leadership encourages process improvement, elimination of waste, understanding patient needs, adapting to change and providing personalized care that they can anticipate that the staff will engage in efforts to standardize work through the use of care pathways, create seamless linkages among clinicians at each process handoff, use simple and direct pathways that ensure resource availability during patient care, promote decision making based on scientifically derived evidence, and eliminate waste and non-value added activities.

Fourth, managers desire to place their employees in an 'environment for success.' This study sheds light on the essential elements of such an environment by highlighting the importance that Operand Knowledge (know what), Operant Knowledge (know how) and Resources have in forming a Value Dense Environment. Such an environment is shown to come as the result of human behavioral practices such as Information Sharing, Lean, Physician Partnership, and Information Quality as well as technology enabled practices such as Comprehensive EMR Use and RFID use. This finding emphasizes the importance of both the human behavioral practices most likely for the transfer and accumulation of tacit knowledge and technology enabled practices most likely for the management of codified knowledge and physical resources.

Fifth, Integrative SC Practices are shown to influence Supply Chain Performance. This links these human behavioral practices and technology enabled practices described in the preceding paragraph with the hospital's desire for Flexibility, Integration, Patient Responsiveness, Physician Performance, and Partnership Quality in healthcare delivery. These performance outcomes are also supported by a Value Dense Environment. Given the relatively recent surge in the use of supply chain concepts (e.g., Lean) in healthcare, these findings provide support for their use, and also provide some clarity regarding the expected outcomes from such programs. A recent field interview with a VP of Quality Initiatives highlighted the focus of hospital leadership on measuring the performance of the process improvement group in terms of financial ROI. The VP shared with the researcher that while ROI is certainly critical to the organization, there *'had to be other benefits to these programs as well.'* This study illuminates some of these potential performance outcomes in the Supply Chain Performance construct. Another field interview with a Physician-Hospital Organization (PHO) Executive Director generated the comment, *'how do I improve the performance of my physicians?'* This study provides insight into this question, suggesting that the path to improved Physician Performance is linked to fostering better Physician Partnerships, Information Sharing and Information Quality and the other dimensions of Integrative SC Practices as well as a Value Dense Environment.

Sixth, this study shows that a hospital can develop a Healthcare Delivery Capability which is made up of care delivery outcomes which are Safe, Effective, Patient-Centered, Timely, and Efficient. These results show that the path to these desired outcomes for managers comes not through a focus on providing resources and training (the creation of an Value Dense Environment) for employees, but through fostering better performance from the healthcare delivery team in terms of Flexibility, Integration, Patient Responsiveness, Physician Performance, and Partnership Quality.

6.4 Limitations

While this study has made several theoretical and practical contributions to healthcare delivery (clinical integration) from a supply chain and IT perspective, it also offers notable limitations as described below.

First, while three sampling frames were employed, and two of the calculable response rates are considered high by today's survey response rate standards (over 15% and 30%), the data were all collected from hospitals within the USA. Given the dramatic healthcare policy differences among world nations it would be useful to engage in comparative research studies. For example, the Canadian or British systems could be considered less decentralized than that of the USA healthcare system, which may enable a comparative study providing useful insights into best practices for coordination mechanisms.

Second, as mentioned in the preceding paragraph, data were collected from three sampling frames, only two of which made it possible to calculate survey response rate. While the AHA and UHC response rates were strong, the inability to calculate the response rate for the CMSA sample (n=31) is a limitation of the study.

Third, data were collected from one respondent from each hospital. This approach has been questioned as a single respondent may not have the ability to provide accurate information regarding complex organizational phenomena (Venkatraman and Grant, 1986). Further, this precludes the researcher from performing any inter-rater reliability tests of the survey data. While, the post hoc test for common method bias provides evidence of an absence of method bias in the data, it would be useful to collect data from multiple respondents in each hospital (see McFadden et al., 2009).

Fourth, the use of cross-sectional data in this study provides only a 'snapshot' of the current operations of the hospital respondents. This inherent flaw in the method typically makes longitudinal studies attractive alternatives. This condition is exacerbated in the current healthcare environment given the federal pressure for operational changes in the healthcare system such as the implementation and *meaningful use* of the EMR.

Fifth, survey method offers the advantage of collecting large amounts of data from large populations. This data can then be used to identify relationships of interest as has been the case for this study. However, "survey information ordinarily does not penetrate very deeply below the surface," (Kerlinger, 1986). In other words, while survey data may be useful in identifying relationships among variables, it may not always provide insight into 'why' these relationships exist. Although the theoretical grounding provided by SDL is useful in this regard, follow up ethnographic studies would likely be worthwhile to explore the phenomena under study in a real-life context (Yin, 1981; Dobrzykowski et al., 2010).

Sixth, the study sample contains a large portion of 'teaching' hospitals (58% of the sample). While this is an advantage in terms of studying cutting edge best practices (McDermott and Stock, 2007), it does bear consideration as a potential limitation when considering the generalizability of the findings. Given this, a *post hoc* ANOVA test was performed to analyze mean differences among 'major teaching', 'minor teaching' and 'non-teaching' hospitals. The results reveal that no statistical differences exist among these groups for the higher order constructs under study (the structural path model variables). The structural path model analysis was also repeated, employing teaching status as a control variable for each endogenous construct in the model. The results reveal that teaching status is not significant as a control variable on any of the higher order endogenous constructs in the structural path model, nor did any of the previously supported hypothesized relationships change significantly. Finally, an ANOVA analysis was performed on each of the 35 first order constructs. This test revealed only one statistically significant mean difference (at $p < 0.01$) among the groups. The results show that 'major teaching' hospitals have a higher mean (μ=4.19) for 'Innovativeness' as a dimension of 'Entrepreneurial Culture' than is the case for 'non-teaching' hospitals (μ=3.57). In this same dimension, the mean difference between 'major teaching' (μ=4.19) and 'minor teaching' hospitals (μ=3.78) is only marginally significant at $p <$ 0.1. The mean difference between 'minor teaching' and 'non-teaching' hospitals on this dimension is not significant. These results suggest that while the goals and missions of teaching and non-teaching hospitals may differ (Li et al., 2002), the operational strategies and practices with regard to the phenomena under study here are not significantly different[8]. This thereby enhances the generalizability of the study findings presented herein.

6.5 Future research opportunities

The limitations mentioned in the preceding section (6.4), the statistical results presented herein, and structured interviews conducted part and parcel to the Q-sort process, reveal some interesting and meaningful opportunities for future research.

First, with regard to the limitations of the study, there is a clear need to repeat this study in an attempt to create longitudinal comparisons. As mentioned in section 6.4,

[8] Other OM studies have hypothesized differences between teaching and non-teaching hospitals and found no statistically significant differences (see Goldstein and Naor, 2005; Tucker et al., 2007; McFadden et al., 2009).

hospitals today are facing tremendous pressure to improve operations and implement IT effectively. Unfortunately, little research, particularly of the empirical variety, has been conducted into the best practices for these and other similar hospital initiatives. While the present study sheds some light on best practices in this area, the rapidly evolving adoption environment warrants investigatory repetition. In a related note, it may be worthwhile to expand the sample frame to include more non-teaching hospitals as well. The collection of additional data would also be useful in validating the instruments developed herein.

Second, with regard to the statistical results of this study, two obvious opportunities readily appear. Attention is drawn to Hypothesis 8 which was not supported in the model. While this was able to be explained by the mediating effect of Supply Chain Performance, there may be other variables which were not considered in this study that may affect the relationship between having a Value Dense Environment and achieving a Healthcare Delivery Capability. Additionally, attention is also drawn to the exogenous variable in the model, Partner Relationship. While this study theorized and statistically supported Partner Relationship as a coordination mechanism in the decentralized supply chain conceptualized herein, many questions are left unanswered about this variable. For example, *what are the antecedents of Partner Relationship?* This study provides value in emphasizing the importance of this variable, but does little to explain how a hospital can achieve Partner Relationship. One final comment on the statistical results is worth mentioning. The structural model conceptualized in this study was very large and complex, measuring 35 constructs with over 130 items. As such, a great deal of opportunity exists in decomposing the model and exploring relationships at the subconstruct (or dimensional) level.

Third, the structured interviews and discussions with some of the survey respondents revealed many valuable insights into relevant research opportunities with regard to the decentralized nature of the healthcare delivery supply chain. Integration of the decentralized healthcare delivery supply chain is a current trend in healthcare. One of the more popular approaches in this regard involves the employment of admitting/attending physicians. These employment relationships involve the hospital (or health system) as the employer, and the physician as the employee. This is a practice which gained great momentum in the early 1990s before waning later in the decade. However, the structured interviews revealed that this trend has again gained momentum, with little if any empirical evidence of its effectiveness in practice. As such, an important opportunity exists to conduct research into this phenomenon thereby informing relevant curiosity among scholars and practitioners alike.

References

Aggarwal, S. (1997). Flexibility management: the ultimate strategy. *Industrial Management,* 39(1), 26–31.

Agarwal, A., Shankar, R., and Tiwari, M.K. (2006). Modeling the metrics of lean, agile, and leagile supply chain: An ANP-based approach. *European Journal of Operational Research,* 173, 211-225.

AHRQ. (2008). *2007 National Healthcare Quality Report*. Rockville, MD: Agency for Healthcare Research and Quality.

Albers, S. (2009). *PLS and success factor studies in marketing.* In: V. Esposito Vinzi, W. W. Chin, J. Henseler, and H.Wang (Eds), Handbook of partial least squares: Concepts, methods, and applications. Berlin: Springer (in print).

Al-Khalifa, K. and Aspinwall, E. (2001). Using the competing values framework to investigate the culture of Qatar industries. *Total Quality Management,* 12(4), 417-28.

Alvarado U. and Kotzab H. (2001). Supply chain management: the integration of logistics in marketing. *Industrial Marketing Management,*30(2):183–98.

Alvarez, D. (1994). Solving the puzzle of industry's rubic cube-effective supply chain management. *Logistics Focus,* 2(4), 2-4.

American Hospital Association (AHA). (2010a). *About the American Hospital Association.* Retrieved June 18, 2010, from http://www.aha.org/aha/about/index.html

American Hospital Association (AHA). (2010b). *Fast Facts on US Hospitals.* Retrieved on June 20, 2010, from http://www.aha.org/aha/resource-center/Statistics-and-Studies/fast-facts.html

American Hospital Association (AHA). (2005). *Forward momentum: hospital use of information technology.* American Hospital Association: Chicago, IL.

Amini, M., Otondo, R., Janz, B. and Pitts, M. (2007). Simulation modeling and analysis: a collateral application and exposition of RFID technology. *Production and Operations Management,* 16(5), 586-598.

Anderson, J.C. and Gerbing, D.W. (1988). Structural equation modeling in practice: a review and recommended two-step approach. *Psychological Bulletin,* 103(3), 411–423.

Apigian, C.H., Ragu-Nathan, B.S. and Ragu-Nathan, T.S. (2006). Strategic profiles and Internet Performance: An empirical investigation into the development of a strategic Internet system. *Information and Management,* 43, 455-468.

Armstrong, J.S. and Overton, T.S. (1977). Estimating non-response bias in mail surveys. *Journal of Marketing Research,* 24, 396-402.

Ash, J.S., Gorman, P.N., Seshadri, V., et al. (2004). Computerized Physician Order Entry 5. in U.S. Hospitals: Results of a 2002 Survey. *Journal of the American Medical Informatics Association*, 11(2): 95–99.

Ashby, J., Guterman, S. and Greene, T. (2000). An analysis of hospital productivity and product change, *Health Affairs*, 19(5), 197-205.

Ayres, R.U. (1998). Technological progress: A proposed measure. *Technology Forecast Social Change*, 59, 213-233.

Bagozzi, R.P. (1980). *A causal model in marketing*. New York: Wiley.

Bagozzi, R.P., and Phillips, L.W. (1982). Representing and testing organizational theories: a holistic construct. *Administrative Science Quarterly*, 27, 459-489.

Ballou, D.S., Gillbert, S.M. and Mukherjee, A. (2000). New managerial challenge from supply chain opportunities. *Industrial Marketing Management,* 29, 7-18.

Balsmeier, P.W. and Voisin, W. (1996). Supply chain management: a time-based strategy. *Industrial Management*, 38(5), 24–27.

Bamford, D. and Griffin, M. (2008). A case study into operational team-working within a UK hospital. *International Journal of Operations and Production Management,* 28(3), 215-237.

Barclay, D.W., Higgins, C., and Thompson, R. (1995). The partial least squares approach to causal modeling: Personal computer adoption and use as illustration. *Technology Studies*, 2(2), 285–309.

Barney, J. (1991). "The resource-based model of the firm: origins, implications, and prospects", *Journal of Management,* 17 (1), 97–117.

Baruch, Y. (1999). Response rate in academic studies. *Human Relations,* 52(4), 421-438

Beamon, B.M. (1998). Supply chain design and analysis: models and methods. *International Journal of Production Economics,* 55(3), 281-294.

Bechtel, C., Jayaram, J. (1997). Supply chain management: A strategic perspective. *International Journal of Logistics Management,* 8(1), 15–34.

Berwick, D. M. (2004). *Crossing the quality chasm: Health care for the 21st century*. Presentation at the IOM Quality Chasm Summit, Washington, DC.

Berry, D., Towill, D.R. and Wadsley, N. (1994). Supply chain management in the electronics products industry. *International Journal of Physical Distribution and Logistics Management,* 24(10), 20–32.

Bitner, M.J., Faranda, W.T., Hubbert, A.R., and Zeithaml, V.A. (1997). Customer contributions and roles in service delivery, *International Journal of Service Industry Management*, 8(3), 193-205.

Blankenship and Breen (1992). *State of the Art Marketing Research,* Ch. 7, *Choosing the Method of Collecting Data,* 121-165.

Bollen, K. (1989). *Structural equations with latent variables.* Wiley: New York, NY.

Boomsma, A. and Hoogland, J.J. (2001). *The robustness of LISREL modeling revisited*. In: R. Cudeck, S. duToit, and D. Sorbom (Eds), Structural equation modeling: Present and future (139–168). Chicago, IL: Scientific Software International.

Booth, R. (1996). Agile manufacturing. *Engineering Management Journal,* April, 105-111.

Bowersox, D. J. (1997). Integrated Supply Chain Management: A Strategic Imperative, in Annual Conference Proceedings, Council of Logistics Management, Chicago, Illinois, 181–189.

Bowersox, D.J. and Closs, D.J. (1996). *Logistical Management: The Integrated Supply Chain Process.* McGraw-Hill Series in Marketing. New York: The McGraw-Hill Companies.

Bowersox, D. J., Closs, D. J., & Stank, T. P. (2000). Ten mega-trends that will revolutionize supply chain logistics. *Journal of Business Logistics,* 21*,* 1–16.

Braunscheidel, M. and Suresh, N. (2009). The organizational antecedents of a firm's supply chain agility for risk mitigation and response. *Journal of Operations Management,* 27, 119-140.

Browne, M.W. and Cudeck, R. (1993). *Alternative ways of assessing model fit*. In K.A. Bollen & J.S. Long (Eds.), Testing structural equation models (pp. 445-455). Newbury Park, CA: Sage.

Bucklin, L.P. and Sengupta, S. (1993). Organizing successful co-marketing alliances. *Journal of Marketing,* 57 (April), 32-46.

Burns, L.R., Chilingerian, J.A. and Wholey, D.R. (1994). The effect of physician practice organization on efficient utilization of hospital resources. *Health Services Research*, 29(5), 583-603.

Butler, T.W., Leong, G.K. and Everett, L.N. (1996), The operations management role in hospital strategic planning. *Journal of Operations Management*, 14(2), 137-56.

Byrne, B.M. (2001). *Structural equation modeling with AMOS*. Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc.

Byrnes, Jonathan L.S. (2004). Fixing the Healthcare Supply Chain. *Harvard Business School: Working Knowledge*. Retrieved February 26, 2009. http://hbswk.hbs.edu/archive/4036.html.

Cabrera, A., Cabrera, E.F. and Barajas, S. (2001). The key role of organizational culture in a multi-system view of technology-driven change. *International Journal of Information Management*, 21(3), 245-61.

Calantone, R., Droge, C., Vickery, S. (2002). Investigating the manufacturing–market interface in new product development: Does context affect the strength of relationships? *Journal of Operations Management*, 20(3), 273–287.

Callaway, S. and Dobrzykowski, D. (2009). Service-Oriented Entrepreneurship: Service-Dominant Logic in green design and healthcare. *Service Science,* 1(4), 225-240.

Cameron, K. and Quinn, R. (1999). *Diagnosing and Changing Organizational Culture.* Addison-Wesley, Reading, MA.

Camillus, J.C. and Lederer, A.L. (1985). Corporate strategy and the design of computerized information systems, *Sloan Management Review,* 26(3), 35-42.

Cannon, C. P., Bahit, M. C., Haugland, J. M., Henry, T. D., Schweiger, M. J., McKendall, G. R., et al. (2002). Under-utilization of evidence-based medications in acute ST elevation myocardial infarction. *Critical Pathways in Cardiology, 1*(1), 44–52.

Carr, A.S. and Person, J.N. (1999). Strategically managed buyers-seller relationships and performance outcomes. *Journal of Operations Management,* 17(5), 497-519.

Cassel, C.M., Hackl, P., and Westlund, A.H. (2000). On measurement of intangible assets: A study of robustness of partial least squares. *Total Quality Management,* 11(7), 897–907.

Cavinato, Joseph L. (1992). A Total Cost/Value Model for Supply Chain Competitiveness," *Journal of Business Logistics,* (13)2, 285-301.

Center for Medicare and Medicaid Services (CMS). (2010). *Acute inpatient – files to download.* Retrieved on June 20, 2010 at http://www.cms.hhs.gov/AcuteInpatientPPS/FFD/itemdetail.asp?filterType=none&filterByDID=0&sortByDID=1&sortOrder=ascending&itemID=CMS1198557&intNumPerPage=10

Chan, P., Wen-Ta, C., Wan-Ming, C., Min-Fang, L. Benette, C. (2005). Applying Six Sigma methodology to maximise magnetic resonance imaging capacity in a hospital. *International Journal of Healthcare Technology & Management*, *6*(3).

Chase, R.B. and Tansik, D.A. (1983). The customer contact model for organization design. *Management Science,* 29(9), 1037-50.

Chen, M.-C., Yang, T., and Li, H.-C. (2007). Evaluating the supply chain performance of IT-based inter-enterprise collaboration. *Information and Management,* 44*,* 524–534.

Chen, I. and Paulraj, A. (2004). Towards a theory of supply chain management: the constructs and measurement. *Journal of Operations Management,* 22, 119-150.

Childerhouse, P., Aitken, J., Towill, D.R. (2002). Analysis and design of focused demand chains. *Journal of Operations Management*, 20, 675–689.

Chin, W.W. (1998). Issues and opinion on structural equation modeling. *MIS Quarterly*, 22(1), 7-16.

Chin, W.W. and Gopal. A. (1995). Adoption Intention in GSS: Relative Importance of Beliefs. *The Data Base for Advances in Information Systems*, 26(2&3), 42-63.

Chin, W.W., Marcolin, B.L. and Newsted, P.R. (2003). A partial least squares latent variable modeling approach for measuring interaction effects: results from a Monte Carlo simulation study and voice mail emotion/adoption study. *Information Systems Research*, 14(2), 189–217.

Chizzo, S.A. (1998). Supply chain strategies: solutions for the customer-driven enterprise. In: *Software Magazine. Supply Chain Management Directions Supplement,* (January), 4–9.

Chopra, S. and Meindl, P. (2004). *Supply Chain Management: Strategy, Planning, and Operations.* Upper Saddle River, N.J.: Prentice Hall.

Christopher, M. (1992). *Logistics and Supply Chain Management*. Pitmans, London.

Christopher, M. G. (1998). *Relationships and Alliances: Embracing the era of network competition, in Strategic Supply Chain Management,* J. Gattorna, ed., Gower Press, Hampshire, England, 272–284.

Christopher, M. (2000). The agile supply chain: Competing in volatile markets. *Industrial Marketing Management*, 29(1), 37-44.

Churchill Jr., G.A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, 16(February), 64–73.

Cigolini, R., Cozzi, M. and Perona, M. (2004). A new framework for supply chain management Conceptual model and empirical test. *International Journal of Operations and Production Management,* 24(1), 7-41.

Claycomb, C., Droge, C. and Germain, R. (1999). The effect of just-in-time with customers on organizational design and performance. *International Journal of Logistics Management*, 10(1), 37–58.

CMSA, Case Management Society of America. (2010a). *What is a Case Manager?* Retrieved on June 1, 20101 from http://www.cmsa.org/CMSA/WhoWeAre/tabid/222/default.aspx

CMSA, Case Management Society of America. (2010b). *Who we are*. Retrieved on June 1, 20101 from http://www.cmsa.org/CMSA/WhoWeAre/tabid/222/default.aspx

Cogan, J., Hubbard, R. and Kessler, D. (2004). Healthy, wealthy, and wise. *Wall Street Journal*, A. 20.

Cohen, J.A. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement,* 20, 37–46.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences (2nd ed.)*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Cohen, W. and Levinthal, D. (1990) Absorptive capacity: A new perspective on learning and innovation. *Administrative Sciences Quarterly,* 35, 128-152.

Condel, J. L., Sharbaugh, D. T. and Raab, S. S. (2004). Error-free pathology: Applying lean production methods to anatomic pathology. *Clinics in Laboratory Medicine*, 24(4), 865–899.

Constantin, J. A. and Lusch, R. F. (1994). *Understanding Resource Management*. Oxford, OH: The Planning Forum.

Cooper, M.C. and Ellram, L.M. (1993). Characteristics of Supply Chain Management and the Implication for Purchasing and Logistics Strategy. *The International Journal of Logistics Management,* 4(2), 13-24.

Cooper, M.C, Ellram, L.M., Gardner, J.T. and Hanks, A.M. (1997). Meshing Multiple Alliances *Journal of Business Logistics,*18(1), 67-89.

Council of Logistics Management (CLM). (2000). *What it's all about*. Oak Brook: CLM.

Coye, M., Haselkorn, A., and DeMello, S. (2009). Remote Patient Management: Technology-Enabled Innovation And Evolving Business Models For Chronic Disease Care, *Health Affairs,* 28(1), 126-135.

Cross, A., and Kelley, L. L. (2004). Trust, commitment and team working: The paradox of virtual organizations. *Global Network,* 4, 375–390.

Crowne, D.P. and Marlowe, D. (1960). A new scale for social desirability independent of psychopathology. *Journal of Consulting Psychology*, 24, 349–354.

Culter, D.M., Feldman, N.E. and Horwitz J.R. (2005). U.S. Adoption of Computerized Physician Order Entry Systems." *Health Affairs (Millwood),* 24(6):1654–1663.

Das, A., Pagell, M., Behm, M. and Veltri, A. (2008). Toward a theory of the linkages between safety and quality. *Journal of Operations Management,* 26, 521-535.

Davis, F.D. (1986). A technology acceptance model for empirically testing new end user information systems: theory and results, Unpublished Doctoral Dissertation, Massachusetts Institute of Technology.

Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance. *MIS Quarterly,* 13(3), 319–330.

Davis, T. (1993). Effective supply chain management. *Sloan Management Review,* 34(4), 35-46.

Davenport, T.H. and Prusak, L. (1998). *Working knowledge: how organizations manage what they know.* Boston: Harvard Business School Press.

Day, G. (2006). Achieving advantage with a service-dominant logic. In R. Lusch & S. Vargo (Eds.), *The Service-Dominant Logic of Marketing* (139-149). Armonk, New York: M.E.Sharpe.

de Treville, S., and Antonakis, J. (2006). Could lean production job design be intrinsically motivating? Contextual, configurational, and levels-of-analysis issue. *Journal of Operations Management*, 24(2), 99–123.

Dey, P.K., Hariharan, S. and Clegg, B.T. (2006). Measuring the operational performance of intensive care units using the analytic hierarchy process approach. *International Journal of Operations and Production Management,* 26(8), 849-865.

Diamantopoulos, A., and Winklhofer, H. (2001). Index construction with formative indicators: An alternative to scale development. *Journal of Marketing Research,* 38(2), 269–277.

Dicken, J. (2009). PRESCRIPTION DRUGS: Overview of Approaches to Control Prescription Drug Spending in Federal. *United States Government Accountability Office*, (June), 1-16.

Dobrzykowski, D.D., Tran, O.T. and Hong, P.C. (*in press* 2011). Insights into integration for supply chain redesign in service and product-focused firms, *International Journal of Services and Operations Management,* 3(11).

Dobrzykowski, D., Tran, O. and Tarafdar, M. (2010). Value Co-Creation and Resource Based Perspectives for Strategic Sourcing. *Strategic Outsourcing: An International Journal,* 3(2), 106-127.

Doll,W. and Vonderembse,M. (1991). The evolution of manufacturing systems: towards the post-industrial enterprise. *Omega*, 19, 401-411.

Donlon J. (1996). Maximizing value in the supply chain. *Chief Executive*,117, 54–63.

Doty, H.D., Glick, W.H., and Huber, G.P. (1993). Fit, equifinality, and organizational effectiveness: A test of two configurational theories. *Academy of Management Review*, 36(6), 1196-1250.

Drucker, P.F. (1985). *Innovation and Entrepreneurship.* Harper & Row: New York, NY.

Drucker, P. F. (1998). "Management's New Paradigms." *Forbes Magazine,* October 5, 52–177.

Duray, R. (2002). Mass customization origins: Mass or custom manufacturing? *International Journal of Operations and Production Management*, 22(3), 314–328.

Economist. (2008). Operating profit. Economist, 388(8593), 74–76.

Edmondson, A.C. (2003). Speaking up in the operating room: how team leaders promote learning in interdisciplinary action teams. *Journal of Management Studies*, 40(6), 1419-52.

Edmondson, A.C., Bohmer, R.M. and Pisano, G.P. (2001), Disrupted routines: teamlearning and new technology implementation in hospitals. *Administrative Sciences Quarterly,* 46(4) 685-716.

Edmondson, A. C., Winslow, A. B., Bohmer, R. M. J., & Pisano, G. P. (2003). Learning how and learning what: Effects of tacit and codified knowledge on performance improvement following technology adoption. *Decision Sciences,* 34(2), 197–223.

Ellram L.M. (1990). The supplier selection decision in strategic partnerships. *Journal of Purchasing and Materials and Management*, (Fall), 8–14.

Ellram, L.M. and Cooper, M.C. (1990). Supply Chain Management, Partnerships, and the Shipper-Third Party Relationship. *The International Journal of Logistics Management,* 1(2), 1-10.

Einhorn, B., & Arnst, C. (2008, March 24). Outsourcing the patients. *Business-Week,* 4076, 36.

Erdos, P.L. (1970). *Professional Mail Surveys.* McGraw-Hill, New York, NY.

Evans, M. (2008). (2010). Integrating efficiency. *Modern Healthcare,* February 4, 2008, 26-29.

Fiala, P. (2005). Information Sharing in Supply Chains. *Omega*, 33(5), 419-423.

Field, A. (2005). *Discovering Statistics Using SPSS*. SAGE Publications, Thousand Oaks, CA.

Fisher, M.L. (1997). What is the right supply chain for your product? *Harvard Business Review*, (March–April), 105–116.

Flynn, B.B., Sakakibara, S., Schroeder, R.G., Bates, K.A., Flynn, E.J., (1990). Empirical research methods in operations management. *Journal of Operations Management*, 9(2), 250–284.

Ford, E. and Scanlon, D. (2007). Promise and problems with supply chain management approaches to healthcare purchasing. *Healthcare Management* Review, 32(3), 192-202.

Fornell, C. (1982). *A second generation of multivariate analysis: An overview.* In: C. Fornell (Ed.), A second generation of multivariate analysis (1, 1–21). New York, NY: Praeger.

Fornell, C. and Larcker, D. (1981) Evaluating Structural Equations Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research,* 18, 39-50.

Foster, S.T. Jr, Sampson, S.E. and Dunn, S.C. (2000). The impact of customer contact on environmental initiatives for service firms. *International Journal of Operations & Production Management*, 20(2), 87-203.

Frohlich, M. T. (2002). Techniques for improving response rates in OM survey research. *Journal of Operations Management,* 20(1), 53–62.

Frohlich, M.T. and Westbrook, R. (2001). Arcs of Integration: an International Study of Supply Chain Strategies. *Journal of Operations Management*, 19(2), 185–200.

Frohlich, M. and Dixon, R. (2001). A taxonomy of manufacturing strategies revisited. *Journal of Operations Management,* 19, 541-558.

Frei, F. X., Kalakota, R., Leone, A. J., & Marx, L. M. (1999). Process variation as a determinant of bank performance: Evidence from the retail banking study. *Management Science*, 45(9), 1210–1220.

Fredendall, L., Craig, J., Fowler, P., and Damali, U. (2009). Barriers to swift, even flow in the internal supply chain of perioperative surgical service department: a case study. *Decision Sciences,* 40(2), 327-350.

Fugate, B., Sahin, F. and Mentzer, J.T. (2006). Supply chain management coordination mechanisms. *Journal of Business Logistics,* 27(2), 129-161.

Gallivan, M. and Srite, M. (2005). Information technology and culture: identifying fragmentary and holistic perspectives of culture. *Information and Organization,* 15(4), 295-338.

Gan, X., Sethi, S. P., & Yan, H. (2005). Channel coordination with a risk-neutral supplier and a downside-risk-averse retailer. *Production and Operations Management,* 14(1), 80–89.

Ganesan, S. (1994). Determinants of long-term orientation in buyer-seller relationships. *Journal of Marketing,* 58, 1-19.

Ganeshan, R., Jack, E., Magazine, M. J., & Stephens, P. (1998). A taxonomic review of supply chain management research. In S. Tayur, R. Ganeshan, & M. Magazine (Eds.), *Quantitative models for supply chain management* (pp. 839–879). (International Series in Operations Research and Management Science, vol. 17). Norwell, MA: Kluwer Academic Publishers.

Garud, R. (1997). On the distinction between know how, know what, and know why. In J.P. Walsh and A.S. Huff (Eds.), *Advances in strategic management 1997: organizational learning and strategic management.* 14, London: JAI, 81-101.

Gasse, Y. (1982). Elaborations on the psychology of the entrepreneur. *Encyclopedia of Entrepreneurship*, 209–223.

Gehmlich, V. (2008). 'Opportunities of supply chain management in healthcare', *In* Hübner, U. and Elmhorst, M. (eds.), *eBusiness in healthcare; from eprocurement to supply chain management,* Springer-Verlag London Limited.

Giffy, C., Roth, A. and Seal, G. (1990). Surveys shows priorities are quality, workers, and mature technologies, *CIM Review,* 7(1), 5-16.

Gilbert, A.H. (1995). An analysis of the relationships among information systems design, strategy, and organizational performance using structural equation modeling. Doctoral Dissertation, College of Administration and Business, Louisiana Tech University.

Gittell, J. H. (2000). Paradox of coordination and control. *California Management Review, 42*(3), 1–17.

Gittell, J. H., Fairfield, K. M., Bierbaum, B., Head,W., Jackson, R., Kelly, M., et al. (2000). Impact of relational coordination on quality of care, postoperative pain and functioning, and length of stay: A nine hospital study of surgical patients. *Medical Care, 38*(8), 807–819.

Gittell, J. H. (2001). Supervisory span, relational coordination, and flight departure performance: A reassessment of post-bureaucracy theory. *Organization Science,* 12(4), 467–482.

Gittell, J. H. (2002a). Relationships between service providers and their impact on customers. *Journal of Service Research, 4*(4), 299–311.

Gittell, J.H. (2002b). Coordinating mechanisms in care provider groups: relational coordination as a mediator and input uncertainty as a moderator of performance effects. *Management Science,* 48(11), 1408-1426.

Glick, H.A., Orzol, S.M., Tooley, J.F. and Mauskopf, J.O. (2003). Design and analysis of unit cost estimation studies: how many hospital diagnoses? How many countries? *Health Economics,* 12(7), 517-27.

Gnanlet, A. and Gilland, W. (2009). Sequential and simultaneous decision making for optimizing health care resource flexibilities. *Decision Sciences,* 40(2), 295-326.

Goffin, K., Lemke, F., Szwejczewski, M. (2006). An Exploratory Study of 'Close' Supplier-manufacturer Relationships. *Journal of Operations Management,* 24(2), 189-209.

Goldstein, S.M., Ward, P.T., Leong, G.K. and Butler, T.W. (2002). The effect of location, strategy, and operations technology on hospital performance. *Journal of Operations Management*, 20(1), 63-75.

Goldstein, S.M. and Ward, P.T. (2004). Performance effects of physicians' involvement in hospital strategic decisions. *Journal of Service Research,* 6(4), 361-72.

Goldstein, S.M. and Naor, M. (2005). Linking publicness to operations management practices: a study of quality management practices in hospitals. *Journal of Operations Management,* 23, 209-228.

Gordis, L. (2009). *Epidemiology, Fourth Edition.* Philadelphia: Saunders Elsevier.

Gowen III, C.R., McFadden, K.L., Hoobler, J.M. and Tallon, W.J. (2006). Exploring the efficacy of healthcare quality practices, employee commitment, and employee control. *Journal of Operations Management,* 24, 765-778.

Grant, R. (1991). The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation. *California Management Review,* 33(3), 114-135.

Greene, A.H. (1991). Supply Chain of Customer Satisfaction. *Production and Inventory Management Review and APICS News,* 11(4), 24-25.

Grewal, R., Cote, J.A., and Baumgartner, H. (2004). Multicollinearity and measurement error in structural equation models: Implications for theory testing. *Marketing Science*, 23(4), 519–529.

Gunasekaran, A. (2005). Editorial: New service and manufacturing environments: Challenges for operations management researchers and practitioners. *International Journal Services and Operations Management,* 1(1), 1-6.

Gunasekaran, A., Patel, C., and Tirtiroglu, E. (2001). Performance measures and metrics in a supply chain environment. *International Journal of Operations and Production Management,* 21(1–2), 71–87.

Hadjistavropoulos, H.D., Frombach, I.K., and Asmundson, G.J.G. (1999). Exploratory and confirmatory factor analytic investigations of the Illness Attitudes Scale in a nonclinical sample. *Behaviour Research and Therapy*, 37, 671-684.

Handfield, R.B., and Nichols, E.L. (1999). *Introduction to supply chain management,* Prentice Hall: Upper Saddler River, NJ.

Handfield R.B. and Pannesi R.T. (1995). Antecedents of lead-time competitiveness in make-to-order manufacturing firms. *International Journal of Production Research,* 33(2), 511–537.

Handfield, R. and Lawson, B. (2007). Integrating suppliers into new product development. *Research Technology Management.* September – October 2007.

Hansen, M.T. (1999). The search-transfer problem: the role of weak ties in sharing knowledge across organizational subunits. *Administrative Sciences Quarterly,* 44(1), 82-111.

Hair, J., Black, W., Babin, B., Anderson, R., and Tatham, R. (2006). *Multivariate Data Analysis, Sixth edition.* Pearson Prentice Hall: Upper Saddle River, NJ.

Hair, J.F., Anderson, R.E., Tatham, R.L., and Black, W.C. (1998). *Multivariate Data Analysis, Fifth edition.* Macmillan Publishing Company: New York, NY.

Hair, J., Black, W., Babin, B., Anderson, R., and Tatham, R. (1995). *Multivariate Data Analysis, Fourth edition.* Prentice Hall: Englewood Cliffs, NJ.

Harland, C.M. (1996). Supply chain management: relationships, chains and networks. *British Journal of Management,* 7(special issues), s63-s80.

Hayer, H. (2002). CHI – its work and emerging themes. Workshop presentation at the *HR in the NHS Conference*. Birmingham, July.

Hayes, R.H. and Wheelwright, S.C. (1984). *Restoring our Competitive Edge: Competing through Manufacturing*, Wiley, New York, NY.

Hayes, Robert, Pisano, Gary, Upton, David and Wheelwright. (2005). *Operations, Strategy, and Technology: Pursuing the Competitive Edge.* Wiley, New York, NY.

Heineke, J. (1995). Strategic operations management decisions and professional performance in U.S. HMOs. *Journal of Operations Management,* 13**,** 255–277.

Henseler, J., Ringle, C. and Sinkovics, R. (2009). The use of partial least squares path modeling in international marketing. *New Challenges to International Marketing*, 20, 277-319.

Hill, A., Collier, D., Froehle, C., Goodale, J., Metters, R. and Verma, R. (2002). Research opportunities in service process design. *Journal of Operations Management,* 20, 189-202.

Holmberg, S. (2000). A systems perspective on supply chain measurements. *International Journal of Physical Distribution and Logistics Management,* 30(10), 847–868.

Hong, P. and Jin, Y. (2007). Coordinating global inter-firm product development. *Journal of Enterprise Information Management,* 20(5), 544-561

Hong, P., Dobrzykowski, D. and Vonderembse, M. (2010). Integration of supply chain IT and lean practices for mass customization: benchmarking of product and service focused manufacturers. *Benchmarking: An International Journal,* 17(4), 561-592.

Hopp,W. J., and Spearman, M. L. (2004). To pull or not to pull: What is the question? *Manufacturing and Service Operations Management*, 6(3), 133–148.

Hsu, S.H., Chen, W.H. & Hsieh, M.J. (2006). Robustness testing of PLS, LISREL, EQS, and ANN-based SEM for measuring customer satisfaction. *Total Quality Management,* 17(3), 355-371.

Hsu, L. and Field, R. (2003). Interrater Agreement Measures: Comments on Kappan, Cohen's Kappa, Scott's Pie, and Aickin's Alpha. *Understanding Statistics*, 2(3), 205-219.

Huber, G. P. (1984). The nature and design of post-industrial organizations. *Management Science,* 30, 928-951.

Hwang, J. and Christensen, C. (2008). Disruptive Innovation In Health Care Delivery: A Framework For Business-Model Innovation. *Health Affairs,* 27(5), 1329-1335.

Ilie, V., Van Slyke, C., Parikh, M., and Courtney, J. (2009). Paper versus electronic medical records: the effects of access on physicians. *Decision Sciences,* 40(2) 213-242.

Institute of Medicine (IOM). (1991). *The computer-based patient record: An essential technology for healthcare*. Washington, DC: National Academy Press. Waikoloa, HI, 142–152.

Institute of Medicine (IOM). (2000). *To err is human: Building a safer health system*. Washington,DC: National Academy Press.

Institute of Medicine (IOM). (2001). *Crossing the quality chasm: A new health system for the 21st century*. Washington, DC: National Academy Press.

Institute of Medicine (IOM). (2008). *Knowing What Works in Health Care: A Roadmap for the* Nation (Executive Summary). Washington, D.C.: National Academies Press.

Institute of Medicine (IOM). (2009). *Toward Health Equity and Patient-Centeredness: Integrating Health Literacy, Disparities Reduction, and Quality Improvement: Workshop Summary.* Washington, D.C.: National Academies Press.

Jack, E. and Powers, T. (2004). Volume flexibility strategies in health services: a research framework. *Production and Operations Management,* 13(3), 230-244.

Jack, E. and Powers, T. (2009). A review and synthesis of demand management, capacity management and performance in health-care services. *International Journal of Management Reviews,* 11(2), 149-174.

Jacobs, A. K.,Antman, E. M., Ellrodt, G., Faxon, D. P.,Gregory, T.,Mensah, G. A., et al. (2006). Recommendation to develop strategies to increase the number of ST-elevation myocardial infarction patients with timely access to primary percutaneous coronary intervention. *Circulation, 113*(17), 2152–2163.

Jaikumar, R. (1986). Postindustrial manufacturing. *Harvard Business Review*, November-December, 69-76.

Jambulingam, T. Kathuria, R. and Doucette, W. (2005). Entrepreneurial orientation as a basis for classification within a service industry: the case of retail pharmacy industry. *Journal of Operations Management,* 23, 23-42.

Jarrell, J.L. (1998). Supply chain economics. *World Trade,* 11(11), 58–61.

Jarvenpaa, S. (1989). The effect of task demands and graphical format on information processing strategies. *Management Science*, 35(3), 285–303.

Jarvis, C.B., Mackenzie, S.B., and Podsakoff, P.M. (2003). A critical review of construct indicators and measurement model specification in marketing and consumer research. *Journal of Consumer Research,* 30, 199-218.

Jha, A.K., DesRoches, C.M., Campbell, E.G., Donelan, K., Rao, S.R., Ferrid, T.G., Shields, A. and Rosenmaum, S. (2009). Chapter 1: Beyond the doctor's office: adoption of electronic health records in U.S. hospitals. In C.M. DesRoches and A.K. Jha (Eds.), *Health Information Technology in the United States: On the Cusp of Change* (8-20). Robert Wood Johnson Foundation: Princeton, NJ.

Jin, Y. (2008). The influences of power and resources on flexibilities in a supply chain context. Dissertation, the University of Toledo.

Jones, C. (1998). Moving beyond ERP: making the missing link. *Logistics Focus*, 6(7), 2–7.

Joreskog, K.G. (1970). A General Method for Analysis of Covariance Structures. Software Inc., Chicago, IL.

Kaiser Family Foundation. (2009). *Trends in health care costs and spending.* (March). Retrieved from http://www.kff.org/insurance/upload/7692_02.pdf

Kane, R. L., Maceijewski, M., and Finch, M. (1997). The relationship of patient satisfaction with care and clinical outcomes. *Medical Care,* 35(7), 714–730.

Kaplan, A. and Haenlein, M. (2006). Toward a Parsimonious Definition of Traditional and Electronic Mass Customization. *Journal of Product Innovation Management,* 23, 168-182.

Karimi, J., Gupta, Y.P., and Somers, T.M. (1996). Impact of competitive strategy and information technology maturity on firms' response to globalization. *Journal of Management Information Systems,* 12(4) 55-88.

Kathuria, R., Joshi, M.P, and Porth, S.J. (2007). Organizational alignment and, performance: Past, present and future. *Management Decision,* 45(3), 503-517.

Kenny, D.A., and McCoach, D.B. (2003). Effect of the Number of Variables on Measures of Fit in Structural Equations Modeling. *Structural Equations Modeling*, 10(3), 333-51.

Kelley, S., Donnelly, J. and Skinner, S. (1990). Customer Participation in Service Production and Delivery. *Journal of Retailing,* 66(3), 315–335.

Kerlinger, (1986). *Foundations of Behavioral Research.* McGraw Hill: New York, NY.

Kerlinger, (1978). *Foundations of Behavioral Research.* McGraw Hill: New York, NY.

Kessler, E. and Chakrabarti, A. (1996). Innovation speed: a conceptual mode of context, antecedents, and outcomes. *The Academy of Management Review,* 21(4),1143–1191.

Kiefer, A.W. and Novack, R.A. (1999). An empirical analysis of warehouse measurement systems in the context of supply chain implementation. *Transportation Journal,* 38(3), 18-27.

Kim, S., Horowitz, I., Young, K. and Buckley, T. (2000). Flexible bed allocation and performance in the intensive care unit. *Journal of Operations Management,* 18, 427-443.

Klassen, R. D., and Jacobs, J. (2001). Experimental comparison of web, electronic and mail survey technologies in operations management. *Journal of Operations Management*, 19, 713-728.

Klevens, M., Edwards, J., Richards, C., Horan, T., Gaynes, R., Pollock, D., Cardo, D. (2007). *Public Health Report,* 122, 160-6.

Knox, E.G., Lancashire, R. and Armstrong, E.H. (1986). Perinatal mortality standards: construction and use of a health care performance indicator. *Journal of Epidemiology and Community Health*, 40(3), 193-204.

Koufteros, X., Vonderembse, M.A. & Doll, W. (2001). Concurrent engineering and its consequences. *Journal of Operations Management*, 19, 97–115.

Koufteros, X. (1999). Testing a model of pull production: a paradigm for manufacturing research using structural equation modeling. *Journal of Operations Management*, 17, 467–488.

Koufteros X.A., Vonderembse, M.A., and Doll W.J. (1997). Competitive capabilities: measurement and relationships. *Proceedings Decision Science Institute*, 1067–1068.

Kumar, A. and Motwani, J.G. (1999). Management of health care technology literature (1979-1997): a multidimensional introspection. *IEEE Transactions on Engineering Management,* 46(3), 247-64.

Kuratko, D.F. and Hornsby, J.S. (2009). *New venture management: the entrepreneur's roadmap.* Pearson Prentice Hall; Upper Saddle River, New Jersey.

Kwon, I.G. and Suh, T. (2004). Factors affecting the level of trust and commitment in supply chain relationships. *Journal of Supply Chain Management: A Global Review of Purchasing & Supply*, 40(2), 4-14.

Lambert, D. and Cooper, M. (2000). Issues in supply chain management. *Industrial Marketing Management*, 29 65-83.

Lamming, R.C. (1996). Squaring lean supply with supply chain management. *International Journal of Operations and Production Management,* 16(2), 183–196.

Landis, J.R. and Koch, G.G. (1977). The measurement of observe agreement for categorical data. *Biometrics,* 33, 159.

Langland-Orban, B., Gapenski, L.C. and Vogel, W.B. (1996). Differences in characteristics of hospitals with sustained high and sustained low profitability. *Hospital & Health Services Administration*, 41(3), 385-99.

Lapinski, A. R., Horman, M. J., & Riley, D. R. (2006). Lena processes for sustainable project delivery. *Journal of Construction Engineering and Management*, 132(10), 1083–1091.

Lagace, M. (2007). The rise of medical tourism. *Harvard Business School Working Knowledge*, December 17.

Lalonde, B.J. (1998). Building a supply chain relationship. *Supply Chain Management Review*, 2(2), 7–8.

Law, K.S., Wong, C.S., and Mobley, W.H. (1998). Toward a taxonomy of multidimensional constructs. *Academy of Management Review.* 23(4), 741-755.

Lee, D. (1997). The impact of poor performance on risk-taking attitudes: A longitudinal study with a PLS causal modeling approach. *Decision Sciences,* 28(1), 59-80.

Lee, H. L., and Billington, C. (1992). Managing supply chain inventory: Pitfalls and opportunities. *MIT Sloan Management Review,* 33*,* 65–73.

Lee, H.L., Padmanabhan, V. and Whang, S. (1997). Information distortion in a supply chain: the bullwhip effect. *Management Science,* 43(4), 546–558.

Lee, Hau. (2004). The triple A supply chain. *Harvard Business Review,* October, 102-112.

Lee, J. N. and Kim, Y. G. (1999). Effect of partnership quality on IS outsourcing: Conceptual framework and empirical validation. *Journal of Management Information System,* 15*,* 29–61.

Leisen, B., Lilly, B. and Winsor, R.D. (2002). The effects of organizational culture and market orientation on the effectiveness of strategic marketing alliances. *Journal of Services Marketing*, 16(3), 201-22.

Levy, D.L. (1997). Lean production in an international supply chain. *Sloan Management Review,* 38(2), 94-102.

Li G., Yang, H., Sun, L., and Sohal, A. (2009). The impact of IT implementation on supply chain integration and performance. *International Journal of Production Economics,* 120, 125-138.

Li, L., Chao, C., Chen, J., and Chin, L. (2009). The impacts of supply chain management systems on information sharing and integrated-performance. *Human Systems Management,* 28(3), 101-121.

Li, S. (2002). An Integrated Model for Supply Chain Management, Performance and Competitive Advantage. Dissertation, the University of Toledo.

Li, S., Rao, S., Ragu-Nathan, T. and Ragu-Nathan, B. (2005). Development and validation f a measurement instrument for studying supply chain management practices. *Journal of Operations Management,* 23, 618-641.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T.S., Rao, S.S. (2006). The Impact of Supply Chain Management Practices on Competitive Advantage and Organizational Performance. *Omega*, 34, 107–24.

Li, L. X. and Benton, W. C. (1995). Performance measurement criteria in health care organizations: Review and future research directions. *European Journal of Operations Research,* 93**,** 449–468.

Li, L. X., Benton, W.C. and Leong, G. K. (2002). The impact of strategic operations management decisions on community hospital performance. *Journal of Operations Management,* 20**,** 389–408.

Li, L. and Benton, W.C. (2003). Hospital capacity management decisions: emphasis on cost control and quality enhancement. *European Journal of Operational Research,* 146(3), 596-614.

Li, L. and Benton, W.C. (2006). Hospital technology and nurse staffing management decisions. *Journal of Operations Management,* 24, 676-691.

Li, L.X. and Collier, D.A. (2000). The role of technology and quality on hospital financial performance: an exploratory analysis. *International Journal of Service Industry Management*, 11(3), 202-24.

Li, X., and Wang, Q. (2007). Coordination mechanisms of supply chain systems. *European Journal of Operational Research,* 179(1), 1–16.

Liao, K. (2008). Achieving Build-to-order Supply Chain Capability through Practices Driven by Supplier Alignment and Supplier Empowerment. Dissertation, the University of Toledo.

Lohmöller, J.B. (1989). *Latent variable path modeling with partial leasts quares.* Heidelberg: Physica.

Löhmoeller, J. B. (1984). *LVPS 1.6 Program Manual: Latent Variable Path Analysis with Partial Least Squares Estimation,* Universitaet zu Koehn, Zentralarehiv fuer Empidsche Sozialforschung.

Lovelock, C.H., Young, R.F. (1979). Look to consumers to increase productivity. *Harvard Business Review*, 57(3), 168–178.

Lumpkin, G.T. and Dess, G.G. (1996). Clarifying the entrepreneurial orientation construct and linking it to performance. *Academy of Management Review,* 21(1), 135–172.

Lundvall, B.A. and Johnson, B. (1994). The learning economy. *Journal of Industry Studies*, 1(2), 23-42.

MacCallum, R.C., Browne, M.W., and Sugawara, H.M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods,* 1, 130-149.

MacCallum, R.C. and Browne, M.W. (1993). The use of casual indicators in covariance structure models: some practical issues. *Psychological Bulletin,* 114(3), 533-541.

Machuca, J., Gonzalez-Zamora, M. and Aguilar-Escobar, V. (2007). Service Operations Management. *Journal of Operations Management,* 25, 585-603.

Magretta, J. (1998). The power of virtual integration: an interview with Dell computers' Michael Dell. *Harvard Business Review,* 76(2), 72–84.

Malhotra, M.K., and Grover, V. (1998). An assessment of survey research in POM: from constructs to theory. *Journal of Operations Management,* 16, 407-425

Manning, K.C., Bearden, W.O., and Tian, K. (2009). Development and validation of the Agent's Socially Desireable Responding (ASDR) scale. *Marketing Letters,* 20, 31-44.

Marek, A. (2009). All inclusive surgery. *Smart Money,* July, 18(7), 64-67.

Marley, K., Collier, D., and Goldstein, S. (2004). The role of clinical and process quality in achieving patient satisfaction in hospital. *Decision Sciences,* 35(3), 349-369.

Mason-Jones, R. and Towill, D.R. (1997). Information enrichment: designing the supply chain for competitive advantage. *Supply Chain Management,* 2(4), 137–148.

McAdam, R. and McCormack, D. (2001). Integrating business processes for global alignment and supply chain management. *Business Process Management Journal,* 7(2), 113–130.

McCutcheon, D. and Stuart, F.I. (2000). Issues in the Choice of Supplier Alliance Partners. *Journal of Operations Management*, 18(3), 279-301.

McDermott, C. and Stock, G. (2007). Hospital operations and length of stay performance. *International Journal of Operations and Production Management,* 27(9), 1020-1042.

McFadden, K.L., Henagan, S.C. and Gowen, C.R., III. (2009). The patient safety chain: Transformational leadership's effect on patient safety culture, initiatives, and outcomes. *Journal of Operations Management,* 27, 390-404.

McGinnis, M.A. and Vallopra, R.M. (1999). Purchasing and supplier involvement in process improvement: a source of competitive advantage. *Journal of Supply Chain Management*, 35(4), 42–50.

McKone-Sweet, K. E.; Hamilton, P. ,Willis, S. B. (2005). The Ailing Healthcare Supply Chain: A Prescription for Change. *Journal of Supply Chain Management: A Global Review of Purchasing & Supply*, 41 (1) 4-17.

Menachemi, N., Saunders, C., Chukmaitov, Matthews, M. C. and Brooks, R. G. (2007). Hospital adoption of information technologies and improved patient safety: A study of 98 hospitals in Florida. *Journal of Healthcare Management,* 52(6), 398–409.

Mentzer, J. M., Min, S. H. and Zacharia, Z. G. (2000). The nature of interim partnering in supply chain management. *Journal of Retailing,* 76, 549–568.

Metters, R. (1997). Quantifying the bullwhip effect in supply chains. *Journal of Operations Management*, 15(2), 89–100.

Meyer, S.M. and Collier, D.A. (2001). An empirical test of the causal relationships in the Baldrige Health Care Pilot Criteria. *Journal of Operations Management,* 19, 403-425.

Miles, R. and Snow, C.C. (1978). *Organizational Strategy, Structure, and Process.* McGraw-Hill, New York, NY.

Miles, R.E. and Snow, C.C. (1984). Fit, failure, and the hall of fame. *California Management Review*, 26(3), 10-28.

Miles, R. and Snow, C. (2007). Organization theory and supply chain management: An evolving research perspective. *Journal of Operations Management,* 25, 459-463.

Miller, D.C. (1991). *Handbook of Research Design and Social Measurement, 5th edition.* Sage Publications: Newbury Park, CA. 704 pages.

Miller, H. (2008). *From volume to value: Transforming health care payment and delivery systems to improve quality and reduce costs.* Network for Regional Healthcare Improvement, 1-51.

Miller, J.G. and Roth, A. (1994). A taxonomy of manufacturing strategies. *Management Science*, 40(3), 285–304.

Min. S and Mentzer, J. (2004). Developing and measuring supply chain concepts. *Journal of Business Logistics,* 25(1), 63–99.

Mohr, J. and Spekman, R. (1994). Characteristics of partnership success: Partnership attributes, communication behavior, and conflict resolution techniques. *Strategic Management Journal,* 15*,* 135–152.

Mohammed, I. and Banwet, R. (2008). Creating flex-lean-agile value chain by outsourcing: an ISM-based interventional roadmap. *Business Process Management Journal,* 14(3), 338-389.

Monczka, R. M., Peterson, K. J., Handfield, R. B., and Ragatz, G. L. (1998). Success factors in strategic supplier alliances: The buying company perspective. *Decision Science,* 29, 553–577.

Mont, O.K. (2002). Clarifying the concept of product-service system. *Journal of Cleaner Production,* 10, 237-245.

Moore, G.C. and Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research,* 2(3), 192-222.Morgan, R. M., & Hunt, S. D. (1994). The commitment-trust theory of relationship marketing. *Journal of Marketing,* 58, 20–38.

Morgan, R. M., & Hunt, S. D. (1994). The commitment-trust theory of relationship marketing. *Journal of Marketing,* 58, 20–38.

National Coalition on Health Care. (2009). *Health care facts: costs.* Retrieved from http://www.nchc.org/documents/Fact%20Sheets/Fact%20Sheet%20-%20Cost%20Sep-09.pdf

Narasimhan, R. and Jayaram, J. (1998). Causal linkage in supply chain management: an exploratory study of North American manufacturing firms. *Decision Sciences,* 29(3), 579-605.

Nelson, R.R. and Winter, S.G. (1982). *An evolutionary theory of economic change*. Cambridge, MA: Belknap Press of Harvard University.

Noble, D. (1997). Purchasing and supplier management as a future competitive edge. *Logistics Focus,* 5(5), 23–27.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization Science,* 5(1), 14-37.

Nonaka, I. and Takeuchi, H. (1995). *The knowledge-creating company: how Japanese companies create the dynamics of innovation.* New York: Oxford University Press.

Normann, R. (2001). *Reframing Business: When the Map Changes the Landscape*. New York, NY: John Wiley & Sons.

Normann, R. and Ramirez, R. (1993). From value chain to value constellation: Designing interactive strategy. *Harvard Business Review,* July/August, 65-77.

Novack, R.A., Langley Jr., C.J. and Rinehart, L.M. (1995). *Creating Logistics Value: Themes for the Future*. Council of Logistics Management, Oak Brook, IL.

Nunnally, J.C. (1978). *Psychometric theory.* McGraw Hill: New York, NY.

O'Brien, Robert M. (2007). "A Caution Regarding Rules of Thumb for Variance Inflation Factors," *Quality and Quantity,* 41(5), 673-690.

O'Connor, G.T., Quinton, H.B., Traven, N.D., Ramunno, L.D., Dodds, T.A., Marciniak, T.A, and Wennberg, J.E. (1999). Geographic variation in the treatment of acute myocardial infarction: the cooperative cardiovascular project. *Journal of the American Medical Association,* 281(7), 627-633.

O'Neill, P. (2007). A health care bargain. *New York Times,* October 16.

Paulhus, D.L. (1984). Two-component models of socially desirable responding. *Journal of Personality and Social Psychology,* 46, 598–609.

Paulraj, A., Lado, A., Injazz, C. (2008). Inter-organizational communication as a relational competency: Antecedents and performance outcomes in collaborative buyer–supplier relationships. *Journal of Operations Management,* 26, 45-64.

Pagell, M. (2004). Understanding the factors that enable and inhibit the integration of operations, purchasing and logistics. *Journal of Operations Management,* 22, 459-487.

Pedhazur, E. and Schmelkin, L. (1991). Chapter 8, "Definitions and Variables" in *Measurement Design and Analysis: An Integrated Approach,* Lawrence Erlbaum Associates, London.

Persoon, T. J., Zaleski, S., & Frerichs, J. (2006). Improving preanalytic processes using the principles of lean production (Toyota Production System). *American Journal of Clinical Pathology*, 125(1), 16–25.

Petter, S., Straub, D., and Rai, A. (2007). Specifying formative constructs in Information Systems research. *MIS Quarterly,* 31(4), 623-656.

Pisano, G.P. (1996). Learning-before-doing in the development of new process technology. *Research Policy,* 25(7), 1097-1119.

Podsakoff, P.M., MacKenzi, S.B., Lee, J.Y. and Podsakoff, N.P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879–903.

Polanyi, M. (1966). *The tacit dimension.* Garden City, NY: Doubleday.

Poon, E. G., Bloomenthal, D., Jaggi, T., Honour, M. M., Bates, D.W., & Kaushal, R. (2004). Overcoming barriers to adopting and implementing computerized physician order entry systems in U.S. hospitals. *Health Affairs,* 23(4), 184– 190.

Porter, M.E. (1980). *Competitive Strategy*. The Free Press, New York, NY.

Porter, M. (1985). *Competitive Advantage: Creating and Sustaining Superior Performance*. New York: The Free Press.

Porter, M. (1996). What is strategy? *Harvard Business Review,* November-December, 61-78.

Power, D.J. Sohal, A. and Rahman, S.U. (2001). Critical success factors in agile supplychain management: an empirical study. *International Journal of Physical Distribution and Logistics Management,* 31(4), 247–65.

Powers, T. and Jack, E. (2008). Using volume flexible strategies to improve customer satisfaction and performance in health care services. *Journal of Services Marketing,* 22(3), 188-197.

Prahalad, C. and Krishnan, M. (2008). The New Age of Innovation: Driving Co-created Value through Global Networks. McGraw-Hill, New York.

Prahalad, C. and Ramaswamy, V. (2004a). Co-creation experiences: the next practice in value creation, *Journal of Interactive Marketing,* 18(3), 5-14.

Prahalad C. and Ramaswamy, V. (2004b). *The future of competition: co-creating unique value with customers.* Boston: Harvard Business School Press.

Qi, Y., Boyer, K. and Zhao, X. (2009). Supply chain strategy, product characteristics, and performance impact: Evidence from Chinese manufacturers. *Decision Sciences,* 40(4), 667-695.

Raab, S. S., Grzybicki, D. M., Sudilovsky, D., Balassanian, R., Janosky, J. E., and Vrbin, C. M. (2006). Effectiveness of Toyota process redesign in reducing thyroid gland fine-needle aspiration error. *American Journal of Clinical Pathology,* 126(4), 585–592.

Raab, S. S., Andrew-JaJa, C., Condel, J. L., & Dabbs, D. J. (2006). Improving Papanicolaou test quality and reducing medical errors by using Toyota production system methods. *American Journal of Obstetrics and Gynecology,* 194(1), 57–64.

Rai, A., Patnayakuni, R. and Seth, N. (2006). Firm performance impacts of digitally enabled supply chain integration capabilities. *MIS Quarterly,* 30(2), 225-246.

Ramanathan, R. (2005). Operations assessment of hospitals in the Sultanate of Oman. *International Journal of Operations and Production Management,* 25(1), 39-54.

Ramayah, T., Sang, T.Y., Omar, R. and Dahlan, N. (2008). Impact of information technology (IT) tools, partner relationship and supply chain performance. *Asian Academy of Management Journal,* 13(2), 33-55.

Ramsay, C.R., Grant, A.M., Wallace, S.A., Garthwaite, P.H., Monk, A.F. and Russell, I.T. (2000). Assessmnet of the learning curve in health technologies: a systematic review. *International Journal of Technology Assessment in Health Care,* 16(4), 1095-1108.

Rathmell, J. (1966). What Is Meant by Services? *Journal of Marketing*. 30 (4).

Read, S., Dew, N., Sarasvathy, S.D., Song, M., and Wiltbank, R. (2009). Marketing under uncertainty: the logic of an effectual approach. *Journal of Marketing,* 73(May), 1-18.

Reiner, G., Trcka, M. (2004). Customized supply chain design: Problems and alternatives for a production company in the food industry. *A simulation based approach*, 89, 217–229.

Rigdon, E.E. (1998). *Structural equation modeling.* In: G.A.Marcoulides (Ed.), Modern methods for business research, 251–294. Mahwah, NJ: Lawrence Erlbaum Associates.

Ringle, C.M./Wende, S./Will, S.: SmartPLS 2.0 (M3) Beta, Hamburg 2005, http://www.smartpls.de.

Roh, J., Hong, P., and Park, Y. (2008). Organizational culture and supply chain strategy: a framework for effective information flows. *Journal of Enterprising Information,* 21(4), 361-376.

Rosenzweig, E.D. (2009). A contingent view of e-collaboration and performance in manufacturing. *Journal of Operations Management*, 27, 462-478.

Ross, A. (1996). Selling uniqueness — Mass customization: The new religion for manufacturers? *Management Engineer*, 75(6), 260–263.

Roth A. and Miller J. (1990). Manufacturing strategy, manufacturing strength, managerial success, and economic outcomes. In: Ettlie J, Burstein M, Fiegehaum A., editors. Manufacturing strategy. Norwell, MA: Kluwer Academic Publishers, 97–108.

Rungtusanatham M, Salvador F, Forza C, Choi TY. (2003). Supply chain linkage and operational performance, a resource-based view perspective. *International Journal of Operations and Production Management,*23(9), 1084–99.

Sabherwal, R. and Chan, Y. (2001). Alignment between business and IS strategies: a study of prospectors, analyzers, and defenders. *Information Systems Research,* 12(1), 11-33.

Sahin, F. and Robinson, P. E. (2002). Flow coordination and information sharing in supply chains: Review, implications, and directions for future research. *Decision Science,* 33(4), 505–535.

Sambamurthy, V. & Chin, W.W. (1994). The effects of group attitudes toward alternative GDSS designs on the decision-making performance of computer-supported groups. *Decision Sciences*, 25(2), 215-241.

Sarasvathy, S.D. (2001). Causation and effectuation: toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of Management Review.* 26(2), 243-263.

Say, J. (1821). *A Treatise on the Political Economy*. Boston: Wells and Lilly.

Schein, E. (1992). *Organizational Culture and Leadership*, 2nd ed., Jossey-Bass, San Francisco, CA.

Schein, E.H. (1996). Three cultures of management: the key to organizational learning, Sloan Management Review, 38(1), 9-20.

Schmenner, R.W. (1986). "How can service businesses survive and prosper? *Sloan Management Review,* 27(3), 21-32.

Schmmener, R.W. (2004). Service Businesses and Productivity. *Decision Sciences,* 35(3), 333-347.

Schmenner, R. W. and Swink, M. L. (1998). On theory in operations management. *Journal of Operations Management,* 17(1), 97–113.

Schmenner, R.W., Van Wassenhove, L., Ketokivi, M., Heyl, J., and Lusch, R.F. (2009). Too much theory, not enough understanding. *Journal of Operations Management*, 27, 339-343.

Schneller, E. S., and Smeltzer, L. R. (2006). *Strategic management of the health care supply chain.* San Francisco, CA: Jossey-Bass.

Schurr, P.H. and Ozanne, J.L. (1985). Influences on exchange processes: buyers' preconceptions of a seller's trustworthiness and bargaining toughness. *Journal of consumer research,* 11(4), 939-953.

Segars, A. (1997). Assessing the unidimensionality of measurement: a paradigm and illustration within the context of information systems research. *Omega International Journal of Management Science,* 25(1), 107-121.

Shah, R., Goldstein, S., Unger, B., and Henry, T. (2008). Explaining anomolous high performance in a health care supply chain. *Decision Sciences Journal,* 39(4), 759-789.

Shannon, R. P., Frndak, D., Grunden, N., Lloyd, J. C., Herbert, C., Patel, B., et al. (2006). Using real-time problem solving to eliminate central line infections. *Joint Commission Journal on Quality and Patient Safety*, 32(9), 479–487.

Shapiro, J. (2003). Lessons for the NHS from Kaiser Permanente. *British Medical Journal,*327, 1241-1242.

Sherck, J.P. and Shatney, C.H. (1996). ICU scoring systems do not allow prediction of patient outcomes or comparison of ICU performance. *Critical Care Clinic*, 12, 515-23.

Shi, L. (1996). Patient and hospital characteristics associated with average length of stay. *Health Care Management Review,* 21(2), 46-61.

Shin, H., Collier, D.A. and Wilson, D.D. (2000). Supply management orientation and supplier/buyer performance. *Journal of Operations Management,* 18(3), 317-333.

Shortell, S. and Zajac, E. (1990). Perceptual and archival measures of Miles and Snow's strategic types: a comprehensive assessment of reliability and validity. *Academy of Management Journal,* 33(4), 817-832.

Shortell, S.M., Morrison, E.M. and Friedman, B. (1990). *Strategic choices for American hospitals,* Jossey-Bass, San Francisco, CA.

Singhal, J., Singhal, K., 2002. Supply chains and compatibility among components in product design. *Journal of Operations Management,* 20(3), 289–302.

Sinha, K. and Kohnke, E. (2009). Health care supply chain design: toward linking the development and delivery of care globally. *Decision Sciences,* 40(2), 197-212.

Skinner, W. (1969). Manufacturing – missing link in corporate strategy, *Harvard Business Review*, 47(3), 136-45.

Skinner, W. (1985). *The taming of lions: how manufacturing leadership evolved, 1780-1984*. In K. B. Clark, R. Hayes and C. Lorenz (eds), The Uneasy Alliance: Managing the Productivity- Technology Dilemma (Boston, MA: Harvard Business School Press), 63-114.

Smeltzer, L. and Ramanathan, V. (2002). Supply chain processes that lead to a competitive advantage for a manufacturer compared to a health care provider. *Decision Sciences Institue 2002 Annual Meeting Proceedings.*

Smith-Daniels, V., S. Schweikhart, D. Smith-Daniels. (1988). Capacity management in health care services: Review and future research directions. *Decision Sciences,* 19(4), 889–919.

Smith, K. L., and Smith, D. (2005). Performance measurement in supply chains. *Australian Accounting Review,* 15, 39–51.

Sole, D. and Edmondson, A. (2002). Situated knowledge and learning in dispersed teams. *British Journal of Management,* 13 (special issue), s17-s34.

Spear, S., & Bowen, H. K. (1999). Decoding the DNA of the Toyota production system. *Harvard Business Review*, 77(5), 97–106.

Spear, S. J. (2004). Learning to lead at Toyota. *Harvard Business Review*, 82(5), 78–86.

Spear, S. J. (2005). Fixing health care from the inside, today. *Harvard Business Review,* 83(9), 78–91.

Spekman, R. E., Kamauff, J. W., and Myhr, N. (1998). An empirical investigation into supply chain management: A perspective on partnerships. *International Journal of Physical Distribution & Logistics Management,* 28, 630–650.

Spender, J.C. (1996). Competitive advantage for tactic knowledge? Unpacking the concept and its strategic implications. In B. Moingeon and A. Edmondson (Eds.), *Organizational learning and competitive advantage.* London: Sage, 56-73.

Stalk G. (1988). Time—the next source of competitive advantage. *Harvard Business Review*, 66(4), 41–51.

Stein, T. and Sweat, J. (1998). Killer supply chains. *Informationweek,* 708(9), 36–46.

Stern L. and Reve T. (1980). Distribution channels as political economies: a framework for competitive analysis. *Journal of Marketing,* 44, 52–64.

Stevens, G.C. (1990). Successful supply-chain management. *Management Decision,* 28(8), 25-30.

Stock, G.N., Greis, N.P. and Kasarda, J.D. (1998). Logistics, strategy and structure. *International Journal of Production and Operations Management,* 18(1), 37-52.

Stuart, F.I. (1997). Supply-chain strategy: organizational influence through supplier alliances. *British Academy of Management,* 8(3), 223–236.

Sundbo, J. (2002). The Service Economy: Standardisation or Customisation? *Service Industries Journal,* 22(4), 93–116.

Swink, M. and Song, M. (2007). Effects of marketing-manufacturing integration on new product development time and competitive advantage. *Journal of Operations Management*, 25, 203-217.

Szulanski, G. (1996). Exploring internal stickiness: impediments to the transfer of best practice within the firm. *Strategic Management Journal,* 17, 27-43.

Tan, K., Kannan V. and Handfield R. (1998). Supply chain management: supplier performance and firm performance. *International Journal of Purchasing and Materials Management*, 34(3), 2–9.

Tan, K.C. (2001). A framework of supply chain management literature. *European Journal of Purchasing & Supply Management*, 7, 39–48.

Tan, K., Lyman, S. and Wisner, J. (2002). Supply chain management: a strategic perspective. *International Journal of Operations and Production Management,* 22(6), 614–31.

Tan, K.C., Kannan, V.R. and Handfield, R.B. (1998). Supply chain management: supplier performance and firm performance. *International Journal of Purchasing and Materials Management,* 34(3), 2–9.

Tarnow-Mordi, W., Ogston, S., Wilkinson, A.R., Reid, E., Gregory, J., Saeed, M. and Wilkie, R. (1990). Predicting death from initial disease severity in very low birth-weight infants: a method for comparing the performance of neonatal units. *British Medical Journal*, 300(23), 1611-14.

Teece, D.J. (1977). Technology transfer by multinational firms: the resource cost of transferring technological know-how. *Economic Journal,* 87(346), 242-261.

Thompson, T. G., and Brailer, D. J. (2004). *The decade of health information technology: Delivering consumer-centric and information-rich health care: Framework for strategic action*. Washington, DC: Department of Health and Human Services, National Coordinator for Health Information Technology. Retrieved October 14, 2007, from http://www.hhs.gov/onchit/ framework/hitframework.pdf

Thomas, J.W., Guire, K.E. and Horvat, G. (1997). Is patient length of stay related to quality of care?, *Hospital & Health Services Administration*, 42(4), 489-507.

Todd, P.A. and Benbasat, I. (1989). An Experimental Investigation of the Impact of Computer Based Decision Aids on the Process of Preferential Choice. Working Paper, School of Business, Queen's University, Kingston, Ontario.

Towill, D.R. (1997). The seamless chain- the predator’s strategic advantage. *International Journal of Technology Management,* 13(1), 37–56.

Towill, D. and Christopher M. (2002). The supply chain strategy conundrum: To be lean or agile or to be lean and agile. *International Journal of Logistics*, 5(3), 299-309.

Tracey M., Vonderembse M.A. and Lim J.S. (1999). Manufacturing technology and strategy formulation: keys to enhancing competitiveness and improving performance. *Journal of Operations Management,* 7(4), 411–28.

Tsay, A. A. (1999). The quantity-flexibility contract and supplier-customer incentives. *Management Science,* 45(10), 1339–1358.

Tu, Q., Vonderembse, M., Ragu-Nathan, T. and Sharkey, T. (2006). Absorptive capacity: Enhancing the assimilation of time-based manufacturing practices. *Journal of Operations Management,* 24, 692-710.

Tucker, A. L. (2007). An empirical study of system improvement by frontline employees in hospital units. *Manufacturing and Service Operations Management*, 9(4), 492–505.

Tucker, A.L., Nembhard, I.M. and Edmondson, A.C. (2007). Implementing new practices: an empirical study of organizational learning in hospital intensive care units. *Management Science,* 53(6), 894-907.

Tucker, A. (2004). The impact of operational failures on hospital nurses and their patients. *Journal of Operations Management,* 22, 151-169.

Tucker, A.L. and Edmondson, A.C. (2003). Why hospitals don't learn from failures: organizational and psychological dynamics that inhibit system change. *California Management Review*, 45(2), 55-72.

Varkey, P., Reller, K. and Resar, R. (2007). Basics of quality improvement in health care. *Mayo Clinic Proceedings,* 82(6), 735-739.

Vargo, S. and Akaka, M. (2009). Service-dominant logic as a foundation for service science: Clarifications. *Service Science Journal*, 1(1) 32-41.

Vargo, S. and Lusch, F. (2008). Service-dominant logic: Continuing the evolution. Journal of the *Academy of Marketing Science,* 36(1) 1-10.

Vargo, S. and Lusch, F. (2006). Service-Dominant Logic: What It Is, What It Is Not, What It Might Be. *The Service-Dominant Logic of Marketing: Dialog, Debate, and Directions*, Robert F. Lusch and Stephen L. Vargo, Eds. Armonk, New York: M.E. Sharpe, 43-56.

Vargo, S. and Lusch, F. (2004a). Evolving to a New Dominant Logic for Marketing. *Journal of Marketing,* 68(1), 1-17.

Vargo, S. and Lusch, F. (2004b). The Four Service Marketing Myths: Remnants of a Goods-Based, Manufacturing Model. *Journal of Service Research,* 6(4), 324-35.

Vargo, S. and Morgan, F. (2005). Services in Society and Academic Thought: A Historical Analysis. *Journal of Macromarketing,* 25(1), 42-53.

Vargo, S., Maglio, P., and Akaka, A. (2008). On value and value co-creation: A service systems and service logic perspective. *European Management Journal,* 26, 145-152.

Vargo, S., Lusch, R. F., Akaka, M. A., and He, Y. (2009). The Service-Dominant Logic: A Review and Assessment, *Review of Marketing Research* (in press).

Venaik, S., Midgley, D.F., and Devinney, T.M. (2005). Dual paths to performance: The impact of global pressures on MNC subsidiary conduct and performance. *Journal of International Business Studies,* 36(6), 655–675.

Venkatraman, N. and Grant, J. H. (1986). Construct measurement in organizational strategy research: a critique and proposal. *Academy of Management Review*, 11(1), 71-87

Venkatraman, N. (1989). Strategic orientation of business enterprises: the construct, dimensionality, and measurement. *Management Science*, 35(8), 942–962.

Vesey, J.T. (1991). The new competitors: they think in terms of speed to- market. *Academy of Management Executive*, 5(2), 23–33.

Vessey, I. (1984). An Investigation of the Psychological Processes Underlying the Debugging of Computer Programs. Unpublished PhD Dissertation, Department of Commerce, University of Queensland.

Vickery, S., Calantone, R. and Droge, C. (1999). Supply chain flexibility: an empirical study. *The Journal of Supply Chain Management,* 35(3), 16-24.

von Hippel, E., (1988). The Sources of Innovation. Oxford University Press, New York.

Vonderembse, M.A. (2002). *Building Supplier Relationships that Enhance Manufacturing Performance*. London: Spiro Press.

Vonderembse, M.A. and Tracey, M. (1999). The impact of supplier selection criteria and supplier involvement on manufacturing performance. *Journal of Supply Chain Management,* 35(3), 33-39.

Vondrembse, M.A., Uppal, M., Huang, S.H., and Dismukes, J.P. (2006). Designing supply chains: Towards theory development. *International Journal of Production Economics*, 100, 223-238.

Vosburgh, K.G. and Newbower, R.S. (2000). Moore's law, disruptive technologies, and the clinician. In J.D. Westwood, H.M. Hoffman, G.T. Mogel, R.A. Robb and D. Stredney (Eds.), *Medicine meets virtual reality.* Amsterdam: IOS Press, 8-13.

Walton, L.W. (1996). Partnership satisfaction: using the underlying dimensions of supply chain partnership to measure current and expected levels of satisfaction. *Journal of Business Logistics,* 17(2), 57-75.

Watcharasriroj, B. and Tang, J. (2004). The effects of size and information technology on hospital efficiency. *Journal of High Technology Management Research,* 15(1), 1-16.

Weinberg, D. B., Gittell, J. H., Lusenhop, R. W., Kautz, C. M., & Wright, J. (2007). Beyond our walls: Impact of patient and provider coordination across the continuum on outcomes for surgical patients. *Health Service Research,42*(1), Part I: 7–24.

Wernerfelt, B. (1984). A resource based view of the firm. *Strategic Management Journal,* 5, 171-180.

Wheelwright, S.C. and Weber, J.A. (1995). Massachusetts General Hospital: CABG Surgery (A), Harvard Business School Publishing, Boston, MA, Product Number 9-696-015.

Williamson O. (1975). *Markets and hierarchies: analysis and antitrust implications.* New York: The Free Press.

Wilson, D.T. and Vlosky, R.P. (1998). Inter-organizational information system technology and buyer-seller relationships. *Journal of Business and Industrial Marketing,* 13(3), 215-234.

Wines, L. (1996). High order strategy for manufacturing. *The Journal of Business Strategy,* 17(4), 32–33.

White, G. (1996). A meta-analysis model of manufacturing capabilities. *Journal of Operations Management,* 14(4), 315-331.

Womack, J., Jones, D., and Roos, D. (1990). *The Machine that Changed the World.* Macmillan, NY.

Womack, J and Jones, D. (1996). *Lean Thinking.* Simon and Schuster, NY.

Wood, A. (1997). Extending the supply chain: strengthening links with IT. *Chemical Week,* 159(25), 25-26.

Yin, R. (1981). The case study crisis: some answers, *Administrative Sciences Quarterly,* 26, 58-65.

Young, D., Carr, H.H. and Rainer, R.K. Jr. (1999). Strategic implication of electronic linkages. *Information Systems Management,* Winter, 32-39.

Yu, Z.X., Yan, H. and Cheng, T.C.E. (2001). Benefits of information sharing with supply chain partnerships. *Industrial Management and Data Systems*, 101(3), 114–119.

Zhang, Q.Y. (2001).Technology infusion enabled value chain flexibility: a learning and capability-based perspective. Doctoral dissertation, University of Toledo, Toledo, OH.

Zhang, Q., Vonderembse, M., and Lim, J. (2002). Value chain Flexibility: a dichotomy of competence and capability. *International Journal of Production Research,* 40(3), 561-583.

Zhang, X. and Chen, R. (2008). Examining the mechanism of the value co-creation with customers. *International Journal of Production Economics,* 116, 242-250.

Zhang, X., Chen, R.Q. (2006). Customer participative chain: Linking customers and firm to co-create competitive advantages. *Management Review,* 18(1), 51–56 (in Chinese with English abstract).

Appendix A. Items Entering Round 1 of Q-sort

CONST.	**1 Partner Relationship**
SCONST.	**Trust**
	Our referring/attending physicians have: **been open** in dealing with our staff.
	Our referring/attending physicians have: **been honest** in dealing with our staff.
	Our referring/attending physicians have: **respect** for the **confidentiality** of patient information.
	Our referring/attending physicians have: **earned our confidence** through their clinical practices.
SCONST.	**Commitment**
	Our referring/attending physicians: **make an effort to work with our staff.**
	Our referring/attending physicians: **are willing to provide assistance to our staff.**
	Our referring/attending physicians: **abide by their commitments.**
	Our referring/attending physicians: **exert effort** to maintain our **relationship.**
SCONST.	**Shared Vision**
	Our referring/attending physicians **share our: patient care beliefs.**
	Our referring/attending physicians **share our: patient care objectives.**
	Our referring/attending physicians **share our: emphasis on collaboration in patient care.**
	Our referring/attending physicians **share our: interest in improvements that benefit patient.**
CONST.	**2 Integrative Information and Resource Strategy**
SCONST.	**Leagile Patient Care Strategy**
	In care delivery, our hospital leadership **encourages: process improvement.**
	In care delivery, our hospital leadership **encourages: elimination of waste.**
	In care delivery, our hospital leadership **encourages: understanding of patient needs.**
	In care delivery, our hospital leadership **encourages: adapting to change.**
	In care delivery, our hospital leadership **encourages: providing personalized care.**
SCONST.	**IS for Comprehensive Patient Care Strategy**
SCONST.	**Operational IS Strategy**
	Our hospital places importance on the use of IT to **reduce: time to process orders (i.e., labs).**
	Our hospital places importance on the use of IT to **reduce: cost to process orders.**
	Our hospital places importance on the use of IT to **reduce: cost of administration.**
	Our hospital places importance on the use of IT to **reduce: cost of delivering care.**

SCONST.	**Patient-focused IS Strategy**
	In care delivery, our hospital places importance on the use of IT to: **provide information about patients.**
	In care delivery, our hospital places importance on the use of IT to: **understand the patient's needs.**
	In care delivery, our hospital places importance on the use of IT to: **respond quicker to patient needs.**
	In care delivery, our hospital places importance on the use of IT to: **improve relationships with patients.**
SCONST.	**Interorganizational (Physician-focused) IS Strategy**
	Our hospital places importance on the use of IT to: **share information with physicians.**
	Our hospital places importance on the use of IT to: **improve communication with physicians.**
	Our hospital places importance on the use of IT to: **track the status of orders (i.e., diagnostics) with physicians.**
	Our hospital places importance on the use of IT to: **integrate plans of treatment with physicians.**
	Our hospital places importance on the use of IT to: **develop stronger relationships with physicians.**
CONST.	**3 Entrepreneurial Culture**
SCONST.	**Proactiveness**
	Our hospital: takes action to **anticipate future** market conditions.
	Our hospital: tries to **prospectively change with the environment** to enhance external relationships to improve our performance in the market.
	Our hospital: **seeks** new opportunities **because market conditions** are changing.
	Our hospital: **builds capabilities to cope with emerging demands.**
SCONST.	**Innovativeness**
	Our hospital: is known as an **innovator** among hospitals in our region.
	Our hospital: **promotes new, innovative services.**
	Our hospital: **provides leadership in developing new services.**
	Our hospital: is on the leading edge in **adopting new technologies.**
SCONST.	**Autonomy**
	At our hospital: employees are **encouraged to envision new ideas** for services.
	At our hospital: management **encourages independent activity** by employees to improve patient care.
	At our hospital: identifying **new business ideas** is the concern of all employees.
	At our hospital: employees are **encouraged to develop ideas** for improving services.

SCONST.	**Competitive Aggressiveness**
	We directly challenge our competitors.
	We are responsive to maneuvers of our rivals.
	We can be said to be aggressive toward our competitors.
	We respond to the actions of our competitors.
SCONST.	**Motivation**
	At our hospital, employees: **have high motivation towards work.**
	At our hospital, employees: **are a group of hard working individuals.**
	At our hospital, employees: **are very ambitious.**
	At our hospital, employees: **have a "can do" attitude towards work.**
CONST.	**4 Integrative Supply Chain Management Practices**
SCONST.	**Strategic Physician Partnership**
	With our referring/attending physicians: we regularly **partner** to solve problems.
	With our referring/attending physicians: we **partner** to improve quality (i.e., through CMEs).
	With our referring/attending physicians: we **partner** on continuous improvement initiatives.
	With our referring/attending physicians: we **partner** in planning and goal-setting activities.
SCONST.	**Patient Relationship**
	We **set service expectations with patients.**
	We **monitor patient satisfaction.**
	We have a **system** for **managing patient complaints.**
	We have a **program** dedicated to **improving patient satisfaction**.
SCONST.	**Information Sharing**
	Our referring/attending physicians: **receive information from us about changing patient needs.**
	Our referring/attending physicians: **share patient information with us**.
	Our referring/attending physicians: **keep us informed** about issues that affect care delivery.
	Our referring/attending physicians: **share information with us** that helps establish treatment plans.
	Our referring/attending physicians: **work with our staff to keep each other informed** about changes that may affect care delivery.
SCONST.	**Information Quality**
	Information exchange between our referring/attending physicians and us is: **timely.**
	Information exchange between our referring/attending physicians and us is: **accurate.**
	Information exchange between our referring/attending physicians and us is: **complete.**

	Information exchange between our referring/attending physicians and us is: **adequate.**
	Information exchange between our referring/attending physicians and us is: **reliable.**
SCONST.	**Lean Principles**
	We engage in efforts to **improve patient care by: standardizing work** (care pathways).
	We engage in efforts to **improve patient care by: creating seamless linkages** among clinicians at each process handoff.
	We engage in efforts to **improve patient care by: using simple and direct pathways** that ensure resource availability during patient care.
	We engage in efforts to **improve patient care by: promoting decision making based on scientifically derived evidence.**
	We engage in efforts to **improve patient care by: eliminating waste** and **non-value added activities.**
SCONST.	**IS Enabled Processes**
SCONST.	**IT Use for Asset Management (or Real Time Location System)**
	We use RFID to: **track mobile medical equipment** used in patient care (e.g., wheelchairs, incubators, surgical instruments, and pumps).
	We use RFID to: **track medications** used in patient care.
	We use RFID to: **locate materials** needed during patient care.
	We use RFID to: **monitor patient movement** and location.
	We use RFID to: **coordinate medical treatment wherever patients go** during care delivery.
	We use RFID to: **monitor expiration dates of medications** used in patient care.
SCONST.	**Comprehensive EMR Use**
SCONST.	**EMR for Electronic Clinical Documentation**
	We use EMR to **capture: patient demographics.**
	We use EMR to **capture: physician notes.**
	We use EMR to **capture: nursing assessments.**
	We use EMR to **capture: problem lists.**
	We use EMR to **capture: medication lists.**
	We use EMR to **capture: discharge summaries.**
	We use EMR to **capture: advanced directives.**
SCONST.	**EMR for Results Viewing**
	We use EMR to **view: lab results.**
	We use EMR to **view: radiology reports.**
	We use EMR to **view: radiology imagines.**
	We use EMR to **view: diagnostic test results.**
	We use EMR to **view: diagnostic test images.**
	We use EMR to **view: consultant reports.**

SCONST.	**EMR for Computerized Physician Order Entry**
	We use EMR to **order: laboratory tests.**
	We use EMR to **order**: **radiology tests.**
	We use EMR to **order: medications.**
	We use EMR to **order: consultants reports.**
	We use EMR to **order: nursing orders.**
SCONST.	**EMR for Decision Support**
	Our EMR systems provides us with: **clinical guidelines.**
	Our EMR systems provides us with: **clinical reminders.**
	Our EMR systems provides us with: **drug allergy alerts.**
	Our EMR systems provides us with: **drug-drug interactions alerts.**
	Our EMR systems provides us with: **drug-lab interactions alerts.**
	Our EMR systems provides us with: **drug diagnosing support.**
CONST.	**5 Value Dense Environment**
SCONST.	**Operand Knowledge**
	When caring for a particular patient, care providers have ample access to: **physicians orders.**
	When caring for a particular patient, care providers have ample access to: **consultants reports.**
	When caring for a particular patient, care providers have ample access to: **previous nursing assessments.**
	When caring for a particular patient, care providers have ample access to: **radiology reports.**
	When caring for a particular patient, care providers have ample access to: **lab reports.**
	When caring for a particular patient, care providers have ample access to: **treatment protocols.**
SCONST.	**Operant Knowledge**
	When caring for a particular patient, care providers in our hospital have the needed: **skills.**
	When caring for a particular patient, care providers in our hospital have the needed: **knowledge.**
	When caring for a particular patient, care providers in our hospital have the needed: **ability.**
	When caring for a particular patient, care providers in our hospital have the needed: **competence.**
SCONST.	**Resources**
	When caring for a particular patient, care providers in our hospital have ready access to the needed: **equipment.**
	When caring for a particular patient, care providers in our hospital have ready

	access to the needed: **medications.**
	When caring for a particular patient, care providers in our hospital have ready access to the needed: **supplies.**
	When caring for a particular patient, care providers in our hospital have ready access to the needed: **facilities.**
CONST.	**6 Supply Chain Performance**
SCONST.	**Supply Chain Flexibility**
	Our patient care team is able to: **rapidly adjust service** capacity in response to changes in patient demands.
	Our patient care team is able to: **introduce large numbers of service improvements/variations.**
	Our patient care team is able to: **handle rapid introduction of new services.**
	Our patient care team is able to: **provide high quality care, even when patient demands vary greatly.**
SCONST.	**Supply Chain Integration**
	In our hospital: there is a **high level of communication** among all functions.
	In our hospital: there is a **high level of coordination** among all functions.
	In our hospital: **cross-functional teams** which include referring/attending physicians **are integrated** for process design and improvement.
	In our hospital: **information systems are integrated.**
SCONST.	**Patient Responsiveness**
	Our hospital: fulfills patients' needs **on time.**
	Our hospital: has **short** order-to-service time.
	Our hospital: has **fast** patient response time.
	Our hospital: is **responsive** to patients' needs.
SCONST.	**Physician Performance**
	Our referring/attending physicians provide: **timely services** (e.g., rounding) to patients.
	Our referring/attending physicians provide: **dependable services** to patients.
	Our referring/attending physicians provide: **high quality services** to patients.
	Our referring/attending physicians provide: an **appropriate level of services** to patients.
SCONST.	**Partnership Quality**
	We and our referring/attending physicians have: **a profitable relationship**.
	We and our referring/attending physicians have: **a harmonious relationship.**
	We and our referring/attending physicians have: **a relationship which meets each others business objectives.**
	We and our referring/attending physicians have: **a relationship which meets each others patient care objectives.**

CONST.	7 Healthcare Delivery Capability
SCONST.	**Safety**
	Compared to our competing hospitals, we are better able to minimize: **diagnostic errors.**
	Compared to our competing hospitals, we are better able to minimize: **treatment errors.**
	Compared to our competing hospitals, we are better able to minimize: **preventive errors**.
	Compared to our competing hospitals, we are better able to minimize: **equipment failure errors.**
SCONST.	**Effectiveness**
	Compared to our competing hospitals, we achieve: **a lower risk adjusted mortality rate.**
	Compared to our competing hospitals, we achieve: **a lower nosocomial infection rate.**
	Compared to our competing hospitals, we achieve: **a lower level of acuity (better outcomes) for nosocomial infections which do develop.**
	Compared to our competing hospitals, we achieve: **fewer unplanned readmissions.**
	Compared to our competing hospitals, we achieve: **higher clinical quality.**
SCONST.	**Patient Centeredness**
	Compared to our competing hospitals, our patients feel that we are more: **respectful of their preferences.**
	Compared to our competing hospitals, our patients feel that we are more: **responsive to their medical needs.**
	Compared to our competing hospitals, our patients feel that we are more: **respectful of their personal values.**
	Compared to our competing hospitals, our patients feel that we are more: **responsive to their complaints.**
	Compared to our competing hospitals, our patients feel that we are more: **responsive to their requests.**
SCONST.	**Timeliness**
	Compared to our competing hospitals, our efforts have resulted in: **lower average length of stay (ALOS)**.
	Compared to our competing hospitals, our efforts have resulted in: **shorter wait times for our patients.**
	Compared to our competing hospitals, our efforts have resulted in: **fewer delays for those involved in patient care.**
	Compared to our competing hospitals, our efforts have resulted in: **fewer bottlenecks during patient care.**

SCONST.	Efficiency
	Compared to our competitors, we do a better job of: **attaining high equipment utilization.**
	Compared to our competitors, we do a better job of: **eliminating waste of supplies.**
	Compared to our competitors, we do a better job of: **eliminating waste of energy.**
	Compared to our competitors, we do a better job of: **holding down inpatient costs.**
	Compared to our competitors, we do a better job of: **attaining higher labor productivity.**

Appendix B. Survey Refinement & Validation Instructions
(Q-Sort Instructions)

Introduction

Thank you for your time and effort in assisting the researcher with this important study. The purpose of this exercise is to assist the researcher to refine and validate questions which will be used in a large-scale survey of hospitals to identify 'best practices' related to information and process/resource management during patient care. Thanks to your efforts, this study will produce meaningful findings which can be employed to improve clinical integration during healthcare delivery around the United States, and potentially around the world.

This is essentially a matching exercise. You will be presented with a research diagram (framework) to provide you with the context of the study for reference. Next, you will receive envelopes with defined terms (concepts) which are relevant to the study. Finally, you will be presented with a pool of statements on note cards which are associated with the terms (concepts) previously mentioned. The exercise requires that you match the statements with the associated terms.

Instructions

1. Please read all of the terms (concepts) and the definitions. These can be found on the covers of the envelopes.
2. Next, read and match each of the statements with the correct term (or envelope). In other words, match each note card to the appropriate envelope. Please feel free to use the "N/A" envelope for any note card statement that you feel does not fit into one of the other envelopes (terms).
3. After you have placed all of the statement cards, **please review each envelope** to double check and confirm your matches.
4. Please feel free to use the post-it-notes provided to comment on statements (note cards) which you feel are unclear.
5. **Most importantly, please ask questions of the administrator if you are at all unsure of how to proceed throughout this exercise.**

Thank you again for participating in this survey refinement and validation exercise. The researcher hopes that you find this to be an interesting and worthwhile experience. Further, he will be happy to provide you with a summary report of the study's findings following data collection, upon request. **Again, thank you!**

Example

Integrative Supply Chain Management Practices is defined as: the extent to which a set of activities is undertaken in a hospital to promote effective management of healthcare delivery.

Integrative Supply Chain Management Practices has two dimensions:
Information Sharing which is defined as: the extent to which facts, data, and knowledge about the **patient** are **communicated** among those involved in care delivery.
And, **Lean Principles** which is defined as: the extent to which efforts are made to **improve patient care** processes **by incorporating standardized work, seamless linkages, simple and direct pathways, and process improvements based on scientific methods.**

Please match the following statements with either **Information Sharing** or **Lean Principles.**

1 Our referring/attending physicians: **receive advanced information from us about changing patient needs.**
2 We engage in efforts to **improve patient care by: creating seamless linkages** among clinicians at each process handoff.
3 Our referring/attending physicians: **keep us informed** about issues that affect care delivery.
4 We engage in efforts to **improve patient care by: promoting decision making based on scientifically derived evidence.**

Appendix C. Q-Sort Results

Legend for variables 1 through 35 in tables 3.3.2.1 through 3.3.2.6

1 Trust	13 Strategic Physician Partnership	24 Operant Knowledge
2 Commitment	14 Patient Relationship	(*Know How*)
3 Shared Vision	15 Information Sharing	25 Resources
4 Leagile Patient Care Strategy	16 Information Quality	26 Supply Chain Flexibility
5 Operational IS Strategy	17 Lean Principles	27 Supply Chain Integration
6 Patient-focused IS Strategy	18 IT Use for Asset Management	28 Patient Responsiveness
7 Interorganizational (Physician-	19 EMR for Electronic Clinical	29 Physician Performance
focused) IS Strategy	Documentation	30 Partnership Quality
8 Proactiveness	20 EMR for Results Viewing	31 Safety
9 Innovativeness	21 EMR for Computerized Physician	32 Effectiveness
10 Autonomy	Order Entry	33 Patient Centeredness
11 Competitive Aggressiveness	22 EMR for Decision Support	34 Timeliness
12 Motivation	23 Operand Knowledge (*Know What*)	35 Efficiency

Table 3.3.2.1 Inter-Judge Raw Agreement Scores: First Q-sort Round

Judge 2	Judge 1																																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	NA
1	4																																			
2		4																																		
3			4																																	
4				5																																
5					3																															
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31																															4					
32																																5				
33																																	5			
34																																		2		
35																																			5	

Total Items Placed: 160	**Number of Agreement: 149**	**Agreement Ratio: 93.1%**

Table 3.3.2.2. Items Placement Ratios: First Q-sort Round

Theoretical Categories \ Actual Categories	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	NA	T	%
1	8																																				8	100
2		8																																			8	100
3			8																																		8	100
4				10																																	10	100
5				1	9																																10	90
6				1		6	1																														8	75
7					1		9																														10	90
8								6	1		1																										8	75
9								2	6																												8	75
10										8																											8	100
11											8																										8	100
12												8																									8	100
13													8																								8	100
14														8																							8	100
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31																															8						8	100
32																																10					10	100
33																																	10				10	100
34																																		6	2		8	75
35																																			10		10	100

Total Items Placed: 320 | **Number of Hits: 311** | **Overall Hit Ratio: 97.2%**

Table 3.3.2.3. Inter-Judge Raw Agreement Scores: Second Sorting Round

		Judge 3																																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	NA
Judge 4	1	4																																			
	2		4																																		
	3			4																																	
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	31																															4					
	32																																5				
	33																																	5			
	34																																		4		
	35																																			4	

Total Items Placed: 160 | **Number of Agreement: 151** | **Agreement Ratio: 94%**

Table 3.3.2.4. Items Placement Ratios: Second Q-sort Round

Actual Categories

Theoretical Categories	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	NA	T	%
1	6	2																																			8	75
2		8																																			8	100
3			8																																		8	100
4				10																																	10	100
5					8																																8	100
6				2		6																															8	75
7							10																														10	100
8								7																												1	8	88
9								1	7																												8	88
10									1	7																											8	88
11											8																										8	100
12												8																									8	100
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24																								8													8	100
25																									8												8	100
26																										7		1									8	88
27																											6			2							8	75
28																												8									8	100
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31																															8						8	100
32																																10					10	100
33																																	10				10	100
34																																		8			8	100
35																															1				9		10	90

Total Items Placed: 320 | **Number of Hits: 309** | **Overall Hit Ratio: 96.6%**

Appendix D. Online Survey Instrument used to collect all data.

CLINICAL INTEGRATION RESEARCH STUDY

Introduction: What is this about?

You are invited to participate in a University of Toledo Doctoral dissertation research survey which explores the **'best practices' for clinical integration** of hospitals across the United States. Much curiosity exists regarding the influence of factors such as **physician employment**, **medical staff** partner **relationship,** hospital **strategy, culture**, and **integration practices** (such as the use of Lean practices or EMR and RFID) on outcomes such as the hospital's **care delivery environment, performance,** and **healthcare delivery capabilities.** This 25 minute survey investigates these issues and will produce meaningful findings capable of helping you to improve the performance of your hospital.

Deliverables: Why should I complete this survey?

Participation in this survey makes you eligible for the following:

- Upon request **I will provide you with a summary report,** comparing your hospital to others in your region or of your type classification. **Custom reports are available without charge** upon request. **Identifying information, such as hospital name, will NOT be released at any time or for any reason.**

- **All** completed surveys will be entered into a **drawing for a $500 cash award** to the individual **as well as a $500 donation on your behalf to a charity of your choice** (i.e., your hospital's foundation). **This is a total of a $1000 incentive for completion**.

Definitions & Clarifications: What do I need to know before I begin?

This study conceptualizes the healthcare delivery supply chain as consisting of:

(1) the **admitting/attending physician** as a **'supplier'** who supplies patients to the hospital and delivers services to the patient in the hospital;

(2) the **hospital** as the **'focal firm'** where significant work is done for patients by individuals employed by or affiliated with the hospital; and

(3) the **patient** as the ultimate **'customer'** – the beneficiary of care.

ALL REFERENCES TO PHYSICIAN IN THIS SURVEY, REFER TO ADMITTING/ATTENDING PHYSICIANS.

Employed physicians are those with whom your hospital has a financial contractual relationship.

Non-employed physicians are those with whom your hospital does **NOT** have a financial contractual relationship.

PLEASE ANSWER QUESTIONS USING YOUR EXPERIENCE IN HOSPITAL-BASED CLINICAL INTEGRATION WITH BOTH EMPLOYED AND NON-EMPLOYED PHYSICIANS WHERE ASKED.

THANK YOU FOR YOUR PARTICIPATION!
ALL RESPONSES WILL BE KEPT CONFIDENTIAL.
AT NO TIME WILL INDIVIDUAL RESPONSES BE RELEASED WITHOUT PERMISSION.

ADULT RESEARCH SUBJECT INFORMATION AND CONSENT FORM

RESEARCH PROJECT TITLE

LINKING ANTECEDENTS AND CONSEQUENCES OF VALUE DENSITY IN THE HEALTHCARE DELIVERY SUPPLY CHAIN

Principal Investigator: David Dobrzykowski, ABD/Mark Vonderembse, PhD

Contact Phone number(s): (419) 297-6600

PURPOSE OF RESEARCH: You are being asked to take part in a research study of hospital clinical integration practices. The purpose of the study is to identify best practices related to clinical integration in hospitals and test relationships between these practices and a hospital's healthcare delivery capability.

You were selected as someone who may want to take part in this study because we believe that you have familiarity with clinical integration practices (such as IT use and process improvement) in hospital operations as well as hospital performance related to patient care.

RESEARCH PROCEDURES: If you decide to take part in this study, you will be asked to complete an online survey requiring approximately 25 minutes.

RISKS AND BENEFITS: There are minimal risks to participation in this study, including loss of confidentiality.

The only direct benefit to you if you participate in this research may be that you may learn more about the best practices related to clinical integration because you will be eligible to receive a summary report comparing your hospital to others in your region or of your type classification. Custom reports are available without charge upon request. We cannot and do not guarantee or promise that you will receive any benefits from this research. Other people may benefit by learning about the results of this research.

COMPENSATION: If you decide to take part in this research you will receive entry into a drawing for a $500 cash award as well as a $500 donation made on your behalf to a charity of your choice (i.e., your hospital's foundation). This is a total of a $1000 incentive for completion.

CONFIDENTIALITY: The researchers will make every effort to prevent anyone who is not on the research team from knowing that you provided this information, or what that information is. Although we will make every effort to protect your confidentiality, there is a low risk that this might be breached.

VOLUNTARY PARTICIPATION: Taking part in this study is voluntary. You may refuse to participate or discontinue participation at any time without penalty or a loss of benefits to which you are otherwise entitled. If you decide not to participate or to discontinue participation, your decision will not affect your future relations with the University of Toledo.

QUESTIONS: If you have questions regarding the research at any time before, during or after the study, you may contact David Dobrzykowski at (419) 297-6600.

If you have questions beyond those answered by the research team or about your rights as a research subject please feel free to contact the Chairperson of the University of Toledo Biomedical Institutional Review Board at 419-383-6796.

CONSENT: IF YOU COMPLETE THE SURVEY, YOU ARE CONSENTING TO PARTICIPATION.

1) We begin with some general questions about your hospital's outcomes. ***Please answer for both employed and non-employed physicians where asked.***

	With Employed Physicians						With Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
Compared to our competing hospitals, we are better able to minimize safety risks.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Compared to our competing hospitals, we achieve higher clinical quality.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Compared to our competing hospitals, our patients feel that we are more patient centered.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Compared to our competing hospitals, our efforts have resulted in timeliness during patient care.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
Compared to our competitors, we do a better job of achieving efficiency.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

2) <u>Partner Relationship</u> is the extent of trust, commitment, and shared vision among healthcare delivery partners. Please select the appropriate response that accurately reflects your hospital's partner relationship with your admitting/attending physicians. ***Please answer for both employed and non-employed physicians where asked.***

<u>QUESTION 1: TRUST</u>

Our admitting/attending <u>physicians have:</u>

	Employed Physicians						Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
been honest in dealing with our staff.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
been open in dealing with our staff.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
respect for the confidentiality of patient information.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
earned our confidence through their clinical practices.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

3) <u>QUESTION 2: COMMITMENT</u>

Our admitting/attending <u>physicians</u>:

	Employed Physicians						Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
make an effort to work with our staff.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
are willing to provide	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

assistance to our staff.												
abide by their commitments.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
exert effort to maintain our relationship.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

4) <u>QUESTION 3: SHARED VISION</u>

Our admitting/attending <u>physicians share our</u>:

	Employed Physicians						Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
patient care beliefs.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
patient care objectives.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
emphasis on collaboration in patient care.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
interest in improvements that benefit patients.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

5) <u>Integrative Information and Resource Strategy</u> is the extent to which a hospital pursues an approach for managing processes, quality systems, and information technologies that balances efficiency and agility in patient care. Please select the appropriate response that accurately reflects your hospital's integrative information and resource strategy. *Please answer for both employed and non-employed physicians where asked.*

<u>QUESTION 4: LEAN/AGILE PATIENT CARE STRATEGY</u>

In care delivery, our <u>hospital leadership encourages:</u>

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
process improvement.	❍	❍	❍	❍	❍	❍
elimination of waste.	❍	❍	❍	❍	❍	❍

understanding of patient needs.	❍	❍	❍	❍	❍	❍
adapting to change.	❍	❍	❍	❍	❍	❍
providing personalized care.	❍	❍	❍	❍	❍	❍

6) <u>QUESTION 5: OPERATIONAL INFORMATION SYSTEMS STRATEGY</u>

Our <u>hospital places importance</u> on the <u>use of Information Technologies</u> to <u>reduce:</u>

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
time to process orders.	❍	❍	❍	❍	❍	❍
cost to process orders.	❍	❍	❍	❍	❍	❍
cost of administration.	❍	❍	❍	❍	❍	❍
cost of delivering care.	❍	❍	❍	❍	❍	❍

7) <u>QUESTION 6: PATIENT-FOCUSED INFORMATION SYSTEMS STRATEGY</u>

In care delivery, our <u>hospital places importance</u> on the <u>use of Information Technology to:</u>

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
recognize the patient's needs.	❍	❍	❍	❍	❍	❍
respond quicker to patient needs.	❍	❍	❍	❍	❍	❍
ensure that clinical milestones are met for specific patients needs.	❍	❍	❍	❍	❍	❍
improve relationships with patients.	❍	❍	❍	❍	❍	❍

8) <u>QUESTION 7: PHYSICIAN-FOCUSED INFORMATION SYSTEMS STRATEGY</u>

Our <u>hospital places importance</u> on the <u>use of Information Technologies to:</u>

	With Employed Physicians						**With Non-Employed Physicians**					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
share information with physicians.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
improve communication with physicians.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
communicate the status of	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

orders (i.e., diagnostics) with physicians.												
integrate plans of treatment with physicians.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
develop stronger relationships with physicians.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

9) <u>Entrepreneurial Culture</u> is the extent of proactiveness, innovativeness, autonomy, competitive aggressiveness, and motivation are displayed by hospital employees involved in patient care. Please select the appropriate response that accurately reflects your hospital's entrepreneurial culture.

<u>QUESTION 8: PROACTIVENESS</u>

Our hospital:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
takes action to anticipate future market conditions.	❍	❍	❍	❍	❍	❍
tries to prospectively affect the environment to enhance external relationships to improve our performance in the market.	❍	❍	❍	❍	❍	❍
seeks new opportunities because market conditions are changing.	❍	❍	❍	❍	❍	❍
builds capabilities to cope with emerging demands.	❍	❍	❍	❍	❍	❍
is proactive.	❍	❍	❍	❍	❍	❍

10) <u>QUESTION 9: AUTONOMY</u>

At our hospital:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
employees are encouraged to envision new ideas for services.	❍	❍	❍	❍	❍	❍
management encourages independent activity by employees to improve patient care.	❍	❍	❍	❍	❍	❍

identifying new business ideas is the concern of all employees.	❍	❍	❍	❍	❍	❍
employees are encouraged to develop ideas for improving services.	❍	❍	❍	❍	❍	❍
employees are autonomous.	❍	❍	❍	❍	❍	❍

11) <u>QUESTION 10: COMPETITIVE AGGRESSIVENESS</u>

We:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
directly challenge our competitors.	❍	❍	❍	❍	❍	❍
are responsive to maneuvers of our rivals.	❍	❍	❍	❍	❍	❍
can be said to be aggressive toward our competitors.	❍	❍	❍	❍	❍	❍
respond to the actions of our competitors.	❍	❍	❍	❍	❍	❍
are aggressive regarding competition.	❍	❍	❍	❍	❍	❍

12) <u>QUESTION 11: MOTIVATION</u>

At our hospital, <u>employees:</u>

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
have high motivation towards work.	❍	❍	❍	❍	❍	❍
are a group of hard working individuals.	❍	❍	❍	❍	❍	❍
are very ambitious.	❍	❍	❍	❍	❍	❍
have a "can do" attitude towards work.	❍	❍	❍	❍	❍	❍
are motivated.	❍	❍	❍	❍	❍	❍

13) <u>QUESTION 12: INNOVATIVENESS</u>

Our hospital:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
is known as an innovator among hospitals in our region.	❍	❍	❍	❍	❍	❍
promotes new, innovative services.	❍	❍	❍	❍	❍	❍
provides leadership in creating new services.	❍	❍	❍	❍	❍	❍
is on the leading edge in creating new	❍	❍	❍	❍	❍	❍

technologies.						
is innovative.	❍	❍	❍	❍	❍	❍

14) <u>Integrative Supply Chain Management Practices</u> is the extent to which a set of activities is undertaken in a hospital to promote effective management of healthcare delivery. Please select the appropriate response that accurately reflects your hospital's integrative supply chain management practices during healthcare delivery. *Please answer for both employed and non-employed physicians where asked.*

<u>QUESTION 13: INFORMATION TECHNOLOGY USE FOR ASSET MANAGEMENT</u>

We use RFID to:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
track mobile medical equipment used in patient care (e.g., wheelchairs, incubators, surgical instruments, and pumps).	❍	❍	❍	❍	❍	❍
track medications used in patient care.	❍	❍	❍	❍	❍	❍
locate materials needed during patient care.	❍	❍	❍	❍	❍	❍
monitor patient movement and location.	❍	❍	❍	❍	❍	❍
coordinate medical treatment wherever patients go during care delivery.	❍	❍	❍	❍	❍	❍
monitor expiration dates of medications used in patient care.	❍	❍	❍	❍	❍	❍

15) <u>QUESTION 14: LEAN PRINCIPLES</u>

We engage in efforts to <u>improve patient care by:</u>

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
standardizing work (care pathways).	❍	❍	❍	❍	❍	❍
creating seamless linkages among clinicians at each process handoff.	❍	❍	❍	❍	❍	❍
using simple and direct pathways that ensure resource availability during patient care.	❍	❍	❍	❍	❍	❍
promoting decision making based on scientifically derived evidence.	❍	❍	❍	❍	❍	❍
eliminating waste and non-value added activities.	❍	❍	❍	❍	❍	❍
using Lean principles.	❍	❍	❍	❍	❍	❍

16) **QUESTION 15: PATIENT RELATIONSHIP**

We:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
set service expectations with patients.	❍	❍	❍	❍	❍	❍
monitor patient satisfaction.	❍	❍	❍	❍	❍	❍
have a system for managing patient complaints.	❍	❍	❍	❍	❍	❍
have a program dedicated to improving patient satisfaction.	❍	❍	❍	❍	❍	❍

17) **QUESTION 16: STRATEGIC PHYSICIAN PARTNERSHIP**

With our admitting/attending physicians:

	With Employed Physicians						With Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
we regularly partner to solve problems.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
we partner to improve quality (i.e., through CMEs).	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
we partner on continuous improvement initiatives.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
we partner in planning and goal-setting.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

18) <u>QUESTION 17: INFORMATION SHARING</u>

Our admitting/attending physicians:

	With Employed Physicians						With Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
receive information from us about changing patient needs.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
share patient information with us.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
keep us informed about issues that affect care delivery.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
share information with us that helps establish treatment plans.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
work with our staff to keep each other informed about changes that may affect care delivery.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

19) <u>QUESTION 18: INFORMATION QUALITY</u>

<u>Information exchange between</u> our admitting/attending <u>physicians and us is:</u>

	With Employed Physicians						With Non-Employed Physicians					
	Strongly	Agree	Neutral	Disagree	Strongly	N/A	Strongly	Agree	Neutral	Disagree	Strongly	N/A

	Agree				Disagree		Agree				Disagree	
timely.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
accurate.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
complete.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
adequate.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
reliable.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

20) QUESTION 19: EMR FOR ELECTRONIC CLINICAL DOCUMENTATION

We use EMR to capture:

	With Employed Physicians						**With Non-Employed Physicians**					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
patient demographics.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
physician notes.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
nursing assessments.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
problem lists.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
medication lists.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
discharge summaries.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
advanced directives.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

21) QUESTION 20: EMR FOR RESULTS VIEWING

We use EMR to view:

	With Employed Physicians						**With Non-Employed Physicians**					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
lab results.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
radiology reports.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
radiology images.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
diagnostic test	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

results.												
diagnostic test images.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
consultant reports.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

22) <u>QUESTION 21: EMR FOR COMPUTERIZED PHYSICIAN ORDER ENTRY</u>

We use EMR to <u>order:</u>

	With Employed Physicians						**With Non-Employed Physicians**					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
laboratory tests.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
radiology tests.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
medications.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
consultants reports.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
nursing orders.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

23) <u>QUESTION 22: EMR FOR DECISION SUPPORT</u>

Our EMR systems provides us with:

	With Employed Physicians						**With Non-Employed Physicians**					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
clinical guidelines.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
clinical reminders.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
drug allergy alerts.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
drug-drug interactions alerts.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
drug-lab interactions alerts.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

drug diagnosing support.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

24) <u>Value Dense Environment</u> is the extent to which those involved in healthcare delivery have *know what* (operand) knowledge, *know how* (operant) knowledge, and resources needed in providing care to a particular patient. Please select the appropriate response that accurately reflects your hospital's value dense environment.

<u>QUESTION 23: OPERAND KNOWLEDGE (*Know What*)</u>

When caring for a particular patient, <u>care providers have ample access to:</u>

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
physicians orders.	❍	❍	❍	❍	❍	❍
consultants reports.	❍	❍	❍	❍	❍	❍
previous nursing assessments.	❍	❍	❍	❍	❍	❍
radiology reports.	❍	❍	❍	❍	❍	❍
lab reports.	❍	❍	❍	❍	❍	❍
treatment protocols.	❍	❍	❍	❍	❍	❍

25) <u>QUESTION 24: OPERANT KNOWLEDGE (*Know How*)</u>

When caring for a particular patient, <u>care providers</u> in our hospital <u>have the needed:</u>

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
skills.	❍	❍	❍	❍	❍	❍
knowledge.	❍	❍	❍	❍	❍	❍
ability.	❍	❍	❍	❍	❍	❍
competence.	❍	❍	❍	❍	❍	❍

26) <u>QUESTION 25: RESOURCES</u>

When caring for a particular patient, <u>care providers</u> in our hospital <u>have ready access to the needed:</u>

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
equipment.	❍	❍	❍	❍	❍	❍
medications.	❍	❍	❍	❍	❍	❍
supplies.	❍	❍	❍	❍	❍	❍
facilities.	❍	❍	❍	❍	❍	❍

27) <u>Supply Chain Performance</u> is the extent to which healthcare delivery in a hospital is flexible, well integrated, and responsive to patients, while enabling physicians to execute their duties, with outcomes that match the expectations of all involved. Please select the appropriate response that accurately reflects your hospital's healthcare delivery supply chain performance. *Please answer for both employed and non-employed physicians where asked.*

<u>QUESTION 26: SUPPLY CHAIN FLEXIBILITY</u>

<u>Our</u> patient care <u>team is able to:</u>

	With Employed Physicians						With Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
rapidly adjust service capacity in response to changes in patient demands.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
introduce large numbers of service improvements/variations.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
handle rapid introduction of new services.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
adapt when patient demands vary greatly to still provide high quality care.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

28) <u>QUESTION 27: SUPPLY CHAIN INTEGRATION</u>

In our hospital:

	With Employed Physicians						With Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
there is a high level of communication among all functions.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
there is a high level of	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

coordination among all functions.												
cross-functional teams which include admitting/attending physicians are integrated for process design and improvement.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
information systems are integrated.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

29) <u>QUESTION 28: PATIENT RESPONSIVENESS</u>
Our hospital:

	With Employed Physicians						With Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
fulfills patients' needs on time.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
has short order-to-service time.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
has fast patient response time.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
is responsive to patients' needs.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

30) <u>QUESTION 29: PHYSICIAN PERFORMANCE</u>

Our admitting/attending <u>physicians provide:</u>

	With Employed Physicians						With Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A

timely services (e.g., rounding) to patients.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
dependable services to patients.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
high quality services to patients.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
an appropriate level of services to patients.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

31) <u>QUESTION 30: PARTNERSHIP QUALITY</u>

<u>We and our</u> admitting/attending <u>physicians have:</u>

	With Employed Physicians						With Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
a profitable relationship.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
a harmonious relationship.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
a relationship which meets each others business objectives.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
a relationship which meets each others patient care objectives.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

32) <u>Healthcare Delivery Capability</u> is the extent to which those involved in patient care are able to provide services to patients in a safe, effective, patient-centered, timely, and efficient manner. Please select the appropriate response that accurately reflects your hospital's healthcare delivery capability. ***Please answer for both employed and non-employed physicians where asked.***

<u>QUESTION 31: SAFETY</u>

Compared to our competing hospitals, <u>we are better able to minimize:</u>

	With Employed Physicians						Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
diagnostic errors.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
treatment errors.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
preventive errors.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
equipment failure errors.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

33) <u>QUESTION 32: EFFECTIVENESS</u>

Compared to our competing hospitals, <u>we achieve:</u>

	With Employed Physicians						With Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
a lower risk adjusted mortality rate.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
a lower nosocomial infection rate.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
a lower level of acuity (better outcomes) for nosocomial infections which do develop.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

fewer unplanned readmissions.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
effective healthcare delivery.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

34) <u>QUESTION 33: PATIENT CENTEREDNESS</u>

Compared to our competing hospitals, <u>our patients feel</u> that we are more:

	With Employed Physicians						With Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
respectful of their preferences.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
responsive to their medical needs.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
respectful of their personal values.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
responsive to their complaints.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
responsive to their requests.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

35) <u>QUESTION 34: TIMELINESS</u>

Compared to our competing hospitals, <u>our efforts</u> have <u>resulted in:</u>

	With Employed Physicians						With Non-Employed Physicians					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
lower average length of stay (ALOS).	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
shorter	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

wait times for our patients.												
fewer delays for those involved in patient care.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
timely delivery of patient care.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

36) <u>QUESTION 35: EFFICIENCY</u>

Compared to our competitors, <u>we do a better job of:</u>

	With Employed Physicians						**With Non-Employed Physicians**					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
attaining high equipment utilization.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
eliminating waste of supplies.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
eliminating waste of energy.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
holding down inpatient costs.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍
attaining higher labor productivity.	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍	❍

37) <u>General Information About Your Hospital</u>
For the following questions, please check <u>all</u> of the answers that apply.

<u>Hospital Type:</u>

- ❑ Tertiary Care
- ❑ Community Hospital
- ❑ Critical Access Hospital
- ❑ County Hospital
- ❑ Other (please specify)

If you selected other, please specify

____

38) <u>Location</u>

- ❍ Urban
- ❍ Rural

39) <u>Profit Status</u>

- ❍ For Profit Hospital
- ❍ Non-Profit Hospital
- ❍ Public Hospital

40) <u>Teaching Status</u>

- ❍ Major Teaching Hospital
- ❍ Minor Teaching Hospital
- ❍ Non-Teaching Hospital

41) <u>System Affiliation</u>

- ❍ Independent
- ❍ Part of a Health System

42) <u>Union Status (Clinical Employees)</u>

- ❍ Union Employees
- ❍ Non-Union Employees

43) Please estimate the percentage of <u>employed</u> admitting/attending physicians.

- ❍ Less than 5%
- ❍ 6% - 15%
- ❍ 16% - 35%
- ❍ 36% - 65%
- ❍ More than 66%

❍ 100% -- Closed System

44) Please estimate the number of hospital employees (all employees).

❍ Less than 250
❍ 251 - 750
❍ 751 - 1,500
❍ 1,501 - 3,000
❍ More than 3,001

45) Please estimate the number of staffed beds in your hospital.

❍ 1 - 49
❍ 50 - 99
❍ 100 - 199
❍ 200 - 399
❍ More than 400

46) Please estimate your hospital's Case Mix Index (CMI).

❍ Less than 1.0
❍ 1.01 - 1.25
❍ 1.26 - 1.40
❍ 1.41 - 1.70
❍ Higher than 1.71

47) Please estimate your hospital's annual Adjusted Discharges.

❍ Less than 1,500
❍ 1,500 - 4,500
❍ 4,501 - 10,000
❍ 10,001 - 20,000
❍ More than 20,001

48) Please estimate your hospital's annual Revenue.

❍ Under $25M
❍ $25M - $100M
❍ $100M - $250M
❍ $250M - $500M
❍ More than $500M

49) Please estimate your hospital's Medicare/Medicaid Payer Mix (%).

____%

50) Please estimate your hospital's Private Insurance Payer Mix (%).

____%

51) Please estimate your hospital's Patient Self Pay Payer Mix (%).

____%

52) Please estimate your hospital's Uncompensated Care Payer Mix (%).

____%

53) FINAL QUESTIONS! CONGRATULATIONS!

STATISTICAL CONTROL QUESTIONS: The following questions are used for statistical control purposes only. While they may or may not be related to your survey answers, they are very important in validating this research from a statistical perspective. YOUR ANSWERS WILL NOT BE RELEASED UNDER ANY CIRCUMSTANCES.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	N/A
None of the managers at my hospital feel dissatisfied with their jobs.	❍	❍	❍	❍	❍	❍
Different functional areas within my hospital, such as the billing department and clinical operations, sometimes lack cohesion or unity.	❍	❍	❍	❍	❍	❍
At my hospital, all of the employees are outstanding performers.	❍	❍	❍	❍	❍	❍
Sometimes my hospital fails to exercise good judgment.	❍	❍	❍	❍	❍	❍
Managers at my hospital are sometimes afraid to voice their disagreement with a higher level manager's ideas.	❍	❍	❍	❍	❍	❍
Employees at my hospital are always trustworthy.	❍	❍	❍	❍	❍	❍
At my hospital, hiring decisions have always been based only on qualifications.	❍	❍	❍	❍	❍	❍
My hospital has downplayed an event that patients might view as negative.	❍	❍	❍	❍	❍	❍

54) The following information will be used only to match your responses with outcomes data available through University Healthsystem Consortium or other publicly available sources.

Hospital Name ________________________________
Zip code ________________________________
State ________________________________

55) Your Job title (Please check the closest title which applies).

❍ Quality Assurance Manager
❍ Director - Patient Care Services
❍ Director of Nursing
❍ Director - Case Management
❍ Director - Quality Initiatives
❍ VP - Patient Care Services
❍ VP - Medical Affairs

- ❍ VP - Case Management
- ❍ VP - Quality Initiatives
- ❍ Chief Executive Officer
- ❍ Chief Operating Officer
- ❍ Chief Medical Officer
- ❍ Chief Nursing Officer
- ❍ Unit Manager
- ❍ Other (please specify) If you selected other, please specify

---

If you would like to be entered into the $1000 raffle, or if you want a summary report the survey findings, please send email to
david.dobrzykowski@rockets.utoledo.edu

THANK YOU FOR PARTICIPATING!

David Dobrzykowski
Doctoral Candidate

University of Toledo
College of Business Administration
Toledo, Ohio 43606
(419) 297-6600
david.dobrzykowski@rockets.utoledo.edu

Appendix E. CMSA Online Newsletter Survey Announcement
Released March 19, 2010

March 19, 2010 Update Your Profile | 2010 Annual Conference | www.cmsa.org

CMSA CASE MANAGEMENT SOCIETY OF AMERICA

MEMBER NEWS
CMSA's Member eNewsletter

Member Resources | Educational Resource Library | Communities | CMAG | Health Reform

QUICK LINKS

- Member-Get-A-Member Recruitment Campaign
- Case Mgmt. Model Act
- Caseload Concept Paper
- Corporate Partners
- Company Memberships
- www.NTOCC.org
- Legislative Flyer
- Multi-State Licensure
- Chapter Liability Insurance

CMSA EVENTS

CMSA's 20th Annual Conference & Expo
Orlando, FL
June 8-11, 2010

National Public Policy Workshop in Washington, DC

April 27-28, 2010
Registration: $199

Details available at:
http://www.cmsa.org/DCDay

MEMBER ANNOUNCEMENTS

CMSA'S 20th ANNIVERSARY CONFERENCE & EXPO

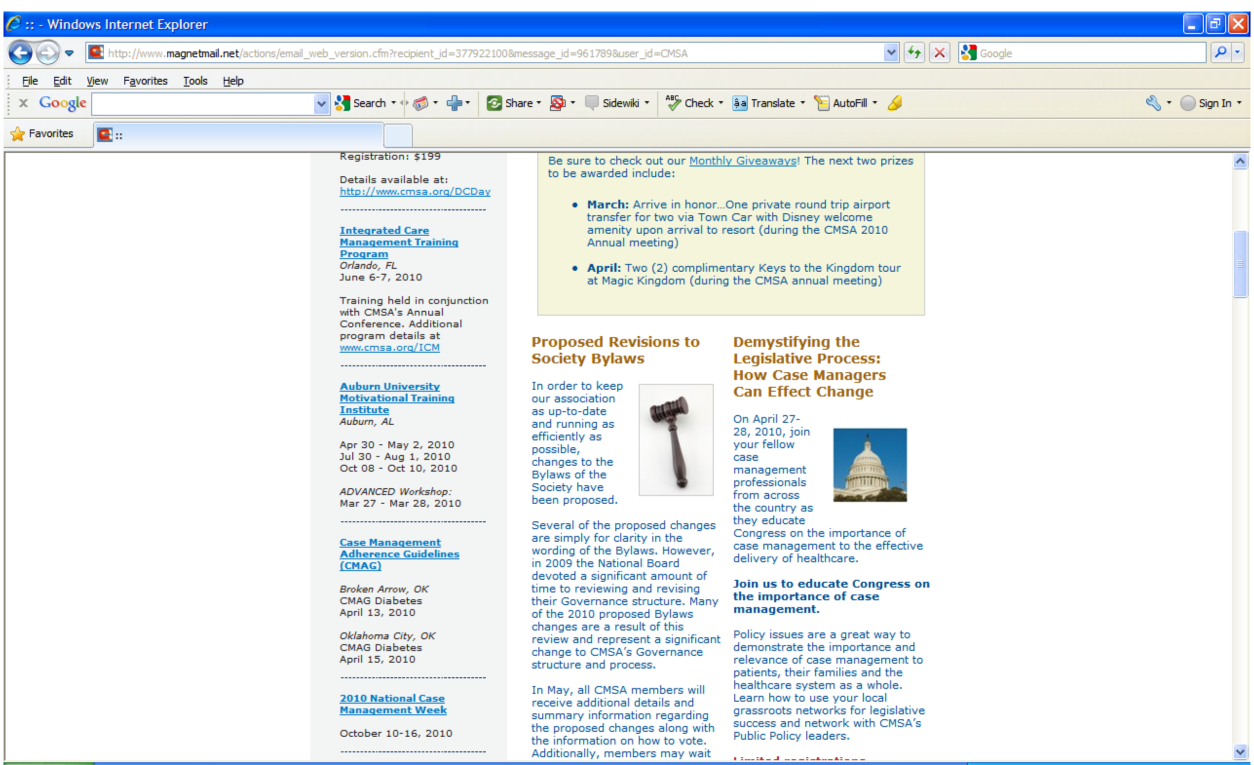
June 8-11, 2010 at Walt Disney World's Coronado Springs Resort in Orlando, FL, this event offers all case management professionals a variety of opportunities to become involved in activities designed to influence the new health care system and to incorporate current information and best practices into the activities designed to advance optimal client-centered care delivery. Discover new and updated evidence-based practices and cutting-edge technologies, treatments, services, and pharmaceuticals.

SPACE IS FILLING FAST! As always, it is important to register early to reserve your participation at the industry-recognized, premiere event.

Register Now

Be sure to check out our Monthly Giveaways! The next two prizes to be awarded include:

- **March:** Arrive in honor...One private round trip airport



Registration: $199

Details available at:
http://www.cmsa.org/DCDay

Integrated Care Management Training Program
Orlando, FL
June 6-7, 2010

Training held in conjunction with CMSA's Annual Conference. Additional program details at www.cmsa.org/ICM

Auburn University Motivational Training Institute
Auburn, AL

Apr 30 - May 2, 2010
Jul 30 - Aug 1, 2010
Oct 08 - Oct 10, 2010

ADVANCED Workshop:
Mar 27 - Mar 28, 2010

Case Management Adherence Guidelines (CMAG)

Broken Arrow, OK
CMAG Diabetes
April 13, 2010

Oklahoma City, OK
CMAG Diabetes
April 15, 2010

2010 National Case Management Week

October 10-16, 2010

Be sure to check out our Monthly Giveaways! The next two prizes to be awarded include:

- **March:** Arrive in honor...One private round trip airport transfer for two via Town Car with Disney welcome amenity upon arrival to resort (during the CMSA 2010 Annual meeting)
- **April:** Two (2) complimentary Keys to the Kingdom tour at Magic Kingdom (during the CMSA annual meeting)

Proposed Revisions to Society Bylaws

In order to keep our association as up-to-date and running as efficiently as possible, changes to the Bylaws of the Society have been proposed.

Several of the proposed changes are simply for clarity in the wording of the Bylaws. However, in 2009 the National Board devoted a significant amount of time to reviewing and revising their Governance structure. Many of the 2010 proposed Bylaws changes are a result of this review and represent a significant change to CMSA's Governance structure and process.

In May, all CMSA members will receive additional details and summary information regarding the proposed changes along with the information on how to vote. Additionally, members may wait

Demystifying the Legislative Process: How Case Managers Can Effect Change

On April 27-28, 2010, join your fellow case management professionals from across the country as they educate Congress on the importance of case management to the effective delivery of healthcare.

Join us to educate Congress on the importance of case management.

Policy issues are a great way to demonstrate the importance and relevance of case management to patients, their families and the healthcare system as a whole. Learn how to use your local grassroots networks for legislative success and network with CMSA's Public Policy leaders.

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http://www.magnetmail.net/actions/email_web_version.cfm?recipient_id=377922100&message_id=961789&user_id=CMSA

2010 National Case Management Week

October 10-16, 2010

SPONSORS/PARTNERS

receive additional details and summary information regarding the proposed changes along with the information on how to vote. Additionally, members may wait to vote on the proposed changes at CMSA's Annual Conference & Expo in Orlando during the CMSA Annual Membership Meeting (Tuesday, June 8, from 9:00am – 10:30am). The 2010 Annual Membership Meeting will include information regarding the Bylaws changes and will be presented by CMSA leaders.

Please check the CMSA website and watch your email for important information and the announcement coming in May.

Learn how to use your local grassroots networks for legislative success and network with CMSA's Public Policy leaders.

Limited registrations available.

Reserve your place today! At this critical time in America's health care future, it is important for our voices to be heard. Register to secure your participation in this extraordinary event.

Register today at:

www.cmsa.org/DCDay

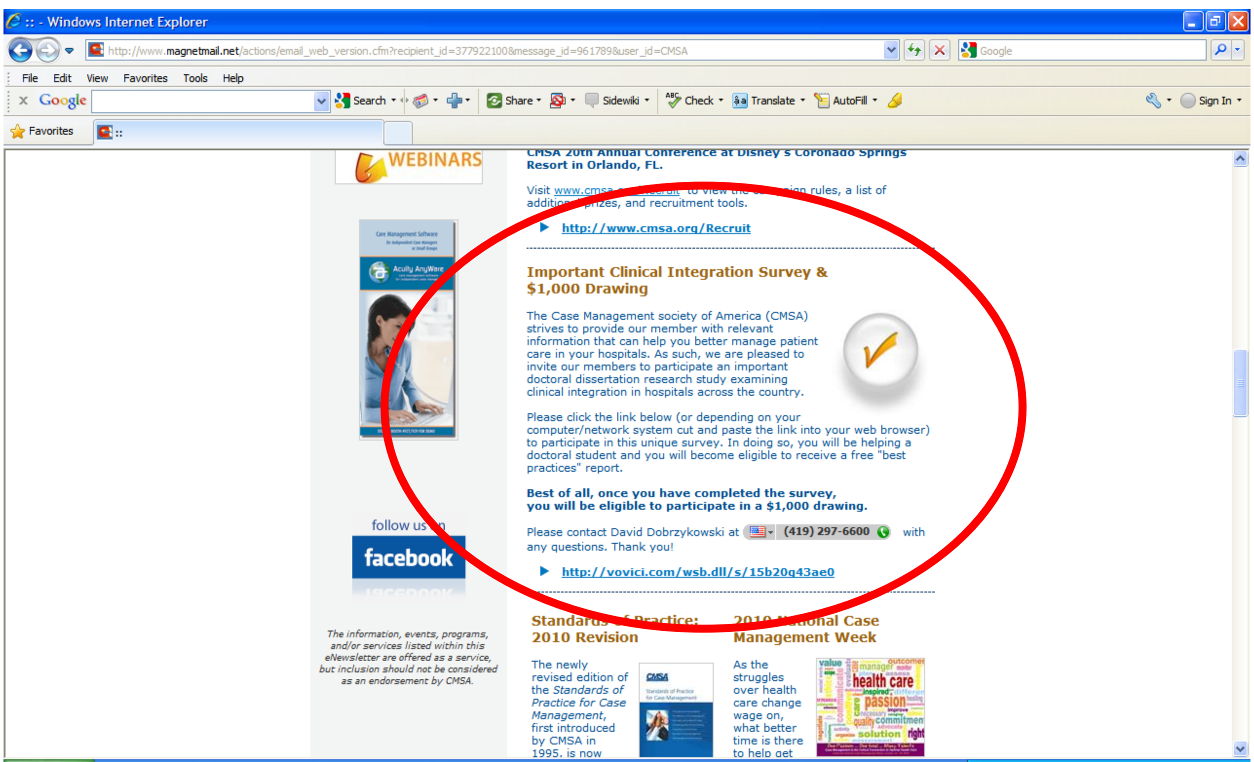
Member Get A Member Recruitment Campaign

April 30, 2010 is the deadline for CMSA's spring Member Get a Member Campaign. This is a chance for you as a member to get involved in the growth of CMSA. Your participation in member development campaigns plays an important and vital role in ensuring the vitality of the society and the case management industry.

CMSA challenges you to share with your colleagues all of the value and the benefits of being a member of CMSA. Word of mouth advertising is the most powerful type of advertisement. As a CMSA member you have power to influence another to invest in the enhancement of their professional development. Only current CMSA members may participate.

All new applications must be received with payment by April 30, 2010. Top Recruiter will receive a complimentary registration to CMSA 20th Annual Conference at Disney's Coronado Springs Resort in Orlando, FL.

Visit www.cmsa.org/Recruit to view the campaign rules, a list of additional prizes, and recruitment tools.



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CMSA 20th Annual Conference at Disney's Coronado Springs Resort in Orlando, FL.

Visit www.cmsa.org/Recruit to view the campaign rules, a list of additional prizes, and recruitment tools.

http://www.cmsa.org/Recruit

Important Clinical Integration Survey & $1,000 Drawing

The Case Management society of America (CMSA) strives to provide our member with relevant information that can help you better manage patient care in your hospitals. As such, we are pleased to invite our members to participate an important doctoral dissertation research study examining clinical integration in hospitals across the country.

Please click the link below (or depending on your computer/network system cut and paste the link into your web browser) to participate in this unique survey. In doing so, you will be helping a doctoral student and you will become eligible to receive a free "best practices" report.

Best of all, once you have completed the survey, you will be eligible to participate in a $1,000 drawing.

Please contact David Dobrzykowski at (419) 297-6600 with any questions. Thank you!

http://vovici.com/wsb.dll/s/15b20g43ae0

follow us on facebook

The information, events, programs, and/or services listed within this eNewsletter are offered as a service, but inclusion should not be considered as an endorsement by CMSA.

Standards of Practice: 2010 Revision

The newly revised edition of the *Standards of Practice for Case Management*, first introduced by CMSA in 1995, is now

2010 National Case Management Week

As the struggles over health care change wage on, what better time is there to help get

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http://www.magnetmail.net/actions/email_web_version.cfm?recipient_id=377922100&message_id=961789&user_id=CMSA

The information, events, programs, and/or services listed within this eNewsletter are offered as a service, but inclusion should not be considered as an endorsement by CMSA.

Standards of Practice: 2010 Revision

The newly revised edition of the *Standards of Practice for Case Management*, first introduced by CMSA in 1995, is now available for free download.

CMSA's *Standards of Practice for Case Management*, 2010 revision, provides voluntary practice guidelines for the case management industry. The *Standards of Practice* are intended to identify and address important foundational knowledge and skills of the case manager within a spectrum of case management practice settings and specialties.

The 2010 Standards reflect many changes in the industry, which resonate with current practice today.

Download your copy at:

- www.cmsa.org/SOP

2010 National Case Management Week

As the struggles over health care change wage on, what better time is there to help get the word out about case management, case managers, and CMSA?

National Case Management Week is a celebration serving to recognize case managers, to educate the public about case management, and to increase recognition of the significant contribution case managers make to quality health care for the patient, health care provider, and payor.

For additional ideas on planning activities, you can see how other CMSA Chapters and organizations have celebrated over the years! Visit www.cmsa.org/cmweek to download summaries of past CM Week Activities.

CM Week Information:

- www.cmsa.org/CMWeek

Motivational Interviewing Training Institute

AUMITI

Motivational interviewing is a proven, patient-centered counseling method for addressing patient ambivalence and resistance to change. Motivational interviewing has been shown to improve treatment adherence and outcomes, promote health behavior change, improve patient satisfaction with care

:: - Windows Internet Explorer

http://www.magnetmail.net/actions/email_web_version.cfm?recipient_id=377922100&message_id=961789&user_id=CMSA

Motivational interviewing is a proven, patient-centered counseling method for addressing patient ambivalence and resistance to change. Motivational interviewing has been shown to improve treatment adherence and outcomes, promote health behavior change, improve patient satisfaction with care and increase retention rates in complex case management.

Dates for 2010 are available at:

- http://www.cmsa.org/AUMITI

FEATURED ARTICLE

Establishing Evidence-Based Patient Caseloads

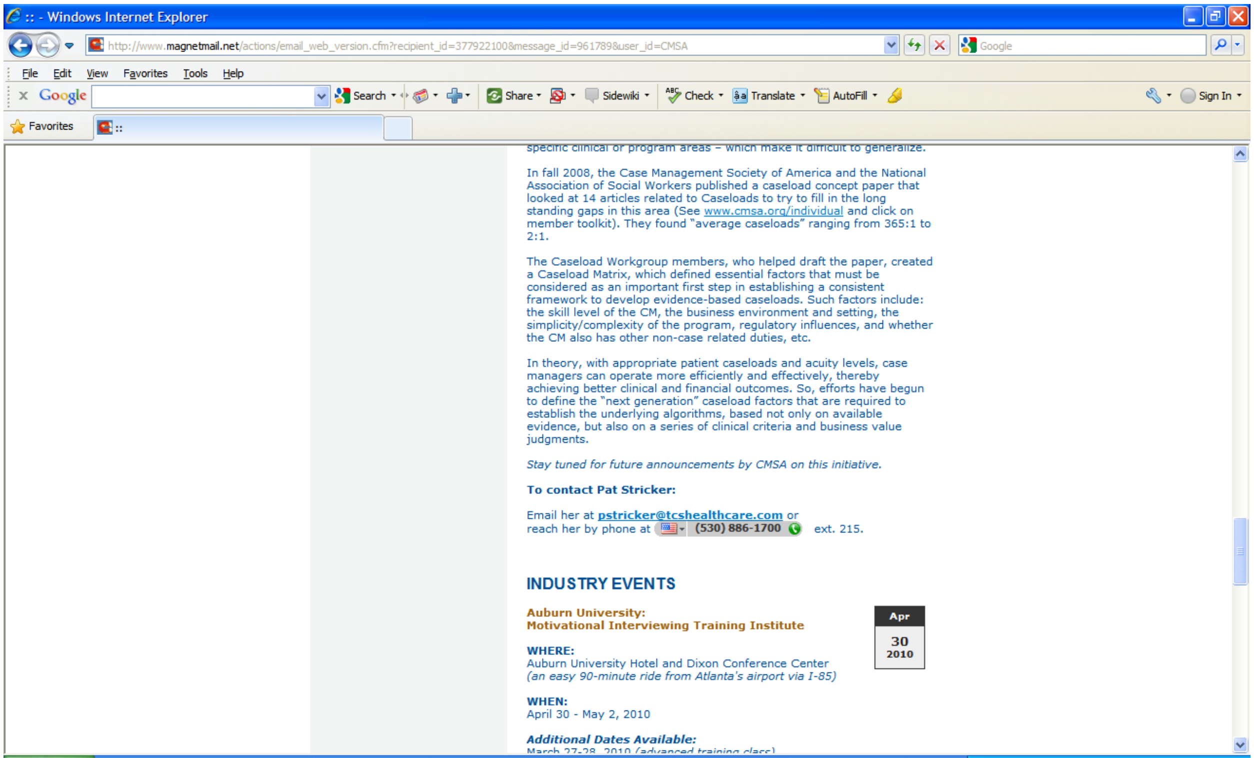
By Pat Stricker, RN, M Ed
VP of Clinical Services, TCS Healthcare Technologies

How many times have we all heard (or asked) "What is the average caseload"? With growing frequency, case managers in a variety of clinical and business settings are expressing concerns about inconsistent or inappropriate patient caseloads they need to maintain. And management is also concerned about how to determine accurate, fair, consistent caseloads that assure the best overall productivity, while still providing excellent clinical care and outcomes.

Standardizing caseloads is a challenge brought on in large part by rapid changes in the medical management field – e.g., the integration of utilization management (UM) and disease management (DM) into case management (CM) functions; and the rise of complex, condition management strategies. Some care management systems promote standardized workflows and acuity levels that can help determine proper caseload sizes or acuity levels for a given population. However, these applications usually lack evidence-based algorithms that result in distinct, accurate caseloads based on a multitude of complex factors that must be considered to make such computations realistic and consistent.

To date, literature reviews and other research findings on this topic are of limited use because they cite caseloads that are focused on their specific clinical or program areas – which make it difficult to generalize.

In fall 2008, the Case Management Society of America and the National Association of Social Workers published a caseload concept paper that looked at 14 articles related to Caseloads to try to fill in the long



specific clinical or program areas – which make it difficult to generalize.

In fall 2008, the Case Management Society of America and the National Association of Social Workers published a caseload concept paper that looked at 14 articles related to Caseloads to try to fill in the long standing gaps in this area (See www.cmsa.org/individual and click on member toolkit). They found "average caseloads" ranging from 365:1 to 2:1.

The Caseload Workgroup members, who helped draft the paper, created a Caseload Matrix, which defined essential factors that must be considered as an important first step in establishing a consistent framework to develop evidence-based caseloads. Such factors include: the skill level of the CM, the business environment and setting, the simplicity/complexity of the program, regulatory influences, and whether the CM also has other non-case related duties, etc.

In theory, with appropriate patient caseloads and acuity levels, case managers can operate more efficiently and effectively, thereby achieving better clinical and financial outcomes. So, efforts have begun to define the "next generation" caseload factors that are required to establish the underlying algorithms, based not only on available evidence, but also on a series of clinical criteria and business value judgments.

Stay tuned for future announcements by CMSA on this initiative.

To contact Pat Stricker:

Email her at **pstricker@tcshealthcare.com** or reach her by phone at (530) 886-1700 ext. 215.

INDUSTRY EVENTS

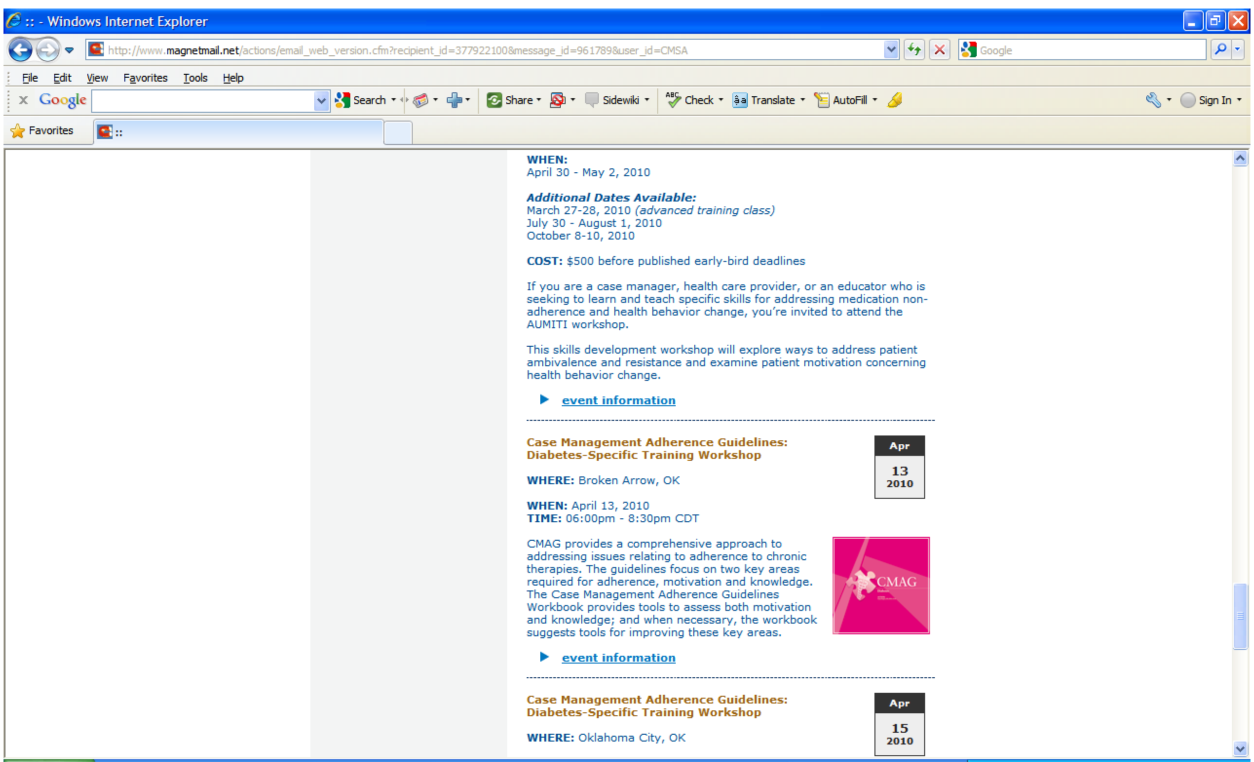
Auburn University: Motivational Interviewing Training Institute

Apr 30 2010

WHERE:
Auburn University Hotel and Dixon Conference Center
(an easy 90-minute ride from Atlanta's airport via I-85)

WHEN:
April 30 - May 2, 2010

Additional Dates Available:
March 27-28, 2010 (advanced training class)



WHEN:
April 30 - May 2, 2010

Additional Dates Available:
March 27-28, 2010 *(advanced training class)*
July 30 - August 1, 2010
October 8-10, 2010

COST: $500 before published early-bird deadlines

If you are a case manager, health care provider, or an educator who is seeking to learn and teach specific skills for addressing medication non-adherence and health behavior change, you're invited to attend the AUMITI workshop.

This skills development workshop will explore ways to address patient ambivalence and resistance and examine patient motivation concerning health behavior change.

▶ **event information**

Case Management Adherence Guidelines: Diabetes-Specific Training Workshop

Apr 13 2010

WHERE: Broken Arrow, OK

WHEN: April 13, 2010
TIME: 06:00pm - 8:30pm CDT

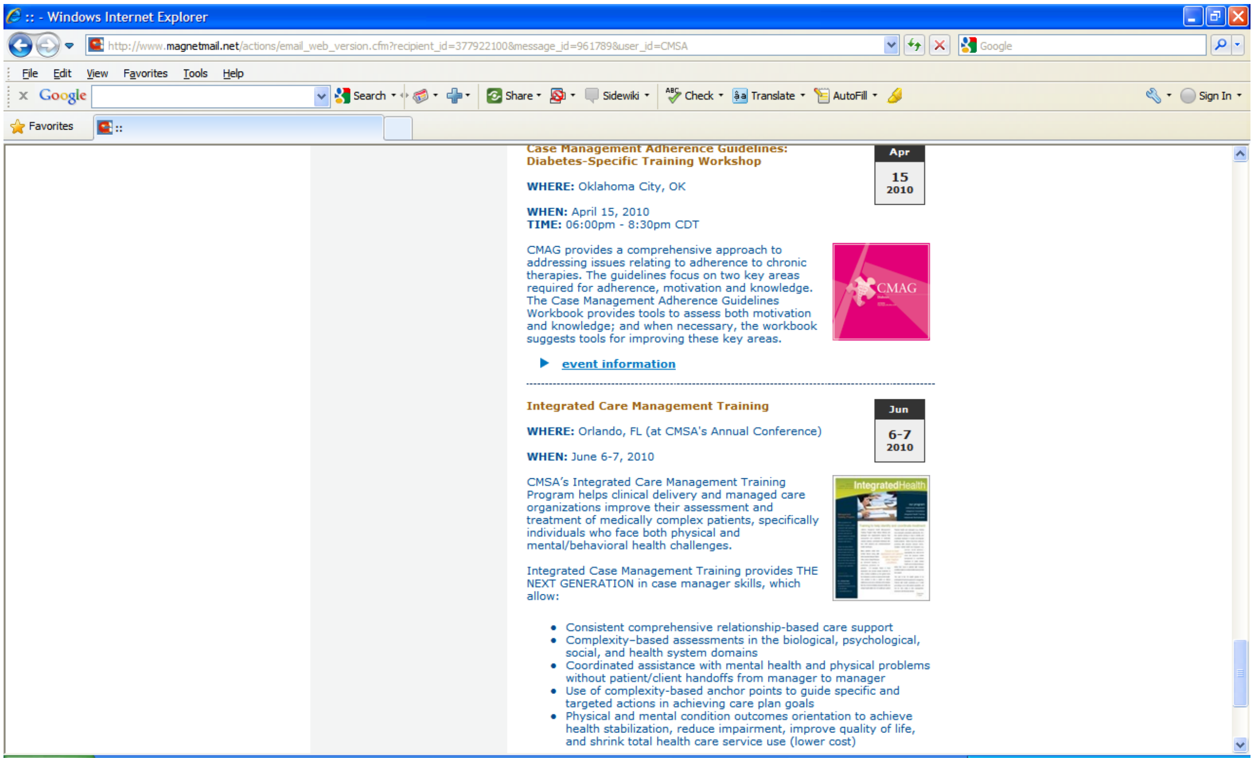
CMAG provides a comprehensive approach to addressing issues relating to adherence to chronic therapies. The guidelines focus on two key areas required for adherence, motivation and knowledge. The Case Management Adherence Guidelines Workbook provides tools to assess both motivation and knowledge; and when necessary, the workbook suggests tools for improving these key areas.

▶ **event information**

Case Management Adherence Guidelines: Diabetes-Specific Training Workshop

Apr 15 2010

WHERE: Oklahoma City, OK



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http://www.magnetmail.net/actions/email_web_version.cfm?recipient_id=377922100&message_id=961789&user_id=CMSA

Case Management Adherence Guidelines: Diabetes-Specific Training Workshop

Apr 15 2010

WHERE: Oklahoma City, OK

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TIME: 06:00pm - 8:30pm CDT

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▶ event information

Integrated Care Management Training

Jun 6-7 2010

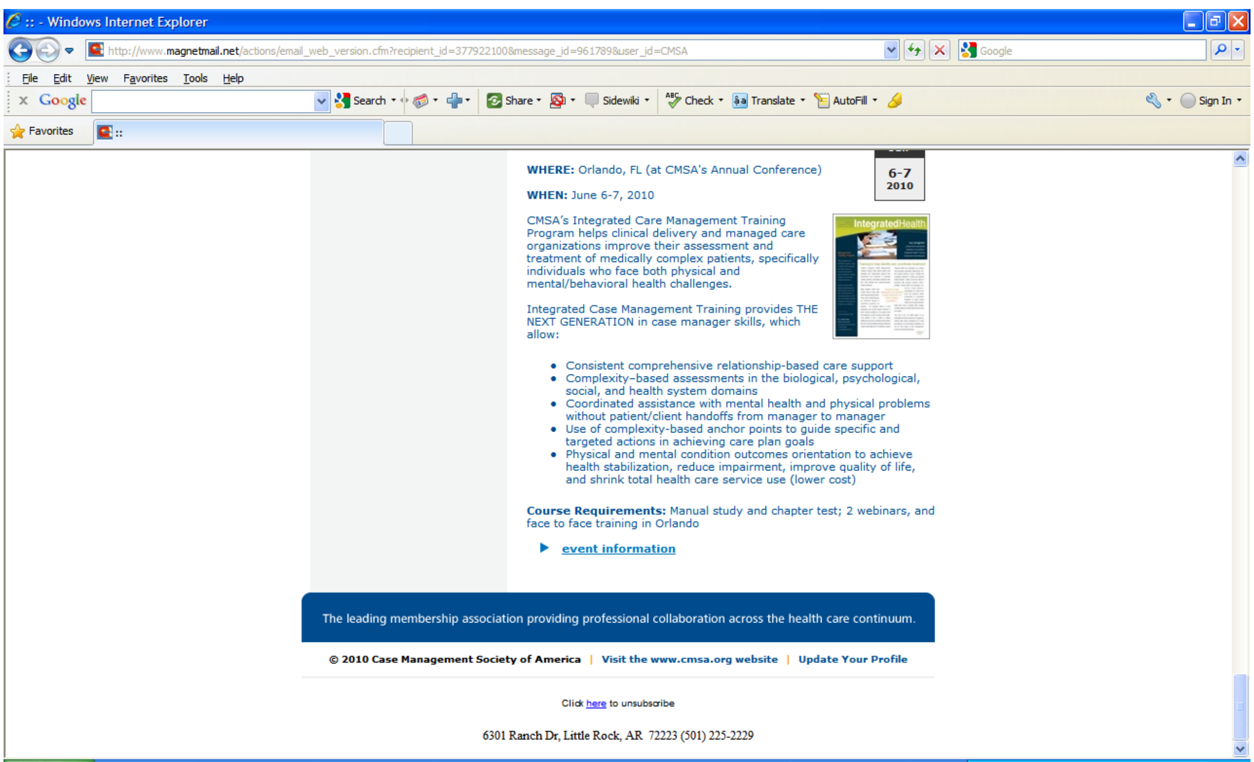
WHERE: Orlando, FL (at CMSA's Annual Conference)

WHEN: June 6-7, 2010

CMSA's Integrated Care Management Training Program helps clinical delivery and managed care organizations improve their assessment and treatment of medically complex patients, specifically individuals who face both physical and mental/behavioral health challenges.

Integrated Case Management Training provides THE NEXT GENERATION in case manager skills, which allow:

- Consistent comprehensive relationship-based care support
- Complexity-based assessments in the biological, psychological, social, and health system domains
- Coordinated assistance with mental health and physical problems without patient/client handoffs from manager to manager
- Use of complexity-based anchor points to guide specific and targeted actions in achieving care plan goals
- Physical and mental condition outcomes orientation to achieve health stabilization, reduce impairment, improve quality of life, and shrink total health care service use (lower cost)



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WHERE: Orlando, FL (at CMSA's Annual Conference)

WHEN: June 6-7, 2010

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- Use of complexity-based anchor points to guide specific and targeted actions in achieving care plan goals
- Physical and mental condition outcomes orientation to achieve health stabilization, reduce impairment, improve quality of life, and shrink total health care service use (lower cost)

Course Requirements: Manual study and chapter test; 2 webinars, and face to face training in Orlando

▶ event information

The leading membership association providing professional collaboration across the health care continuum.

Appendix F. UHC Listserv Announcement
Released March 16, 2010

Clinical Integration Study

Meurer, Steve [meurer@uhc.edu]
Sent: Tuesday, March 16, 2010 9:56 PM
To: CIAG@AURA.UHC.EDU
Cc: Dobrzykowski, David Daniel

Group,

I want to provide you with an opportunity to be part of a study looking at clinical integration. Please feel free to forward the survey on to the person who you believe would be best to complete the survey. Although the survey will take some time to complete, I guarantee the results will be of particular interest.

Please click the link below or depending on your computer/network system cut and paste the link into your web browser to participate in this opportunity. In doing so, you will be helping a doctoral student and you will become eligible to receive a free 'best practices' report. Best of all you will be eligible to **participate in a $1000 drawing.**
Thank you!

CLICK: http://vovici.com/wsb.dll/s/15b20g43adf

XXXXXX YYYYYY PhD, MBA, MHS
Vice President, Clinical Data & Informatics
University HealthSystem Consortium

Appendix G. Glossary of Key Terms and Variables

Term	**Definition**
Autonomy (ECA)	The extent to which all those involved in healthcare delivery have freedom to bring forth new vision or ideas and follow it through to completion. This is a hypothesized dimension of Entrepreneurial Culture for the purposes of this study.
Commitment (COM)	The extent of willingness of admitting/attending physicians to exert effort on behalf of the relationship. This is a hypothesized dimension of Partner Relationship for the purposes of this study.
Competitive Aggressiveness (ECC)	The extent to which those involved in healthcare delivery have a propensity to directly and intensely challenge competitors to improve their current market position or enter a new market altogether. This is a hypothesized dimension of Entrepreneurial Culture for the purposes of this study.
Comprehensive Electronic Medical Records (EMR) Use	The extent to which EMR is utilized in the hospital for clinical documentation, results viewing, computerized physician order entry (CPOE), and decision support. This is a hypothesized dimension of IS Enabled Processes for the purposes of this study.
Effectiveness (EFC)	The extent to which those involved in healthcare delivery achieve low mortality and nosocomial infection rates and high quality care. This is a hypothesized dimension of Healthcare Delivery Capability for the purposes of this study.
Efficiency (EFI)	The extent to which the actions of those involved in healthcare delivery contribute to holding down costs, attaining high labor productivity, and maintaining high capacity utilization. This is a hypothesized dimension of Healthcare Delivery Capability for the purposes of this study.
Entrepreneurial Culture (EC)	The extent to which those involved in healthcare delivery shift efforts and assets from unproductive to productive activities. It involves five dimensions of organizational culture: proactiveness, innovation, autonomy, competitive aggressiveness, and motivation.
Flexibility (F)	See Supply Chain Flexibility. This is a hypothesized dimension of Supply Chain Performance for the purposes of this study.

Healthcare Delivery Capability (HCDC)	The extent to which those involved in patient care are able to provide services to patients in a safe, effective, patient-centered, timely, and efficient manner.
Integration (I)	See Supply Chain Integration. This is a hypothesized dimension of Supply Chain Performance for the purposes of this study.
Integrative Information and Resource Strategy (IIRS)	The extent to which a hospital pursues an approach for managing processes, quality systems, and information technologies that balances both efficiency and agility in patient care.
Integrative Supply Chain Practices (ISCP)	The extent to which a set of activities is undertaken in a hospital to promote effective management of healthcare delivery.
Information Sharing (ISH)	The extent to which critical information is communicated to those involved in healthcare delivery. This is a hypothesized dimension of Integrative Supply Chain Practices for the purposes of this study.
Information Systems (IS)	The use of technology, often computers, in managing, processing, and communicating information.
Information Technology (IT)	See Information Systems (IS).
Innovativeness (ECI)	The extent to which those involved healthcare delivery engage in and support new ideas, experimentation, novelty, and creativity, some of which that may result in new services. This is a hypothesized dimension of Entrepreneurial Culture for the purposes of this study.
IS Enabled Processes	The extent to which IS is used to facilitate the flow of physical materials and information among those involved in healthcare delivery. This is a hypothesized dimension of Integrative Supply Chain Practices for the purposes of this study.
IS for Comprehensiveness Strategy	The extent to which a hospital provides and encourages actors involved in providing patient care to use information systems for operational, customer/patient focused, and

	interorganizational / physician activities. This is a hypothesized dimension of Integrative Information and Resource Strategy for the purposes of this study.
IT Use for Asset Management	The extent to which Radio Frequency Identification technology (RFID) is used to monitor and locate resource materials needed during patient care. This is a hypothesized dimension of IS Enabled Processes for the purposes of this study.
Leagile Supply Chain Strategy	The extent to which a hospital encourages actors involved in providing patient care to continuously improve processes to eliminate waste and non-value added activities, while understanding the needs of patients, being adaptable to change, and able to provide responsive, personalized care. This is a hypothesized dimension of Integrative Information and Resource Strategy for the purposes of this study.
Lean Principles (LNP)	The extent to which efforts are made to improve healthcare delivery processes by incorporating standardized work, seamless linkages, simple and direct pathways, and process improvements based on scientific methods. This is a hypothesized dimension ofIntegrative Supply Chain Practices for the purposes of this study.
Motivation (ECM)	The extent to which those involved in healthcare delivery enhance each others' morality and attitudes about work, encouraging hard work and high level job performance. This is a hypothesized dimension of Entrepreneurial Culture for the purposes of this study.
Operand Knowledge (VDW)	The extent to which physicians, hospital clinical staff, and patients have '*know what'* knowledge to one another for use during healthcare delivery. This is a hypothesized dimension of Value Dense Environment for the purposes of this study.
Operant Knowledge (VDH)	The extent to which physicians, hospital clinical staff, and patients have *'know how'* knowledge to one another for use during healthcare delivery. This is a hypothesized dimension of Value Dense Environment for the purposes of this study.
Operations Management	A field of study concerned with the transformation of inputs

(OM)	into desired finished goods or services, thus producing and delivering goods and/or services of value to customers of the organization.
Partner Relationship (PR)	The extent of trust, commitment, and shared vision among healthcare delivery actors.
Partnership Quality (PQ)	The extent to which the outcome of the relationship among all those involved in healthcare delivery matches the expectations of each party. This is a hypothesized dimension of Supply Chain Performance for the purposes of this study.
Patient Centeredness (PC)	The extent to which patients judge the overall hospital experience favorably and would return for a future visit. This is a hypothesized dimension of Healthcare Delivery Capability for the purposes of this study.
Patient Relationship (PS)	The extent to which the hospital employs practices for the purposes of managing patient complaints, building long-term relationships with patients, and improving patient satisfaction. This is a hypothesized dimension of Integrative Supply Chain Practices for the purposes of this study.
Patient Responsiveness (R)	The extent to which a hospital can provide prompt attention to a patient's needs. This is a hypothesized dimension of Supply Chain Performance for the purposes of this study.
Physician Performance (DP)	The extent to which admitting/attending physicians provide dependable, timely, and appropriate services to patients. This is a hypothesized dimension of Supply Chain Performance for the purposes of this study.
Proactiveness (ECP)	The extent to which healthcare delivery processes are targeted at anticipating and acting on unknown future market (patient) needs. This is a hypothesized dimension of Entrepreneurial Culture for the purposes of this study.
Resources (VDR)	The extent to which physicians, hospital clinical staff, and patients have the materials necessary during healthcare deliver. This is a hypothesized dimension of Value Dense Environment for the purposes of this study.
Responsiveness (R)	See Patient Responsiveness.
Safety (SF)	The extent to which those involved in healthcare delivery are able to reduce diagnostic, treatment, preventative, and other

	medical errors in treating patients. This is a hypothesized dimension of Healthcare Delivery Capability for the purposes of this study.
Shared Vision (SV)	The extent of similarity of the pattern of shared values, goals and beliefs among healthcare delivery actors. This is a hypothesized dimension of Partner Relationship for the purposes of this study.
Strategic Physician Partnership (SPR)	The extent to which the hospital has long-term relationships with its key physicians intended to leverage the strategic and operational capabilities of both parties to help them achieve significant ongoing benefits. This is a hypothesized dimension of Integrative Supply Chain Practices for the purposes of this study.
Supply Chain Flexibility (F)	The extent to which those involved in healthcare delivery are able to effectively adapt or respond to changes that directly impacts the hospital's patient. This is a hypothesized dimension of Supply Chain Performance for the purposes of this study.
Supply Chain Integration (I)	The extent to which all of the activities, of all of those involved in healthcare delivery are coordinated together. This is a hypothesized dimension of Supply Chain Performance for the purposes of this study.
Supply Chain Management (SCM)	The systemic, strategic coordination of business functions and tactics across business functions within a particular organization and among trading partners for the purposes of improving the long-term performance of the individual organizations and the network as a whole.
Supply Chain Performance (SCP)	The extent to which healthcare delivery in a hospital is flexible, well integrated, and responsive to patients, while enabling physicians to execute their duties, with outcomes that match the expectations of all those involved. (SCP)
Timeliness (T)	The extent to which the efforts and actions of those involved in healthcare delivery result in short average lengths of stays – or the length of time a patient maintains inpatient status in the hospital. This is a hypothesized dimension of Supply Chain Performance for the purposes of this study.

Trust (TRT)	The extent of willingness to rely on an admitting/attending physician in whom one has confidence and a belief of integrity. This is a hypothesized dimension of Partner Relationship for the purposes of this study.
Value Chain	The view that an organization (or multiple organizations) exist as a series of processes, each of which adds worth to a product or service.
Value Dense Environment (also Value Density) (VDE)	The extent to which those involved in healthcare delivery have *know what* (operand) knowledge and *know how* (operant) knowledge and resources available for use in providing care.