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Impact of standards adoption on healthcare transaction performance: The case of HIPAA

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ABSTRACT

The Health Insurance Portability and Accountability Act (HIPAA) is a standard for the healthcare industry mandating, in part, use of the EDI X12 protocol set for data exchanges among industry members. The motivation underlying this change was the view that lack of a standard format for healthcare data created significant inefficiencies, resulting in increased costs within the industry. With regulators' supposition that the standard would improve data exchange performance, we set out to determine the actual performance implications of HIPAA.

Using data on transactions occurring over 106 months from 1998 to 2004, we study the impact of the HIPAA standardization requirement on transaction performance in the form of transaction delivery time and transaction quality measured as percentage errors. Performance is expected to deteriorate immediately following HIPAA compliance, due to system disruption, before a longer-term trend toward improved performance. Transaction performance immediately following HIPAA compliance shows deterioration in transaction delivery time, as expected, but a surprising improvement in transaction quality. The longer-term trends associated with HIPAA compliance for both transaction quality and transaction delivery time show that both are trending toward improvement. However, when we compare performance three, six, and 12 months before and after HIPAA compliance, we find that neither delivery time nor quality has improved. The implications for practice and theory are discussed.

1. Introduction

Healthcare is a highly regulated industry in which numerous standards are endorsed and mandated (Menon et al., 2000). Technology standards are a subset of the numerous classes of standards used in the industry. The primary goal of technology standards is to improve information flow both intra-organizationally, among areas within healthcare provider entities, as well as inter-organizationally, between various participants in the healthcare supply chain (Premkumar and Ramamurthy, 1995). The desired outcome of improved information handling performance includes reducing costs and increasing productivity. However, there is little evidence as to how much, if any, performance improvement the healthcare industry has gained due to technology standards and their requisite information technologies (Chaudhry et al., 2006).

In this study, we examine the specific case of the Health Insurance Portability and Accountability Act (HIPAA), mandated by the U.S. federal government. We study the short- and long-term impact of this standard's adoption on the performance of transactions between payers (insurers) and medical service providers (hospitals, etc.). Specifically, we measure the impact of HIPAA compliance on inter-organizational transaction delivery time and transaction quality. This is the first empirical study (to our knowledge) investigating HIPAA's impact on transaction delivery time and quality using objective data.

Adopting new standards requires participants to change the nature of task specifications, task processes, and metrics (Venkatesh, 2006; Bendoly et al., 2007). Typically, in adoption of voluntary standards, the firm weighs the relative advantage over and compatibility with existing processes and metrics, as well as the complexity, trialability, and observability of the standard as an innovation (Rogers, 1996, p.16). In contrast, legislated standards, as in the case of HIPAA, are forced upon adopters regardless of the potential benefits of the adoption. This raises questions as to the ultimate value of the implementation. Although this study investigates a healthcare industry standard, our findings may generalize to other settings and industries in which mandatory standards are implemented.

In particular, this study serves two practical purposes. First, our analysis provides current industry administrators with valuable

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insight regarding adoption and implementation processes of mandatory standards. The results can inform their judgment in decisions related to monitoring and managing performance both prior to and following implementation (Venkatesh, 2006). Second, this study can aid administrators and regulators in planning future industry standards. Discerning the timing and magnitude of performance effects of mandatory standard compliance can guide these parties in two ways. The large-sample analysis reported here should help to create realistic expectations among industry and regulatory bodies related to the adoption of mandatory standards, and secondarily, aid these bodies in developing strategies to counteract the predictable performance effects of such standards implementation.

This study contributes to the management literature by documenting the performance effects of a mandatory standard. The study results show that adoption of the HIPAA standard is associated with significant immediate (short-term) effects on transaction performance, specifically improvement in quality (percentage errors decrease) and degradation of delivery time (delivery time increases). In the longer-term, both performance measures show trending improvement, i.e., delivery time and percentage errors both decrease. However, there is no evidence that HIPAA is associated with an overall improvement in transaction delivery time or quality when performance is compared across three pre- and post-compliance time windows.

The remainder of the paper is organized as follows. We first establish the practical and theoretical foundations for the study model, hypothesizing HIPAA's immediate and trending relationships with performance as well as the pre- and post-implementation performance. We empirically test the research hypotheses using panel transaction data from a healthcare industry clearinghouse. We conclude the paper by drawing conclusions for both the research and practitioner communities.

2. Background and hypotheses development

Standardization is a key feature of modernization and plays an important role in determining the evolution of processes in organizational and inter-organizational contexts (Hanseth et al., 2006). The standards underlying electronic data interchange (EDI) systems used for inter-organizational exchanges in supply chains have been adopted in a variety of industries beginning in the 1970s (Zhu et al., 2006). While voluntary adoption and diffusion of standards such as EDI have been well examined by the research community, the impact of legislatively mandated standards on system-level performance has received little attention (Kaufmann et al., 2000).

Firms in the healthcare industry – both providers and payers – have been among the earliest adopters of interorganizational systems to streamline business transactions (Southard et al., 2000). By the late 1990s, most had electronic platforms and utilized electronic transactions for billing and payment processing. These systems, while challenging to implement, have stabilized over time and help payers and payees manage the increased complexity of claims and payments that occurred in the 1990s. During this period, industrywide spending on information technologies was over $16B. Capital expenditure on IT in healthcare organizations amounted to between 5 and 7 percent of revenues (Southard et al., 2000).

When President Clinton signed the federal HIPAA legislation on August 26, 1996, there were three main objectives: (i) issue privacy regulations to protect individually identifiable health information; (ii) standardize all electronic transactions and security; and (iii) implement security standards for protection of electronic health information (Phelan, 2002; Simkin and Yamamura, 2003). While there are numerous qualitative papers discussing the relationship between HIPAA and either privacy regulations or security standards, there are almost no papers analyzing quantitative data. Our literature review identified only one empirical paper focusing on institutional and market forces that impact HIPAA compliance (Appari et al., 2009). Regarding the impact of HIPAA on transaction standardization, the existing literature consists primarily of articles in trade journals focusing on the goals and potential effects of the standard (DeGrand, 2001; Simkin and Yamamura, 2003), potential problems of implementation (Petaschnick, 2004a, 2004b), and the responsibilities of various parties in the supply chain for successful implementation (Phelan, 2002; Fusile et al., 2002; Petaschnick, 2003; McKinstry, 2003; Fedorowicz and Ray, 2004). We did not identify any large-sample empirical studies examining the impact of HIPAA on transaction performance, the focus of this paper.

Before the HIPAA standardization mandate, processes linking payers, clearinghouses, and providers used multiple data formats (proprietary, X12, or XML) as well as a variety of communication protocols (LU6, FTP, TCP/IP, HTTPS, or X25). HIPAA goals related to data exchange standardization were to supplant proprietary data formats with X12 standards and increase the efficiency and accuracy of the information exchange between payers and providers. Ultimately, these changes were aimed at reducing transaction costs within the healthcare supply chain. The final Transactions and Code Sets (TCS) Rule defining transaction format was published August 17, 2000 (Federal Register, 2000), and the compliance deadline for healthcare industry organizations was October 16, 2002 (October 16, 2003 for small health plans and organizations submitting a compliance extension plan). The final rule established national electronic standards for the following healthcare transactions: claim information, referral, claim status, eligibility, enrollment, payment, coordination of benefits, and premium payments (Robinson, 2001).

Due to the challenge of meeting the resource requirements (hardware, software, process redesign, training, etc.), many providers achieved HIPAA compliance by contracting with clearinghouses (Phelan, 2002). Thus, these healthcare providers avoided redesigning their systems to meet the new standard. Clearinghouses helped providers achieve compliance by using format translators that translate the output of firms' existing systems into the required X12 format. They provide and manage middleware to "translate" the various data formats used in transactions between providers and payers. HIPAA enforced compliance by clearinghouses and payers with penalties up to $250,000 annually for multiple incidents of noncompliance and prison terms of up to 10 years for any criminal violation of the law (Phelan, 2002). The information processing requirements necessary to comply with HIPAA regulations were expected to enhance business operations, improve cash flow, and decrease transaction costs for medical service providers, payers (insurers), clearinghouses, and their business partners (DeGrand, 2001). Clearinghouses became key facilitators in helping healthcare providers with limited resources achieve HIPAA compliance (Fig. 1).

In contexts in which firms have operational systems in place, the adoption of HIPAA standards for electronic interactions involves changes to both information systems and current processes, increasing risk in several ways. In the short-term, the effect of complex changes can be disruptive and impair the performance of organizational processes. Changes to operational systems are fraught with problems as information systems have inherently lower levels of reliability during their early phases. This performance degradation due to disruptions is observed in hospitals following implementation of computerized physician order entry systems (Han et al., 2005). In the longer-term, organizations often find that when stable systems are altered, there may be new sources of inefficiency and variability that arise, and thus, overall system performance improvement may be delayed (Hanseth and Braa, 2001). Together, the immediate