With the finalization of HIPAA regulations, innovative IT applications and services are on the radar screens of many healthcare senior executives. An Application Service Provider (ASP) is an information technology innovation wherein a vendor manages and distributes software-based services and solutions to customers across a wide area network from a centralized location. This study developed an exploratory research model encompassing institutional and organizational factors to identify the antecedent drivers to adoption of the ASP model in the healthcare industry.

An innovation is defined as an idea, practice, or object that is perceived as new by an individual or other unit of adoption. An adoption literature is replete with the diffusion of technology across organizations, but there is a relative paucity of research on the antecedent drivers of adoption. IT outsourcing has special considerations relating to security, performance, and usability, as well as costs and contracting issue, but ASPs can be beneficial to hospitals for many reasons. ASPs can provide hospital IT departments with expertise at fixed costs, relieving the shortage of skilled IT staff and allowing internal IT departments to focus on implementing new applications. ASPs can also give hospitals access to high-end applications with reduced implementation time.

**Research Objectives**

The purpose of this study was to explore adoption drivers among healthcare decision makers with respect to the ASP model. To accomplish this, an exploratory research model (figure 1a. ASP Construct Loadings) and hypotheses were developed. In 1996 Congress passed the Healthcare Insurance Portability and Accountability Act (HIPAA), governing the transfer of electronic information and the security of patient records. The legislative impetus was to reduce the complexity of payment systems, improve the compatibility between various standards.
and protocols, and standardize third-party processing of health claims. Many healthcare organizations are struggling to comply with regulatory pressures in addition to the financial crisis that plagues healthcare. Government regulation alters the level of competition and the flow of resources in local markets.

**H1: Regulatory impacts** (the degree to which an organization is ready to comply with HIPAA regulations) will have a negative relationship with ASP model adoption.

Organizations with multiple information technology systems and various platforms are looking to external providers such as ASPs to streamline their operations and reduce non-compliance liability. The ASP model is a viable option to meet compliance standards; ASP providers can focus on meeting changing regulations since their efforts are concentrated and they serve multiple organizations that must follow similar guidelines.

If the organization is ready to meet HIPAA guidelines, they have invested in new technology and have created procedures to comply with privacy requirements and patient protections. Regulatory impacts (the level of readiness for HIPAA) would be related to the investigation of procedures that bring the organization in compliance. Government regulation and policy affects divergent change by increasing or decreasing the level of competition and the flow of resources in local markets. Those that have not invested in new technology and processes, or do not have the capital to meet deadlines, can use the ASP provider to achieve compliance.

**H2: Environmental hostility** will positively influence ASP model adoption.

Competitive pressure has been identified in previous studies as an influential construct in innovation adoption. Organizations experiencing increased competitive pressure tend to use environmental scanning and boundary spanners to ensure they identify potential competitive advantages. Environmental hostility will make an organization search for innovations that may affect its competitive positioning and thus increases the probability of ASP adoption. External pressure to adopt may originate from industry or trading partners. A high degree of competition will also lead hospitals to strive to develop competitive advantage through adoption of innovations such as ASPs.

**H3a: Vendor trust** will positively influence ASP model adoption.

**H3b: Improper access protections** will positively influence ASP model adoption.

**H3c: Unauthorized secondary usage protections** will positively influence ASP model adoption.

Issues of data security are of primary concern to all organizations, but are of particular importance to healthcare organizations. The protection of patient information is a key concern of healthcare security legislation and a vital part of the new HIPAA regulations. Data security can be viewed as a function of vendor trust, appropriate access, and proper secondary usage of information.

Vendor trust has previously been identified as an antecedent in exchange relationships that involves risks and vulnerabilities. Improper access refers to the protection of the data at the organization or at the ASP vendor site, and encompasses both technological constraints and organizational policy. Unauthorized secondary usage refers to the inappropriate use of stored information at the ASP vendor site. The usage is specific to external concerns over data disclosed to third parties other than those included in the contract. ASP models that protect against the unauthorized usage and the improper access of information will be more likely to positively influence adoption.

**H4a: Higher production costs** will positively influence ASP model adoption.

**H4b: High transaction costs** will negatively influence ASP model adoption.

**H4c: High supplier presence** will positively influence ASP model adoption.

In the last two decades, the healthcare industry has experienced rising costs with shrinking revenue streams, leading hospitals to search for effective cost management solutions. Research in information technology outsourcing has shown that a primary reason for using external providers is the potential for cost savings.

ASPs have been projected to reduce production costs (of maintaining patient information and medical systems) in pure monetary terms for factors such as hardware, software, and personnel costs. As a nascent outsourcing model, ASP contractual agreements are still evolving to an industry standard. IT managers might be reluctant to enter into long-term contracts. The viability of the ASP model may dissuade potential adopters. The transaction costs involved in negotiating an ASP contract were hypothesized to negatively influence the adoption of the ASP model. Supplier presence reflects the paucity of available vendors in the marketplace. The availability of reputable and trustworthy external IT service providers in the market can also be a concern to hospitals seeking to adopt ASPs.

**H5a: High asset specificity** will positively influence ASP model adoption.

**H5b: Resource availability** (an abundance of capital-intensive resources) will positively influence ASP model adoption.

Asset specificity refers to the uniqueness and specificity of an organization’s information technology applications and assets. The level of investment in specialized equipment or the skills required to yield value from an asset can influence its adoption. ASPs may have the greatest potential for organizations that are logistically or geographically disparate and/or administratively complex.

The recent consolidations in the turbu-
lent hospital industry have created merged systems that contain redundant, legacy systems. Organizations with high asset specificity will seek to reduce their reliance on legacy systems and multiple platforms. ASPs will benefit from the need to streamline operations. Similarly, organizations with high resource availability may choose to investigate the ASP model through use of slack resources. When excess resources are available to the hospital, they will be more likely to adopt an ASP. The level of investment in specialized equipment or the skills required to yield value from an asset can influence its adoption. Thus, the abundance of capital resources will allow organizations to investigate new technology.

**H6a: Reliability of the ASP system** will positively influence ASP model adoption.

**H6b: Customizability of the ASP system** will positively influence ASP model adoption.

**H6c: Magnitude of potential loss** (risk aversion of the hospital) will negatively influence ASP model adoption.

Researchers have posited that users who perceive an innovation positively with regard to relative advantage over existing systems will be more likely to adopt that innovation; relative advantage is in part a function of reliability and customizability. Reliability refers to the dependability of the technology systems used by the ASP. Customizability refers to the ability of the technology systems used by the ASP to conform to specific needs of the user applications. The potential impact of the failure of the innovation post-adoption will significantly lower the attractiveness of the ASP model. Those seeking to lower the magnitude of potential loss (risk averse) will seek to adopt proven technologies; the nascent nature of the model will reduce adoption behavior.

**H7: Strategic align.goals** will positively influence ASP model adoption.

Strategic alignment (goals) refers to the presence of organizational commitment to the importance of IT efforts. Strategic planning effectiveness is dependent on the internal co-alignment of various dimensions. The alignment of the ASP goals with those of the organization is important for success. Information sharing between the partners can create strategic competitive advantages and lead to synergistic relationships. The introduction of new technologies and processes within an organization signifies that management is committed to the adoption of innovations.

**Methodology**

A survey was developed based on innovation adoption and outsourcing literature; content validity was established by the use of previously validated variables and individual interviews with IT professionals in the hospital industry. A pilot test was conducted using a sample of 84 IT professionals resulting in 29 usable responses. The internal consistency (Cronbach’s alpha) for the pilot data was calculated with results ranging from 0.5903 to 0.9407. Cronbach’s alpha for survey data ranged from 0.6818 to 0.9521. Factor analysis was used to verify discriminant validity; items with a factor rating below 0.5 were dropped. In collaboration with the Healthcare Information and Management Systems Society (HIMSS), the final survey was distributed to 3,500 identified IT hospital executives (CEO, CIO, IT director) with the option to complete a Web survey (overall response rate 6 percent).

**Dependent and Control Variables**

Prior researchers have developed multiple-stage models to capture adoption. We used an adjusted seven-stage adoption model. This model was selected because all instances where the model would likely be adopted needed...
to be captured, even though the model may not have been yet contracted for or implemented in the organization, allowing inclusion of different adoption stages (awareness, interest, evaluation, trial and reject, commitment, limited deployment, or general deployment).

With respect to control variables, organizational size has been linked to adoption behavior. Size promotes adoption due to resources, up to a point where diminishing returns set in. Alternately, the larger the size the more likely any change would disrupt the structure of the organization, creating disincentives for change. Thus, size was applied as a control variable and measured using the number of licensed beds reported.

Results

There were 223 total surveys returned (50 with multiple variables missing data were eventually dropped). Of the 173 remaining, 84 surveys had indicated that they were aware of ASPs but were non-adopters and had stopped completing the survey at that point. In summary, we had 120 non-adopters and 53 adopters. Excluding incomplete surveys, we had 36 non-adopters and 53 adopters. Due to the relatively small sample size (usable completed surveys, n=89), the results were analyzed using partial least squares (PLS) analysis under PLSGRAPH (version 3.00). PLS is appropriate due to the minimal demands on sample size and measurement scales, and is frequently used in exploratory analysis to suggest relationships. It also allows for optimal empirical assessment of the theoretical model. PLS is also suited to exploratory models without theory grounding where explaining the relationships among a set of constructs is desired.

The overall model (figure 1a. ASP Construct Loadings) encompassing the continuous variables (R2=0.533) showed that all the four constructs were significant. The influence of cost management and that of relative advantage persisted. On the variable loadings model (figure 1b. Variable Loadings), environmental competition (0.339, p<0.001) and the magnitude of potential loss (0.298, p<0.001) were highly significant (p<0.001) and positively affected adoption while transaction costs (-0.308, p<0.01) negatively influenced cost management and adoption. Vendor trust (0.222), unauthorized secondary usage (0.256), and strategic alignment (0.196) were also significant (p<0.05).

The R-Square and the factor loadings do not relate to how well the latent variables or item measures are predicted; the algorithm takes the model as true and attempts to find the best parameter estimates; standardized paths should be around 0.200 and ideally above 0.300 to be meaningful. While other control variables for size were investigated (annual gross revenue, total FTEs, IT FTEs, number of licensed beds), they correlated significantly with each other but not with adoption measures. The number of licensed beds was chosen in the PLS model.

Significance of Results and Relevance to Management

No support was shown for regulatory (HIPAA) impacts on adoption. Organizations could have been investigating internal processes prior to looking at new technology models. HIPAA readiness could also have been preliminary in most organizations during the survey period. Lack of support for improper access could imply that hospitals assume that access issues are not a primary concern as much as vendor trust is, and that access protections are implied in the contracts.

The strong support for the magnitude of potential loss was expected, but the direction was found to be opposite from predicted. Those with high risk aversion were predicted to not adopt ASPs. The
positive response could suggest that these organizations had previously investigated ASPs and were currently using them, lowering risk aversion. Organizations could also have more confidence in the ASPs than their own IT staff/capabilities.

Commitment to the nascent model is clouded by financial uncertainty and questions of cost benefits. IT outsourcing has implications for patient confidentiality. However, the relative newness of the ASP model and the inherent risks of outsourcing patient information did not significantly deter healthcare organizations from adopting an ASP. Additionally, the HIPAA regulations are forcing organizations to re-examine their IT functions and investigate new and better ways of doing things.

The final analysis of ASP adoption in healthcare is still evolving as ASP providers themselves transform to meet new demands. Hospitals are continuing to be plagued by financial crises, federal and state cutbacks, and post-9/11 funding shortfalls, the result being that the adoption of the ASP model has settled to a cautious, incremental approach. Hospitals should investigate the ASP model in context with other options to select the most cost-effective approach.

Even though the nature of the healthcare environment has become very competitive, adoption of ASP to reduce costs and improve operations needs to be an incremental process that evaluates the transaction costs (contract negotiations) and the effect on the organization should the ASP system fail once adopted. In contrast, ASP providers need to promote the benefits of their businesses, as many respondents were aware of the model but have not yet seen the impetus for change. ASP vendors need to tap into the regulatory conundrums faced by hospital executives and design solutions that reduce uncertainty.

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