

Environmental factors and health information technology management strategy

By: Nir Menachemi, Dong Yeong Shin, Eric W. Ford, and Feliciano Yu

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Abstract:

Background: Previous studies have provided theoretical and empirical evidence that environmental forces influence hospital strategy.

Purposes: Rooted in resource dependence theory and the information uncertainty perspective, this study examined the relationship between environmental market characteristics and hospitals' selection of a health information technology (HIT) management strategy.

Methodology/Approach: A cross-sectional design is used to analyze secondary data from the American Hospital Association Annual Survey, the Healthcare Information and Management Systems Society Analytics Database, and the Area Resource File. Univariate and multinomial logistic regression analyses are used.

Findings: Overall, 3,221 hospitals were studied, of which 60.9% pursued a single-vendor HIT management strategy, 28.9% pursued a best-of-suite strategy, and 10.2% used a best-of-breed strategy. Multivariate analyses controlling for hospital characteristics found that measures of environmental factors representing munificence, dynamism, and/or complexity were systematically associated with various hospital HIT management strategy use. Specifically, the number of generalist physicians per capita was positively associated with the single-vendor strategy ($B = -5.64$, $p = .10$). Hospitals in urban markets were more likely to pursue the best-of-suite strategy ($B = 0.622$, $p < .001$). Dynamism, measured as the number of managed care contracts for a given hospital, was negatively associated with the single-vendor strategy ($B = 0.004$, $p = .049$). Lastly, complexity, measured as market competition, was positively associated with the best-of-breed strategy ($B = 0.623$, $p = .042$).

Practice Implications: By and large, environmental factors are associated with hospital HIT management strategies in mostly theoretically supported ways. Hospital leaders and policy makers interested in influencing the adoption of hospital HIT should consider how market conditions influence HIT management decisions as part of programs to promote meaningful use.

Keywords:

dynamism | environmental factors | health information technology | hospital strategy | munificence | health care management

Article:

Management scholars have long theorized that the environment has an influence on organizational activities (Bourgeois, 1980; Lawrence & Lorsch, 1967; Thompson, 1967). Empirical evidence from industry (Luo & Park, 2001; Miller, 1987; Tan & Litschert, 1994) and health care (Kazley & Ozcan, 2007; Trinh & O'Connor, 2002; Weech-Maldonado, Qaseem, & Mkanta, 2009; Zinn, Proenca, & Rosko, 1997) supports this notion. For example, various measures of environmental resource availability influence hospitals' strategic behaviors such as electronic health record adoption (Kazley & Ozcan, 2007), HMO contracting strategies (Trinh & O'Connor, 2002), provision of uncompensated care (Hsieh, Clement, & Bazzoli, 2010), and alliance formation (Zinn et al., 1997).

Interest and investments in health information technology (HIT) have grown significantly in response to evidence that such investments will yield important operational (Parente & Van Horn, 2006), clinical, and/or financial benefits to hospitals (Amarasingham, Plantinga, Diener-West, Gaskin, & Powe, 2009; Menachemi, Chukmaitov, Saunders, & Brooks, 2008). Because hospitals' HIT capabilities and complexity have expanded, so did the need to develop strategic resources of information management systems. To manage a hospital's HIT portfolio, three main strategies have emerged: a best-of-breed (BoB) approach, a single-vendor approach, and a best-of-suite (BoS) approach (Burke, Yu, Au, & Menachemi, 2009). Although each strategy has advantages and disadvantages (described next section), the influence of environment factors on this choice is not well understood.

The purpose of this study was to examine the relationship between the environmental market characteristics and the HIT management strategies used by hospitals. Understanding the environment's relationship to the choice of HIT management strategies helps chief information

officers or chief executive officers that are involved in HIT decision making to address some of the challenges they face when optimizing their HIT investments and management. Moreover, understanding how market conditions are related to major HIT management decisions by hospitals will assist policy makers to better understand the effects of new policies designed to stimulate the adoption of HIT by providers (DHHS, 2010).

Conceptual Framework

To explore the relationship between the environment and the HIT management strategy among hospitals, this study draws upon two prominent theoretical perspectives (i.e., resource dependence perspective and information uncertainty perspective), both of which dominate the literature on organizational environments. These perspectives conceptualize the environment as a source of resources (Pfeffer & Salancik, 1978; Thompson, 1967) and information (Duncan, 1972; Tan & Litschert, 1994), respectively, and as such have an influence on organizational strategies. Before we closely examine these perspectives and describe how they bring insights to the potential relationship between the environment and the HIT management strategy, we begin by defining the three HIT management alternatives and discuss the advantages and disadvantages of each strategic approach to HIT management.

HIT Management Strategies

Among the three main HIT management strategies, a single-vendor approach is the most common strategy pursued—representing 61% of hospitals (Burke et al., 2009). In a single-vendor approach, a hospital contracts with one vendor for all (or most) of its HIT needs. The benefits of this strategy include not needing to retain a large number of highly trained in-house IT staff because (a) contract management with only one vendor is less onerous (Geishecker, 1999; Hyvonen, 2003), (b) system integration between HIT systems in the hospital is theoretically simpler and done by the vendor (Light, Holland, & Wills, 2001; Themistocleous, Irani, & O'Keefe, 2001), (c) maintenance and troubleshooting of all HIT applications are typically outsourced to the single-vendor as well, and (d) HIT firms offering single-vendor solutions are typically larger and more established and less likely to go out of business (Burke et al., 2009).

Despite these benefits, the drawbacks of pursuing a single-vendor HIT management strategy, including the relative complexity of deploying HIT systems organization-wide, can result in longer, more disruptive installation and customization periods (Hong & Kim, 2002). In addition, because end users in specific units within a hospital are unlikely to participate in system selection, "push back" can occur particularly because the installation periods are complex (Burke

et al., 2009). Finally, overdependence on a single-vendor may also be less desirable because it introduces risks associated with reliance on a partner whom may have conflicting interests with the needs of the hospital (Roberts, 2001).

A second common HIT management strategy, known as BoB, is pursued by approximately 10% of U.S. hospitals (Burke et al., 2009). In this approach, hospitals select the HIT product deemed most appropriate for the adopting organization unit regardless of vendor. Many of the benefits of this approach are the opposite of the single-vendor strategy. For example, in a BoB approach, end users are more involved in selecting the HIT system, thus making installation and subsequent training easier (Geishecker, 1999; Hyvonen, 2003). Moreover, given that BoB HIT vendors have typically developed their products for use by specific units within hospitals, there is a greater chance that the product would have richer, more domain-specific functionalities that can yield better outcomes from its intended use (Burke et al., 2009). However, the disadvantages of the BoB approach includes needing to maintain a large, highly skilled IT staff that can manage potentially dozens of contracts with vendors, assure that all the HIT systems in the organization are communicating with one another, and keep abreast of periodic upgrades and "patches" for many systems-each upgrade of which can cause disruptions to systems integration. Lastly, given that BoB HIT vendors tend to be smaller niche players, those pursuing a BoB strategy risk having their vendors go out of business or be acquired by a larger HIT vendor who may aggressively renegotiate contract terms when it expires-knowing that the hospital's switching costs are high (Geishecker, 1999; Hyvonen, 2003).

BoS is the third common HIT management strategy and is pursued by approximately 29% of hospitals. BoS is a hybrid approach designed to maximize the benefits of both BoB and single-vendor strategies while minimizing their drawbacks. In a BoS approach, hospitals contract with a select number of HIT vendors that emphasize integration among suites of HIT applications. Each vendor is then responsible for all HIT needs for that suite. For example, a hospital may contract with one vendor to develop, to implement, and to support all financial HIT systems in the organization, with different vendors for clinical systems, and so forth. As a result, BoS solutions are somewhat easier to implement than single-vendor solutions and could also provide many benefits associated with BoB strategies as well (Burke et al., 2009).

Environmental Factors

Barnard (1938) first posited that the survival of an organization is determined by its ability to uphold a balance between the demands of its external environment and by regulating its internal processes in a way that suits the various elements of the environment (Barnard, 1938). Since then, management scholars defined the environment as not a single, but a multidimensional construct. Three specific dimensions of the environment have been identified using deductive conceptual studies and inductive empirical approaches, including munificence, which is a measure of resource abundance in the environment (Dess & Beard, 1984; Miller, 1987; Tan & Litschert, 1994; Trinh & O'Connor, 2002; Zinn et al., 1997), dynamism, which is a measure of the rate of change and thus uncertainty in the environment (Dess & Beard, 1984; Luo & Park, 2001; Miller, 1987; Tan & Litschert, 1994; Zinn et al., 1997), and complexity, which is closely related to dynamism and is a measure of how difficult it is to build effective mental models of the environment prospectively (Dess & Beard, 1984; Tan & Litschert, 1994; Zinn et al., 1997).

The resource dependence theory and the information uncertainty perspective provide us with an explanatory framework to understand how these environmental dimensions can affect the formulation of strategy in organizations (Tan & Litschert, 1994). Guided by these two perspectives regarding organizational environments, we discuss ways these environmental measures should impact each of the HIT management strategies in the hospital setting.

Munificence

Consistent with the resource dependence theory, munificence represents the availability and accessibility of environmental resources to firms. It is posited that the most valuable environmental resources are scarce and are actively sought after by competing organizations (Pfeffer & Salancik, 1978). Because firms typically lack exclusive control over these resources, it produces uncertainty for organizational leaders. Therefore, they seek strategies to secure these resources, to build a competitive advantage, and to ensure their firm's survival (Kreiser & Marino, 2002). If the environment becomes less munificent, firms face greater uncertainty and would move to either reduce their dependence on or increase their control over these resources (Thompson, 1967). For example, in environments characterized by low munificence, hospitals may select to pursue a single-vendor strategy because of the difficulty to acquire the necessary staff and HIT expertise needed to successfully manage a BoB strategy. Likewise, hospitals in very munificent (abundant) environments may be more prone to select a BoB or BoS strategy because the needed resources to be successful may be more obtainable from the environment. Moreover, the level of resources in a hospital's market could determine the degree of inputs available to hospitals' operations. Hospitals located in more munificent areas may cater to a more affluent customer base, which in turn may provide greater financial flexibility to pursue resource

intensive strategies such as BoB or BoS. Likewise, higher munificent areas may also provide hospitals with increased access to a broader range of human resources talent, thus enabling the pursuit of BoB or BoS strategies. Although it is possible to hypothesize that environmental resource availability would make the more restrictive single-vendor strategy less attractive to hospitals, resource dependence theory provides less guidance as to which strategy (BoS or BoB) would be preferred. Thus, we hypothesize:

Hypothesis 1: Hospitals in markets with relatively munificent environmental conditions are less likely to pursue single-vendor HIT management strategies, all other factors held constant.

Dynamism and Complexity

Dynamism reflects the rate of change and innovation in an industry as well as the uncertainty or unpredictability of competitors and/or customers (Miller, 1987). Complexity, on the other hand, represents the level of intricate knowledge needed to understand the environment (Sharfman, Dean, Dess, & Rasheed, 1991). Environmental dynamism and complexity have been closely tied to the information uncertainty perspective (Duncan, 1972), which stresses the subjectively perceived uncertainty by managers rather than the uncertainty gauged by objective data available to researchers (Tan & Litschert, 1994). Compared with the resource dependence theory focusing on control over critical resources, the information uncertainty perspective views the lack of information as the driver of environmental uncertainty. Researchers suggest that firms are unable to gain absolute knowledge about their environment and that this lack of information generates uncertainty for the firm (Duncan, 1972). Dynamism and complexity have an influence on the perceived uncertainty of decision makers in organizations, thereby affecting the characteristics of strategic decision made by them (e.g., risk taking, futuristic, proactive, or defensive propensities; Miles & Snow, 1978). Previous studies suggest that increased dynamism and complexity results in an organization's selection of shorter term and less risky strategies (Birnbaum, 1984; Mahon & Murray, 1981). For example, a study of Chinese firms transitioning from a "planned economy" to a more "market-driven economy" found that firms tended to pursue less-risky defensive strategies in lieu of proactive future-oriented strategies under such a dynamic and complex environment (Tan & Litschert, 1994). Likewise, we expect hospitals in either an increasingly dynamic and/or an increasingly complex environment (both of which are associated with increased uncertainty) to select less-risky HIT management strategies. Because BoB and BoS strategies are easier to implement and do not require long-term reliance on a single vendor who may have misaligned interests with the hospital, we would expect single-vendor strategies to be less common in highly dynamic or complex environments. Thus, we hypothesize:

Hypothesis 2: Hospitals in markets with relatively dynamic environmental conditions are less likely to pursue single-vendor strategies, all other factors held constant.

Hypothesis 3: Hospitals in markets with relatively complex environmental conditions are less likely to pursue single-vendor strategies, all other factors held constant.

Methods

This study uses a cross-sectional design to analyze secondary data from three sources whose unit of analysis is the acute-care hospital. To examine the relationship between environmental factors and hospital's HIT strategies, we draw data from the 2007 American Hospital Association Annual Survey, the 2008 Healthcare Information and Management Systems Society (HIMSS) Analytics Database, and the 2008 Area Resource File (ARF).

Our main dependent variable, HIT management strategy, was extracted from the HIMSS database, which contains rich IT-related information on more than 6,000 U.S. health care facilities. The data representing environmental factors were extracted from the ARF, which includes county-level market characteristics (e.g., population counts, numbers of health professionals, economic activity, socioeconomic status) from all U.S. states. Lastly, control variables representing hospital characteristics were obtained from the American Hospital Association data set. In the next paragraph is a description of the sampling frame, how variables were operationalized, and the statistical approach used. A summary of each construct including how each variable was operationalized and its source data set appear in Table 1.

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The sampling frame consists of U.S. general, acute-care hospitals, not owned by the federal government. In addition, individual hospitals in the HIMSS database needed to have a value for our dependent variable, which was derived from the question on the survey that asked respondents to describe the vendor selection strategy at their facility. Answers to this question included a BoB, a single-vendor, or a BoS approach. Twelve hospitals were excluded from our analyses because their specified HIT management strategy was "focusing on self-developed technologies," which represents a group too small for robust statistical analyses. After merging

the three data sources, our final sample included 3,221 hospitals. For illustrative purposes, we provide the characteristics of included and excluded hospital

Variables

Our main independent variables were selected to operationalize the various dimensions of the environment (e.g., munificence, dynamism, and complexity). Consistent with previous work, munificence was measured from the ARF using six variables that were selected to operationalize community income level, rurality, supply of physicians, and demand for health services as follows (Ginn & Young, 1992; Kazley & Ozcan, 2007; Trinh & O'Connor, 2002; Zinn et al., 1997). Specifically, we measured community income level as average per capita income and rurality as rural or urban on the basis of federally developed rural-urban commuting codes (Morrill, Cromartie, & Hart, 1999). Supply of physicians was measured by number of generalist physicians per 1,000 population and the number of specialist physicians per 1,000 population. It is important to note that a relatively greater number of general practitioners in a given hospital's market would be considered a negative marker of munificence because of the inverse relationship between increased supply of primary care access and decreased demand for hospital services (Bindman et al., 1995; Gaskin & Hoffman, 2000; Parchman & Culler, 1994). On the other hand, a greater number of specialists in a given market typically results in higher utilization of hospital services (Starfield, Shi, Grover, & Macinko, 2005); thus, an increase in specialists per capita would indicate increased munificence. Lastly, demand for health services was measured by number of births and separately the proportion of population 65 years or older.

Dynamism was captured by two variables representing the extent of managed care contracts (measured as the number of HMO and PPO contracts for the hospital) and the degree of instability in health services needs as expressed by the change in unemployment rate between 2000 and 2007. The presence of managed care has been used frequently to operationalize dynamism (Zinn et al., 1997) because the strong presence of these organizations in a market causes instability for a hospital having to deal with multiple rounds of contracting for risk. Furthermore, because managed care may be associated with decreased financial flexibility, increased hospital dependency on HMO and PPO contracts fosters a scenario of unpredictability and dynamic change. Likewise, because the concept of dynamism also represents the rate of change or unpredictability of customers, researchers have operationalized dynamism as the degree of change in historic unemployment rates in a given market (Kazley & Ozcan, 2007). In this study, we used the fluctuation in unemployment rates for the past 8 years (e.g., 2000-2007) to capture this important measure of dynamism.

Complexity was measured by the degree of competition in the local market. Market competition was measured with the Herfindahl-Hirschman Index (HHI), which ranges from 0 to 1, where lower values indicate greater market competition. Increased competition in the hospital industry is frequently associated with the need for increased complexity when making major decisions. Not surprisingly, the HHI has been used to measure this dimension of the environment (Banaszak-Holl, Zinn, & Mor, 1996; Kazley & Ozcan, 2007; Weech-Maldonado et al., 2009; Zinn et al., 1997). Importantly, Kazley and Ozcan (2007) recently noted that in the case of system hospitals, "two hospitals in the same geographic area maintain greater market share through joint management than a single independent hospital in the same market" (p. 380). Thus, the HHI for system hospitals was calculated for hospitals affiliated with the same system at the market level.

Lastly, all models used hospital characteristic control variables, including size (measured by the number of staff beds), system affiliation (yes or no), and tax status (for profit or not for profit). All of these variables are organizational factors found to have an influence on HIT adoption (Furukawa, Raghu, Spaulding, & Vinze, 2008; Hikmet, Bhattacharjee, Menachemi, Kayhan, & Brooks, 2008; Wang, Wan, Burke, Bazzoli, & Lin, 2005) and more importantly the selection of HIT management strategies (Burke et al., 2009).

Data Analysis

We began by developing descriptive statistics to examine the variable distributions and the suitability for analyses and to identify potential data anomalies. Next, chi-square analysis and analysis of variance were used to explore the univariate relationships between the dependent variable (HIT management strategy) and each of the variables measuring environmental dimensions. Finally, we examined the effect of munificence, dynamism, and complexity on HIT management strategy while controlling for hospital characteristics in a series of multinomial logistic regressions. Multinomial logistic regressions are similar to binary logistic regression but allow for the analysis of categorical outcome measures with more than two groups. The model described earlier was run twice, once each with a single vendor, and the BoB categories were specified as the reference category. Doing so facilitated an examination of all pairwise comparisons of the three categories of the dependent variable (e.g., single vendor, BoB, and BoS) in the context of our model. In all cases, we adjusted for the clustering of error terms that could occur at the market (county) level. The results we present include the unstandardized logistic regression coefficients and adjusted odds ratios with 95% confidence intervals. Multivariate results are flagged for significance at the $p < .1$, $p < .05$, and $p < .01$ levels,

respectively. Lastly, using the Nagelkerke statistic, we reported the change in pseudo-R² that is observed when including the hospital characteristic control variables in the model.

Results

A total of 3,221 hospitals made up the sample of the current study. Organizational characteristics of the included and excluded hospitals are displayed in Table 2. Briefly, the average included hospital had 200 staffed inpatient beds with a range from 6 to 2,157. A majority of hospitals were system affiliated (59.4%) and/or had a nonprofit tax designation (84.8%). In addition, most hospitals were located in an urban area (56.7%). With respect to HIT management strategies, a single-vendor approach was most common (60.9%), followed by BoS (28.9%) and lastly BoB (10.2%). Compared with included hospitals, excluded hospitals were on average smaller and more likely to be stand alone (e.g., not system affiliated), have a for-profit tax designation, and located in a rural area (see Table 2).

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In the univariate analysis, differences were noted in each of the environmental variables relative to the hospital's HIT management strategies. For example, hospitals that pursued a single-vendor strategy tended to be in markets with lower per capita income, lower rates of physician specialists per capita, higher rates of generalist physicians per capita, smallest changes in historic unemployment rates, less competition, and higher proportion of elderly people (older than 65 years; see Table 3). On the other hand, hospitals pursuing a BoS strategy were most frequently in urban areas, in markets with the highest per capita birth rates, and in areas with the most competitive hospital markets. Lastly, hospitals using a BoB approach were in markets with the highest per capita income and the greatest magnitude change in historic unemployment rates.

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In multivariate analyses that controlled for hospital characteristics and all environmental factors, several variables representing munificence, dynamism, and/or complexity were associated with hospital HIT management strategy (see Table 4). The environmental variables when modeled alone explained 11.0% of the variation in the outcome variable, whereas inclusion of the hospital characteristic control variables increased the pseudo-R² to 15.3%. As can be seen in Table 4, we found strong support for Hypothesis 1, which theorized that an increase in munificence (e.g., environmental resource abundance) would be negatively correlated with the single-vendor strategy. An increase in the number of generalist physicians per capita (representing a decrease in munificence) was positively associated with the single-vendor strategy. Specifically, relative

to a single-vendor approach, the BoB ($B = -5.64, p = .10$) and the BoS ($B = -3.07, p = .05$) strategies were both less likely as the number of generalist physicians per capita increased. Moreover, in multivariate analysis, urban markets were associated with the BoS strategy ($B = 0.622, p < .001$ versus single vendor; and $B = 0.87, p = .001$ versus BoB) relative to the other strategic alternatives. Lastly, contrary to the hypothesized relationship, we found that an increase in the number of individuals 65 years or older in a given market reduced the odds of a hospital pursuing a BoS strategy ($B = -0.038, p = .09$ versus single vendor).

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Hypothesis 2 theorized that an increase in dynamism would be associated with a reduction in hospital pursuit of the single-vendor strategy. Our analysis found some support for this notion (see Table 4). Specifically, an increase in dynamism measured as the number of managed care contracts for a given hospital was associated with a decrease in likelihood of the single-vendor strategy relative to the BoS strategy ($B = 0.004, p = .049$). Dynamism, which was also measured as the change in unemployment rates between 2007 and 2000, was not related to HIT management strategy.

Lastly, Hypothesis 3 stated that an increase in complexity, measured as market competition, would result in a decrease in hospitals selection of the single-vendor strategy. Our analysis found support for this hypothesis; specifically, as HHI decreased (suggesting an increase in competition), the BoB strategy was increasingly more likely relative to the single-vendor ($B = -0.544, p = .036$) strategy. In addition, BoB ($B = 0.623, p = .042$) was increasingly more likely as competition increased when compared with the BoS approach.

Discussion

Despite the growing number of health care studies demonstrating how the external environment influences organizational decision making, no study has examined the impact of the environment on hospital's selection of an HIT management strategy. Given the recent and anticipated growth of HIT investments, the decision regarding how to manage the strategic resource of information management by hospitals has become an increasingly important topic. This study empirically tested several hypotheses, rooted in resource dependence theory and the information uncertainty perspective, to examine the relationship between environmental variables and hospital selection of HIT management strategy.

The overall findings of this study suggest that the environment plays a significant role in how hospitals choose to manage their HIT portfolios. Consistent with our hypotheses, measures of munificence, dynamism, and complexity were each significant predictors of hospital selection of HIT management strategy. Besides providing support to theory, these findings have practical implications to the currently pursued national efforts designed to increase hospital adoption of HIT. Current national efforts are largely focused on providing financial incentives for the "meaningful use" of HIT by provider organizations (DHHS, 2010). Ford, Menachemi, Huerta, and Yu (2010) recently found that HIT management strategy can influence the successful, complete implementation of complex HIT applications. Thus, incentive programs focusing exclusively on financial aspects that fail to consider environmental factors may ultimately attenuate the intended impacts of such policies.

In this study, the single-vendor strategy was most likely to be pursued in environments characterized by low levels of environmental munificence. The single-vendor strategy requires less upfront investments in financial and human resource intensive endeavors. However, this strategy is associated with a potentially risky reliance on a powerful outside entity whose interests may not be aligned with that of the hospital. Hospitals in resource-poor environments are more frequently forced to take this risk to accomplish their HIT-related goals. Per our findings, hospitals with diminished access to a steady cadre of HIT professionals (e.g., in rural areas) or hospitals in areas with fewer profitable hospitalizations (e.g., relatively higher number of generalist physicians) pursue single-vendor strategies more often. Conversely, in munificent areas, hospitals preferred the hybrid BoS strategy in significantly greater proportions. This suggests that hospitals with the greatest access to environmental resources opt for the strategy that maximizes benefits while minimizing drawbacks to the organization. Collectively, these findings are consistent with the literature which suggests that low levels of munificence are associated with strategies requiring less upfront resource commitments (Kreiser & Marino, 2002; Weech-Maldonado et al., 2009) and high levels of munificence are associated with benefit maximization and less dependence on outside organizations (Zinn et al., 1997).

Our findings also suggest that environments characterized by increasing dynamism are associated with hospital selection of the BoS strategy in lieu of the single-vendor approach. Specifically, as hospitals had more managed care contracts, they were less likely to select the single-vendor approach. Increased reliance on managed care is associated with risk sharing and financial instability. Thus, hospitals must respond by making improvements in efficiency to remain profitable (Mello, Stearns, & Norton, 2002; Miller & Luft, 2002). Under dynamic scenarios, hospitals selected the BoS strategy because this approach offers potentially more

efficient HIT implementation processes that tend to be less disruptive to organizational-wide workflows (Hong & Kim, 2002). These findings are similar to previous studies that reported that unstable environments cause organizations to avoid overreliance on external entities and prefer more innovative strategies (Kazley & Ozcan, 2007; Tan & Litschert, 1994; Zinn et al., 1997).

We found that market competition (complexity) was negatively associated with the use of single-vendor strategy by hospitals. As competition increases, hospitals require more intricate knowledge to understand their increasingly uncertain environment. This environmental scenario makes single-vendor approaches and their more difficult and disruptive HIT implementations less attractive. In addition, the complexity associated with increased competition makes reliance on a single vendor whose interests are not aligned with the hospitals too risky. Our finding supports previous studies (Banaszak-Holl, Zinn, & Mor, 1996; Trinh & O'Connor, 2002; Zinn et al., 1997) that found an association between market competition and the strategic behavior of hospitals.

There may also be internal factors at play in adopting certain strategies by hospitals. Although our research provides a glimpse of how external factors shape organizational (internal) HIT management strategy, internal factors including organizational culture and tolerance for risk play a role as well. For example, not all organizations have the cultural affinity for early innovation. Because clinical information systems evolved over time, HIT vendors were initially focused in addressing specific niche services (i.e., departmental vs. organizational), and later, when the health industry's information needs began to grow, vendors acquired a variety of toolsets, through self-development, mergers, and acquisitions and offered more integrated solutions to gain a competitive market share advantage (Haux, 2006). Thus, organizations that adopt HIT technologies later in the adoption curve may tend to benefit from more integrated solutions offered by single-vendor strategies (Burke et al., 2009).

Strengths of the current analysis include the use of multiple data sources. Data drawn from a single source may be subject to common method bias. Thus, the use of multiple sources has the potential to generate findings that are strong in internal validity. An additional strength of our study is that we address an issue of contemporary importance. Unprecedented federal financial and political support for HIT adoption makes understanding antecedents and consequences of this policy paramount. To our knowledge, our study is the first to examine the environment's role in hospitals selection of HIT strategy. However, despite these strengths, our study has several limitations worth discussing.

First, our analysis is, by design, a cross-sectional retrospective study; therefore, the relationship we found should be interpreted as associations only. To detect the causality of relationship, we recommend that future studies should use a longitudinal design with the examination of fixed effects. Second, data entry and coding errors inherent in secondary data sets limit our study. One of our data sets (i.e., HIMSS Analytics) was built on the voluntary reporting of responses by individuals in organizations. Thus, our results are based on these respondents' willingness and ability to provide accurate responses. Third, we acknowledge the potential endogenous nature of our managed care variable, which reflects hospital-level data and not market-level information. Unfortunately, national estimates on managed care penetration at the county level are not publically available. This further stresses that our analysis can only be interpreted as associations. Given the nature of available data, our environment variables were measured at the county level. Operationalizing the environment at this level is admittedly suboptimal.

Related to the nature of available data, we recognize that it is challenging to operationalize certain dimensions of the environment (e.g., munificence, dynamism) in multifactorial ways. For example, it is possible that dynamic environmental forces are present as they pertain to human resource factors, financial factors, and so forth. We were only able to account for issues for which variables were available and acknowledge that a gap remains between that which is available and that which is optimal. Future research should examine how other measures of the environment relate to HIT management strategy. Along the same lines, future research can also investigate the relationship between HIT strategy and HIT adoption levels and timing of adoption. Lastly, our findings are generalizable to our study sample only, which excludes certain hospitals and other types of health organizations such as nursing homes or physician practices.

Implications to Management Practice

Our findings raise an important issue regarding national efforts imbedded in the American Recovery and Reinvestment Act of 2009, which provides hospitals and other providers with financial incentives to adopt and "meaningful use" HIT. Although financial barriers to HIT use has been well documented in the literature (Hersh, 2004; Menachemi, Burke, Clawson, & Brooks, 2005; Poon et al., 2004), little attention has been given to how the environment may influence HIT management strategies and ultimately HIT adoption. Previous work has found that market forces influence the adoption of electronic health records by hospitals (Kazley & Ozcan, 2007); our study adds the requisite notion that HIT management strategy is also related to the environment. Unfortunately, the current federal incentives program does not take these factors into consideration. Given that certain HIT strategies are more appropriate in certain market conditions, chief executive officers and chief information officers should consider how to best align their organization's HIT strategy with the operating environment they are in. In fact, given

the large capital requirements of HIT implementation and support, hospital managers should routinely carefully consider environmental conditions as part of their HIT strategy formulation process.

References:

- Amarasingham, R., Plantinga, L., Diener-West, M., Gaskin, D. J., & Powe, N. R. (2009). Clinical information technologies and inpatient outcomes: A multiple hospital study. *Archives of Internal Medicine*, 169(2), 108-114.
- Banaszak-Holl, J., Zinn, J. S., & Mor, V. (1996). The impact of market and organizational characteristics on nursing care facility service innovation: A resource dependency perspective. *Health Services Research*, 31(1), 97-117.
- Barnard, C. I. (1938). *The functions of the executive*. Cambridge, MA: Harvard University Press.
- Bindman, A. B., Grumbach, K., Osmond, D., Komaromy, M., Vranizan, K., Lurie, N., et al. (1995). Preventable hospitalizations and access to health care. *Journal of the American Medical Association*, 274(4), 305-311.
- Birnbaum, P. H. (1984). The choice of strategic alternatives under increasing regulation in high technology companies. *Academy of Management Journal*, 27(3), 489.
- Bourgeois, L. J. III. (1980). Strategy and environment: A conceptual integration. *Academy of Management Review*, 5(1), 25.
- Burke, D., Yu, F., Au, D., & Menachemi, N. (2009). Best of breed strategies-hospital characteristics associated with organizational HIT strategy. *Journal of Healthcare Information Management*, 23(2), 46-51.
- Dess, G. G., & Beard, D. W. (1984). Dimensions of organizational task environments. *Administrative Science Quarterly*, 29, 52-73.
- DHHS. (2010). Office of the National Coordinator for Health Information Technology: Meaningful use. Retrieved April 14, 2010, from <http://healthit.hhs.gov/portal/server.pt?open=512&objID=1325&parentname=CommunityPage&parentid=1&mode=2>
- Duncan, R. B. (1972). Characteristics of organizational environments and perceived environmental uncertainty. *Administrative Science Quarterly*, 17(3), 313-327.

Ford, E., Menachemi, N., Huerta, T., & Yu, F. (2010). Hospital IT adoption strategies associated with implementation success: Implications for achieving meaningful use. *Journal of Healthcare Management*, 55(3), 175-188.

Furukawa, M. F., Raghu, T. S., Spaulding, T. J., & Vinze, A. (2008). Adoption of health information technology for medication safety in U.S. Hospitals, 2006. *Health Affairs (Millwood)*, 27(3), 865-875.

Gaskin, D. J., & Hoffman, C. (2000). Racial and ethnic differences in preventable hospitalizations across 10 states. *Medical Care Research and Review*, 57(Suppl. 1), 85-107.

Geishecker, L. (1999). ERP vs. best-of-breed. *Strategic Finance*, 80(9), 62.

Ginn, G. O., & Young, G. J. (1992). Organizational and environmental determinants of hospital strategy. *Hospital and Health Services Administration*, 37(3), 291-302.

Haux, R. (2006). Health information systems-Past, present, future. *International Journal of Medical Informatics*, 75(3-4), 268-281.

Hersh, W. (2004). Health care information technology: Progress and barriers. *Journal of the American Medical Association*, 292(18), 2273-2274.

Hikmet, N., Bhattacharjee, A., Menachemi, N., Kayhan, V. O., & Brooks, R. G. (2008). The role of organizational factors in the adoption of healthcare information technology in Florida hospitals. *Health Care Management Science*, 11(1), 1-9.

Hong, K., & Kim, Y. (2002). The critical success factors of ERP implementation: An organizational fit perspective. *Information Management*, 40(1), 25-40.

Hsieh, H. M., Clement, D. G., & Bazzoli, G. J. (2010). Impacts of market and organizational characteristics on hospital efficiency and uncompensated care. *Health Care Management Review*, 35(1), 77-87.

Hyvonen, T. (2003). Management accounting and information systems: ERP versus BoB. *European Accounting Review*, 12(1), 155.

Kazley, A. S., & Ozcan, Y. A. (2007). Organizational and environmental determinants of hospital EMR adoption: A national study. *Journal of Medical Systems*, 31(5), 375-384.

Kreiser, P., & Marino, L. (2002). Analyzing the historical development of the environmental uncertainty construct. *Management Decision*, 40(9), 895-905.

Lawrence, P. R., & Lorsch, J. W. (1967). *Organization and environment; managing differentiation and integration*. Boston: Division of Research, Graduate School of Business Administration, Harvard University.

- Light, B., Holland, C. P., & Wills, K. (2001). ERP and best of breed: A comparative analysis. *Business Process Management Journal*, 7(3), 216.
- Luo, Y., & Park, S. H. (2001). Strategic alignment and performance of market-seeking MNCs in China. *Strategic Management Journal*, 22(2), 141.
- Mahon, J. F., & Murray, E. A. Jr. (1981). Strategic planning for regulated companies. *Strategic Management Journal*, 2(3), 251.
- Mello, M. M., Stearns, S. C., & Norton, E. C. (2002). Do Medicare HMOs still reduce health services use after controlling for selection bias? *Health Economics*, 11(4), 323-340.
- Menachemi, N., Burke, D., Clawson, A., & Brooks, R. (2005). Information technologies in Florida's rural hospitals: Does system affiliation matter? *Journal of Rural Health*, 21(3), 263-268.
- Menachemi, N., Chukmaitov, A., Saunders, C., & Brooks, R. (2008). Hospital quality of care: Does information technology matter? The relationship between information technology adoption and quality of care. *Health Care Management Review*, 33(1), 51.
- Miles, R. E., & Snow, C. C. (1978). *Organizational strategy, structure, and process*. New York: McGraw-Hill.
- Miller, D. (1987). The structural and environmental correlates of business strategy. *Strategic Management Journal*, 8, 55-76.
- Miller, R. H., & Luft, H. S. (2002). HMO plan performance update: An analysis of the literature, 1997-2001. *Health Affairs (Millwood)*, 21(4), 63-86.
- Morrill, R., Cromartie, J., & Hart, L. (1999). Metropolitan, urban, and rural commuting areas: Toward a better depiction of the u.s. settlement system. *Urban Geography*, 20(8), 727-748.
- Parchman, M. L., & Culler, S. (1994). Primary care physicians and avoidable hospitalizations. *Journal of Family Practice*, 39(2), 123-128.
- Parente, S. T., & VanHorn, R. L. (2006). Valuing hospital investment in information technology: Does governance make a difference? *Health Care Finance Review*, 28(2), 31-43.
- Pfeffer, J., & Salancik, G. R. (1978). *The external control of organizations: a resource dependence perspective*. New York: Harper & Row.
- Poon, E. G., Blumenthal, 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 (Millwood)*, 23(4), 184-190.
- Roberts, V. (2001). Managing strategic outsourcing in the healthcare industry. *Journal of Healthcare Management*, 46(4), 239.

Sharfman, M. P., Dean, J. W. Jr., Dess, G. G., & Rasheed, A. M. A. (1991). Conceptualizing and measuring the organizational environment: A multidimensional approach; a critique and suggestions; dimensions and constructs: A response to Dess and Rasheed. *Journal of Management*, 17(4), 681.

Starfield, B., Shi, L., Grover, A., & Macinko, J. (2005). The effects of specialist supply on populations' health: Assessing the evidence. *Health Affairs (Millwood)*, W5, W5-97-W95-107.

Tan, J., & Litschert, R. (1994). Environment-strategy relationship and its performance implications-An empirical-study of the Chinese electronics industry. *Strategic Management Journal*, 15(1), 1-20.

Themistocleous, M., Irani, Z., & O'Keefe, R. M. (2001). ERP and application integration. *Business Process Management Journal*, 7(3), 195.

Thompson, J. D. (1967). *Organizations in Action*. New York: McGraw-Hill.

Trinh, H. Q., & O'Connor, S. J. (2002). Helpful or harmful? The impact of strategic change on the performance of U.S. urban hospitals. *Health Services Research*, 37(1), 145-171.

Wang, B. B., Wan, T. T. H., Burke, D. E., Bazzoli, G. J., & Lin, B. Y. J. (2005). Factors influencing health information system adoption in American hospitals. *Health Care Management Review*, 30(1), 44.

Weech-Maldonado, R., Qaseem, A., & Mkanta, W. (2009). Operating environment and USA nursing homes' participation in the subacute care market: A longitudinal analysis. *Health Services Management Research*, 22(1), 1-7.

Zinn, J., Proenca, J., & Rosko, M. (1997). Organizational and environmental factors in hospital alliance membership and contract management: A resource-dependence perspective. *Hospital and Health Services Administration*, 42(1), 67-86.