Information & Management 53 (2016) 570–580

Contents lists available at ScienceDirect

Information & Management

journal homepage: www.elsevier.com/locate/im

Applying institutional theory to the adoption of electronic health records in the U.S.

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ARTICLE INFO

Article history:
Received 22 January 2015
Received in revised form 13 January 2016
Accepted 17 January 2016
Available online 23 January 2016

Keywords:
Institutional theory
Electronic health records
IT adoption
Mimetic
Normative
Coercive

ABSTRACT

This study uses institutional theory to explain adoption of electronic health records (EHRs) in ambulatory medical practices in the U.S. Health care is a highly institutionalized industry, subject to multiple regulatory forces, high levels of professionalism, and growing network externalities that can influence adoption decisions. We found that mimetic forces were more critical predictors when there was greater uncertainty, coercive forces were significant predictors after the U.S. government established incentives, and normative forces have continually influenced adoption. This study demonstrates the impact of the institutional effect of government policies and industry norms on adoption of critical technologies.

1. Introduction

The U.S. health-care industry has lagged behind other industries in its adoption of information technology (IT) in the workplace [92], particularly for clinical record systems. Electronic health records (EHRs) have long been hyped as a critical factor for decreasing health-care costs and improving health-care quality, by enabling clinical analytics using "big data." The Institute of Medicine's 2002 report "Crossing the Quality Chasm" identified health IT as one of four critical forces that could significantly improve health-care quality [51]. Nevertheless, the adoption of EHRs in the U.S. was slow: <15% of U.S. physician offices used any type of EHR system in 2005 [30], even as studies were predicting significant efficiency and safety savings [45]. It was not until after the passage of the HITECH Act in 2009 through which the U.S. government created financial incentives and penalties associated with EHR adoption (or lack thereof) that adoption increased. By 2012, 72% of the U.S. physicians had adopted some type of EHR system [73].

The diffusion of EHRs across the health-care industry provides an opportunity to investigate technology adoption decisions within a highly institutionalized and regulated industry with a high level of professionalism. A unique aspect of EHR adoption is that the benefits do not accrue primarily to the adopters, nor are they shared primarily with suppliers and customers. The physicians and staff who adopt EHR systems traditionally have not received most of the benefits even though their opinions significantly influence the likelihood of adoption, and they bear the burden of reengineering their business processes to accommodate the new technology [8]. However, this is changing to some extent as providers begin to receive incentives/penalties from the U.S. government under the HITECH Act. The payers of health-care services, who are public and private insurers and employers, are often the primary beneficiaries of EHR-related efficiency gains or patient safety and quality improvements because these advancements typically lower health-care costs and improve access to care [70]. The customers, or patients, have traditionally not directly witnessed the benefits, but this may change in the future as more patients gain access to their records through patient portals. This contrasts with adoption decisions in other industries, where, for example, a business that adopts an enterprise resource planning (ERP) system expects to be the prime beneficiary of the quality and cost improvements. When adopting interorganizational systems in a supply chain, it is often expected that suppliers

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http://dx.doi.org/10.1016/j.im.2016.01.002
0378-7206/

(and/or customers) will share the benefits. The complexity of the health-care industry, with the separation of payers and customers, adds a unique element to the adoption decision, particularly from an institutional standpoint, as the payers are not direct suppliers or customers of the services.

The health-care industry is also highly institutionalized, in terms of regulatory oversight and professional roles, and also operationally and technically complex [82]. The impact of the government financial incentives distributed through Medicare and Medicaid is unique to this industry. In addition, ambulatory medical practices are embedded in various institutional networks that may influence adoption. Physicians have a high level of professionalism and they often affiliate within their own specialties via professional training and participation in specialty-focused organizations. Successful adoption of EHRs by others within their own specialties may sway their decisions, particularly if they are uncertain about individual benefits. As regional networks adopt EHRs and begin to share information among hospitals, pharmacies, and other health-care providers, it is expected that independent physician practices experience pressure to participate. There have been numerous studies on both individual and organizational factors that affect technology adoption [74,99], but due to the reasons discussed above, their application to health-care IT has generated mixed results [46].

Given the strength of the institutional forces and the uniqueness of this industry, our study views adoption as an institutional effect and aims to explain how institutional forces affect adoption of EHRs in ambulatory physician practices. External institutional forces are critical, especially as EHR systems are required to interoperate with others to be eligible for government subsidies and to avoid regulatory penalties. We focus on the important forces and also the way they drive adoption of EHRs. Our approach addresses the call for more information systems (IS) research using institutional theory [19] and, in particular, the need to recognize the unique aspects of the health-care industry [15]. This study is an empirical assessment and extension of Ref. [83].

We show that mimetic forces were more critical in predicting EHR adoption prior to the passage of the HITECH Act, particularly when there was more uncertainty about the benefits from these systems. Coercive forces, particularly revenue from Medicare and Medicaid, were significant predictors of EHR adoption after the HITECH Act. However, even after the HITECH Act, normative forces continue to play an important role in predicting EHR adoption, especially given the potential for network externalities within health networks or through health information exchanges.

2. Background

2.1. Adoption of EHRs in the United States

EHRs act as repositories of information on patient attributes and improve communication across groups of service providers. The most basic functionality of an EHR system is the ability to electronically store clinical information documented at patient encounters such as ambulatory office visits. In the ambulatory setting, physicians typically enter information into the EHR during the patient interview. It is easier to retrieve electronic records than paper records, and they are less expensive to back up and secure. EHRs also have a multitude of more advanced capabilities. In particular, they can be used to transmit orders for laboratory and diagnostic tests; issue prescriptions; and both transmit and receive information from other care providers at inpatient or outpatient facilities. They can also contain clinical decision support tools and can be used to facilitate the reporting of quality and cost metrics. As more information is captured digitally, these "big data" can be analyzed to detect population health patterns and trends. A system that lacks the ability to exchange information is now typically referred to as an electronic medical record (EMR) system, whereas a system that conforms to the interoperability standards and can be managed across more than one organization is now referred to as an EHR system [3].

The U.S. has lagged as much as a dozen years behind other industrialized countries in health information technology (HIT) adoption, particularly as other governments took an earlier role in establishing adoption protocols and standards and health insurers and/or government taxes in these countries paid most of the cost [4,7,14,89]. In 2008, a national survey of almost 3000 U.S. physicians reported that only 13% of physicians had a basic electronic record system and only 4% had a fully functional system with some interoperation for prescriptions and images [27].[2] U.S. providers tend to respond negatively to clinical reporting mandates, particularly compared to their international counterparts [31], but the biggest barrier in the first decade of the century was financial reimbursement as physicians paid for the EHRs, but most of the benefits accrued to payers and purchasers. Other barriers included lack of interoperability, low risk tolerance, time concerns, fears about privacy, system maintenance, and the number and transience of vendors [7].

In February 2009, the U.S. government began to take a more active role by signing into law the HITECH provisions of the American Recovery and Reinvestment Act (ARRA). The HITECH provisions established a process for benchmarking or making meaningful use of specific health record functions. Meaningful use means that providers must show they are using certified EHR technology in ways that can be measured significantly in quality and in quantity. The incentive programs were implemented in three stages, each with their own goals and priorities. In each stage, there is a core set of requirements as well as a list of menu requirements. Stage 2 requirements began on January 2014 and focus more on information exchange and patient engagement as well as increasing compliance thresholds, compared to stage 1 requirements. Stage 3, released in March 2015, focuses on some of the more difficult aspects of stage 2 and requires providers to greatly improve their adoption and care delivery by 2018.

The HITECH Act made substantial financial incentives available to providers. Physicians who contract with Medicare can now receive up to $44,000 each in higher reimbursements over 5 years if they adopt certified EHR systems that are "meaningfully used." Furthermore, physicians who fail to adopt any meaningfully used certified EHR systems would experience Medicare payment reductions beginning in 2015.[3] Physicians who serve at least 30% Medicaid patients (20% for pediatricians) or work in a Federally Qualified Health Center (FQC) or Rural Health Center (RHC) with 30% needy patients can receive up to $63,750 over 6 years. While physicians and physician groups must choose to participate in either the Medicare or Medicaid incentive program, hospitals may participate in both incentive programs simultaneously (with payments apportioned based on the percentage of Medicare and Medicaid patients served).

Adoption rates have increased since the law was enacted. Between 2009 and 2012, the percentage of office-based physicians with basic EHRs almost doubled from 21% to 40%. The percentage

[2] Basic systems include patient information such as demographics, problem lists, medications, and clinical notes; orders for prescription; and viewing lab and imaging results. Fully functional systems also include patient notes with medical history and follow-up; orders for laboratory and radiology tests; sending prescriptions and orders electronically; returning electronic images; and clinical decision support.

[3] Medicare payments for noncompliant physicians will be reduced 1% per year between 2015 and 2017, and penalties will remain at 3% thereafter, assuming that at least 75% of eligible professionals are meaningful users. If, however, <75% of eligible professionals are meaningful users, Medicare payments will drop an additional 1% in 2018 and 2019, and penalties will remain at 5% thereafter.

with any EHR increased by 50% from 48% to 72% [73]. The highest relative increases were among physicians with historically low adoption levels, including older physicians and those working in solo practices or community health centers [49]. By 2013, 78% of office-based physicians had adopted some type of EHR, and 48% had the capabilities required for a basic EHR system. However, there have been persistent gaps in EHR adoption, with physicians in solo practices and non-primary care specialties and those aged >55 years lagging behind others [25]. In addition, psychologists, ophthalmologists, and dermatologists have lagged other specialties, perhaps because the software programs may not have had features that were valuable for some specialties [60].

Electronic health information exchange and patient engagement remain low in office settings [35], and benefits to individual physicians are still in question. In a study of community practices within the new Massachusetts eHealth Collaborative, only a fraction of physician practices showed a positive 5-year return on investment, even after accounting for the value of the government incentives [1]. In a study of small physician practices in New York, quality of care improved slightly, but only after sustained technical assistance [79]. Some providers may forego government incentive payments, waiting for more progress and stability in EHR capabilities, and greater simplicity in installation and maintenance, to minimize their total costs [34].

2.2. Technology adoption

The technology acceptance model (TAM) and the unified theory of technology acceptance (UTAUT) [24,100], widely applied in many industries, have been used to explain individual physician adoption of HIT, including health records [9,44,50,52,53,68,91,95,101,102], but with mixed results [46]. "The majority of academic research in IT adoption in health care has focused on the individual level." (Ref. [12], page 226). While certain TAM relationships are consistently significant, others, particularly the role of perceived ease of use in predicting adoption, have been much more inconsistent. This has been attributed to the complexity of health care's socio-technical systems, differences between health-care users and users in other industries, and the uniqueness of the health-care context [46].

While the technology adoption model is at the individual level, we study the adoption of EHR at the organization level, the ambulatory practice. A committee, not a single individual, often makes the EHR adoption decision. Even for small offices, adoption requires participation not only of physicians but also of nurses, medical assistants, the office manager, and other administrative staff [23]. Furthermore, these systems may require information sharing across multiple organizations; therefore, others outside the practice may influence adoption decisions. Thus, the environment is expected to have a strong influence on adoption.

There have been fewer studies of HIT adoption at the social level compared to the individual level [88]. At the firm level, technology adoption theories have included not just organizational factors but also environmental characteristics [74,105], typically drawing upon the diffusion of innovation theory [78] or the TOE (technology, organization, and environment) framework [78,93,98]. While the use of institutional theory in IS research is sparse compared to other fields such as organization science [103], several studies have taken an institutional approach to adoption of technology applications to explicitly consider the institutional forces that are crucial to shaping organizational actions and the opinions of the decision makers [74,93].

Technology adoption is a process; it is a sequence of activities that lead to the initial acquisition and subsequent usage of an IT innovation [58]. Several specific definitions of EHRs have evolved based upon how the records are used, including basic EHRs and fully functional systems [27] or meaningfully used systems (healthIT.gov). Studies have reported adoption rates for different types of uses. For example, in 2011, one study reported that approximately 60% of office-based physicians had "any" EMR/EHR; a little over one-third had a basic EMR; and only 11% had the ten capabilities necessary to support the first stage of the core meaningful use objectives [48]. The focus of our study is on the adoption of any EHR system, either all or partially electronic. Adoption is the culmination of a process of becoming aware of the technology and making a series of decisions that end in making that technology available for use. We expect that the adoption of any system, whether partially or fully electronic, is fundamental in moving toward the more specific types of uses that have been defined.

2.3. Institutional theory

Institutional theory posits that an institution's environment can strongly influence the development of structures in an organization, often more than market pressures [29]. The institutional environment encompasses the cultural belief systems, normative frameworks, and regulatory systems that provide meaning and stability to an industrial sector [82]. Institutional environments may endogenously influence organizations through the "archetypes they develop for actors, the logics they legitimate, and the governance systems and rules of social action they support" (Ref. [82], page 166). Organizational decisions are not driven purely by rational goals of efficiency but also by social and cultural factors and concerns for legitimacy [39,75]. Social contagion has been shown to influence behavior [10,36], including that of physicians [5,16].

Institutional effects are dispersed through mimetic, normative, and coercive isomorphism. Isomorphism is a constraining process that forces one unit in a population to resemble other units that face the same set of environmental conditions. Mimetic isomorphism is the copying of another similar organization's behavior. Normative isomorphism is learning from others in professional networks. Coercive isomorphism results from pressures that are exerted either formally or informally by other organizations upon which one is dependent. These institutional forces can influence organizational structure, climate, and behavioral focus [29].

"Institutional theory offers a conceptually rich source to observe the non-linear (as opposed to linear) routes of information technology adoption and assimilation across markets and organizations." [19]. Decision making under conditions of uncertainty is often influenced by subtle social processes – coercive, normative, and mimetic [37]. The institutional forces model has been applied to explain adoption of technologies including ERP and enterprise applications [62,85,97], e-commerce and supply chains [39,55,87,94], and financial data interchange [90]. It has also been applied to the adoption of accounting standards [17,57] and HIPAA (Health Insurance Portability and Accountability) compliance [6]. Table 1 summarizes how some of the key IT adoption studies based upon institutional theory have measured these forces. For more detail on the sources of institutional forces within the general IS literature, see the study by Mignerat and Rivard [71].

Health care provides opportunities to refine IS theory because of its unique institutional context [15]. Organizations in highly institutionalized industries such as health care face particularly high barriers to change [82], and as a result, health care's institutional environment is crucial to shaping health-care organizations' structure and actions [80]. Institutional theory has been used to explain EHR adoption in several countries having different health-care systems and institutions compared to the U.S. For example, research by Currie [20,21] shows that institutional forces both drove and inhibited EHR adoption in the UK National Health Service. Jensen et al. show that institutional theory, along with sense-making theory, provides an interpretative perspective

Table 1
Measures of mimetic, normative, and coercive forces in the IT adoption literature.

Reference	Adoption context	Mimetic	Normative	Coercive
[39]	E-commerce	External pressure from competitors	External pressure from customer; Trading demands	External pressure from parent corporations; Government promotion; Legislation barriers
[62]	ERP systems	Perceived success of competitive adopters	Extent to which members of dyadic relational channels have adopted ERP; Extent to which government and industry agencies promote use of ERP	Extent of formal and informal pressures perceived from local government, industry associations, and competitive conditions
[55]	E-business	Prior adoption by other organizations in the same industry	Presence of a senior IS executive	Prior adoption by larger strategic organizations
[94]	RFID by suppliers	Competitors' actions; Other supplier and industry association practices	Cooperation trend; Contractual sharing norm; Public pressure; Government policy	Negative sanctions; Favorable terms; Customer refusal to deal; Promotional assistance
[87]	B2B e-marketplaces	Adoption among competitors; Perceived success of competitor adopters	Adoption among suppliers; Participation in professional and trade associations	Perceived dominance of supplier adopters
[90]	Interorganizational linkages for FEDI (financial electronic data interchange)	Extent of adoption by competitors; Perceived success of adoption by competitors	Extent of adoption by organization's suppliers and customers; Participation in professional, trade, and business bodies that promote and disseminate information on FEDI adoption	Perceived dominance of supplier adopters; Perceived dominance of customer adopters; Conformity with parent corporation's practices
[6]	HIPAA compliance	State level compliance base	External consultants	State level privacy regulatory pressure

on the implementation of an electronic patient record system in a hospital ward in Denmark [54]. We likewise expect institutional forces to influence adoption decisions by U.S. physicians and staff in both small and large ambulatory practices. Due to the unique and highly institutionalized health-care environment in the U.S., we therefore focus on EHR adoption as an isomorphic institutional change that leads to the decision to acquire and make available electronic records for use in ambulatory practices.

3. Using institutional theory to explain adoption of EHRs

U.S. health care is highly institutionalized, with a high level of professionalism and regulation. We thus expect that isomorphic forces will drive organizational decision-making processes and, in particular, the decision to adopt EHRs. We summarize here how institutional theory can help explain the adoption of EHRs in order to provide support for the hypotheses that we test in this paper. For more details on the theoretical foundation, please see Sherer's study [83].

Physician ambulatory practices are embedded within several institutional networks. First, there is a strong professional network [33], which is supported via professional organizations, journals, and referral networks. Physicians are thus subject to mimicry of successful others within their specialty. Second, health care is typically delivered regionally. Regional networks can exert normative pressures, especially as others within a region begin to share patient information with other providers, including hospitals, nursing homes, laboratories, pharmacies, and consulting specialists. In addition to mimetic and normative forces exerted through networks, physicians became subject to coercive forces after payers of health-care services, such as Medicare and Medicaid, began to provide adoption incentives for EHRs. Due to the presence of all three external forces from institutional theory on physician behavior (mimetic, normative, and coercive, described in detail later), we believe that institutional theory is a useful framework for analyzing EHR adoption.

3.1. Mimetic forces

Mimetic isomorphism refers to the tendency of an organization to imitate another similar organization. This happens particularly when an organization's goals or means of achieving these goals are unclear. Mimicking another organization perceived as legitimate becomes a "safe" way to proceed [29]. Imitation can be information or rivalry based [63]. Decisions to engage in a particular behavior depend on the perceived number of similar organizations in the environment that have already done likewise and if enough similar organizations do things in a certain way, it legitimizes that course of action and others follow suit to avoid embarrassment [43,66,90]. One way that managers learn about options and strategies that they might adopt is by tapping into networks [41]. The social contagion literature documents how ideas, information, and technologies spread throughout a population via social networks [78].

By mimicking others, organizations join an IT innovation assimilation bandwagon generated by prior adopters, justifying their decisions with the consensus of the "herd" [104]. By imitating actions of successful and high status actors, they economize on search costs and minimize experimentation costs [84,90], particularly when it is difficult to quantity the benefits [97]. When technologies are poorly understood, goals are ambiguous, or the environment creates uncertainty, organizations mimic those that are perceived to be legitimate or successful [29].

U.S. physicians have historically faced uncertainty regarding the value of adopting EHRs. They have been concerned about the functionality of the solutions [2]. Moreover, they have had to choose from many proprietary vendor offerings [65,72], which often did not interoperate with other systems, and they have been concerned with vendor viability and reliability. Moreover, financial outcomes remain uncertain, even after the institution of government incentives [1].

Professionalism in medicine has a strong tradition, although this is currently being challenged via management control and market mechanisms [22]. Medical professional organizations (MPOs) provide professional identity for each medical specialty [42], Through MPOs, physicians may transfer knowledge regarding successful EHR systems and the timing of adoption within a specialty via conferences, educational workshops, and publications. Second-mover advantages allow physicians to observe the systems that worked best for others in their specialty and the actions undertaken to insure successful implementation. Thus, we expect that MPOs serve as a focal point for peer influence and that

affiliation with a specific professional specialty exerts mimetic pressure, particularly due to the uncertainty facing providers in making the decision to adopt and use EHRs.

This leads to our first hypothesis:

H1. Physicians subject to higher mimetic forces will be more likely to adopt EHRs.

3.2. Normative forces

Normative forces are pressures to adopt techniques that are considered effective by the community. Organizations learn about innovations from adopters with whom they have direct or indirect ties [10]. Normative forces are stronger when a system integrates firms [97]. There is empirical evidence that pressures originate through suppliers and customers in the supply chain [59,90]. For example, normative pressures for ERP adoption have been contextualized as the strength of inter-organizational network adoption, measured by the extent of adoption by both customers and suppliers [62]. Further, when these pressures stem from trading partners in the supply chain, they encourage organizations to conform to specific standards that insure that information sharing is facilitated throughout the supply chain [64]. In the case of interactive technologies involving reciprocal interdependence and complementary innovations, the frequency of use among an organization's suppliers and customers may directly create positive externalities and increase the technical value of that innovation for the adopter [90].

Health-care resources in the U.S. are highly localized, with most Americans using services of nearby practices. They provide care locally within regional hospitals and other services including laboratories, pharmacies, nursing homes, and other care providers. If these local partners successfully implement an electronic record system, it is expected that independent physicians who admit to these hospitals or share information such as laboratory results or pharmacy orders will perceive greater value from adopting a system, and higher pressure to adopt a system that interoperates with the partner system. Even though EMRs can be used in isolation, greater health-care quality and lower costs accrue with collaboration and shared direct mediation [77]. While patient engagement with EHRs is currently low [35], we expect that as patients begin to use portals with some of their physicians, they may exert further pressures for other local physicians to adopt these systems. Decisions to engage in a particular behavior depend in part on the sheer number of others in the environment who have already done likewise [40,61]. As more organizations within a given geographical area adopt EHRs, they become a norm for operation in that area. Spatial proximity has been shown to influence hospital EHR adoption in certain parts of the U.S., particularly when population density is lower [5]. It is expected that adoption rates will increase, as the EHR becomes a norm in a region, leading to our second hypothesis:

H2. Physicians subject to higher normative forces will be more likely to adopt EHRs.

3.3. Coercive forces

Coercive forces are formal or informal pressures exerted by other organizations upon which they depend [29]. Coercive pressures are derived from resource-dominant organizations, regulatory bodies, and/or parent corporations. Dominant organizations controlling resources demand that dependent organizations adopt mechanisms that serve their interests, and resource-dependent organizations comply to secure their own survival [76]. There are two sources of coercive forces, competition and regulation [84], and the extent of coercion is partially a function of the power of the dominant actor.

Third-party payers of health-care services, such as private insurance companies and government programs, are a powerful and dominant force controlling physician resources because they set or negotiate reimbursement rates. When physicians are financially dependent on Medicare and Medicaid reimbursements, the U.S. government's stance on EHRs acts in a coercive way on the physicians. The percentage of U.S. residents covered by government insurance rose from 24.5% in 1999 to 32.6% in 2012, thus increasing reliance of physicians on public insurance payments [26,96]. Therefore, more physicians are not only eligible for the incentive payments instituted under the HITECH Act, but they are affected to a larger extent by the Act's future payment penalties. These penalties are significant and represent the major coercive force on physician behavior.

Prior to the passage of HITECH Act, we believe that coercive forces were minimal. In fact, a 2005 study found no relationship between payer mix and adoption of EHRs [11,69].

In general, private payers do not require adoption of EHR systems; hence, we model the coercive forces for EHR adoption as the incentives and payment penalties instituted under the HITECH Act. As a corollary, physicians who rely more on Medicare or Medicaid will be more inclined to adopt EHRs than those who rely more on private insurance. When a private payer does require EHR adoption, it is typically because the payer is a staff model HMO network and, as a result, the direct employer of physicians. In this case, the HMO's decision to adopt an EHR system can be viewed as the result of the mimetic, normative, or coercive forces acting at the HMO level. HMOs have always been more likely to participate in EHRs, given that they receive revenue from capitation payments that may provide stronger incentives to minimize costs in a given time period [11]. We do control for the ownership of practices in our empirical models.

It is possible that competition could be a coercive force, with an increased EHR adoption if patients or private insurance providers had preferences for physician practices with EHRs. However, there is little empirical evidence that this is the case, although we do control for the level of competition across practices in our empirical models. This leads to our third hypothesis, which we model with the coercive forces created by the HITECH Act:

H3. After passage of the HITECH Act, physicians subject to higher coercive forces will be more likely to adopt EHRs.

4. Data and empirical analysis

We model the decision to adopt an EHR system as a function of coercive, normative, and mimetic forces. As the strength of these forces has changed over time, we use two sources of data that span the period of rapid EHR adoption. The first dataset is the 2008 Health Tracking Physician Survey, which is a nationally representative survey of U.S. physicians providing at least 20 h/week of direct patient care. Approximately 4700 physicians remitted surveys through the mail between February and October 2008 that contained information on demographic and practice characteristics as well as the use of IT. Data collection was implemented by the Center for Studying Health Systems Change [13] and funded by the Robert Wood Johnson Foundation. We obtained access to these data through the Interuniversity Consortium for Political and Social Research.[4]

Our second data source is the 2012 National Electronic Health Records Survey, which was added as a mail-in supplement to the

[4] http://doi.org/10.3886/ICPSR27202.v1.

nationally representative National Ambulatory Medical Care Survey administered by the National Center for Health Statistics (NCHS). The survey was administered to non-federal-employed office-based physicians who were primarily engaged in direct patient care, and contains approximately 4500 respondents.[5] We received permission to access these restricted-use data at the NCHS Research Data Center in Hyattsville, MD.

Both surveys distinguish between partial and full adoption of electronic record systems, but they use a slightly different terminology. In the 2012 survey, *partial* adoption indicates the use of a system that is partially electronic and partially paper based, which is referred to as an EMR whereas *full*, or complete, adoption of a fully electronic system is referred to as the adoption of an EHR. The 2008 survey also uses the term EMR to refer to systems that are only partially electronic, but it also describes fully electronic systems as EMRs. Part of the discrepancy is due to differences in nomenclature over time. For consistency, we refer to all systems as EHRs that providers may either partially or fully adopt, with the caveat that some of the full EHRs in the 2008 survey may not have the same level of interoperability as full EHRs described in the 2012 survey. In either case, however, we do not create finer characterizations of systems based on specific functionalities.

We assume that a physician's actual level of EHR use, Y^*, is unobserved, but can be measured along a continuum. Based on our theoretical framework,

$$Y^*_{ikr} = \beta_1' C_{ikr} + \beta_2' N_r + \beta_3' M_k + \beta_4' X_{ikr} + \varepsilon_{ikr}. \quad (1)$$

where i indicates physician, k indicates specialty, and r indicates hospital referral region (HRR). The 306 hospital referral regions defined by the Dartmouth Atlas Project represent regional healthcare markets for tertiary medical care requiring the services of a major referral center for cardiovascular or neurosurgery.[6]

C_{ikr} is a vector of variables measuring coercive forces on EHR adoption. We define these variables as the percentage of revenue from Medicare/Medicaid. The percentage revenue from these programs enables us to capture the major coercive force on the physicians, as the more financially dependent physicians are on these sources, the greater the degree of coercion. In addition, we recognize that ownership by a staff model HMO or hospital may also compel physicians to use an EHR, but as the HMO or hospital, not the physician practice, has made the adoption decision, we control for this variable rather than consider it a coercive force.

In order to qualify for incentive payments through the Medicaid program instituted under the HITECH Act, providers must have a minimum of 30% Medicaid patient volume (20% for pediatricians).[7] Our data do not include volume information by payer, only revenue by payer. We group providers into those with no Medicaid revenue, those with between 1% and 15% Medicaid revenue, and those with >15% Medicaid revenue and create indicator variables for these categories. As some physicians did not report their Medicaid revenue in 2012, we also create an indicator for missing Medicaid revenue. On average, Medicaid payments are approximately half the level of private insurance payments; hence, these cutoffs loosely correspond to the requisite patient volume levels imposed by the Center for Medicare and Medicaid Services (CMS) [38]. There are no patient volume requirements to receive incentives under the Medicare program; hence, we group providers into those with no Medicare revenue, those with between zero and 30% Medicare revenue and those with >30% Medicare revenue, and those who did not report their Medicare revenue in 2012 and create indicator variables for these categories. These cutoffs divide providers with positive Medicare revenue into similarly sized groups.

N_r in Eq. (1) is a vector of variables measuring normative forces on EHR adoption. We define these variables as the percentage of physicians in the same hospital referral region (HRR) that have either partially or fully adopted EHRs in their practices. The HRR is a geographic proxy for the potential for linkages to share data, which has been used within studies applying institutional theory to supply chains, measuring normative forces by the extent of adoption by suppliers and customers with which an organization shares information [39,62,87,90]. As health care is localized, more adoption within the same HRR would imply more opportunities for sharing information locally. Higher percentages of adoption within a region represent a move toward a norm to use EHRs for sharing and integrating information, which is a stronger force for adoption.

Likewise, M_k is a vector of variables measuring mimetic forces, which we define as the percentage of physicians in the same specialty that have either partially or fully adopted EHRs. There are 77 unique specialties in the 2008 sample and a more aggregated set of 14 specialties in 2012, both of which we grouped into five major specialty categories: (1) Primary Care, (2) OB & GYN, (3) Psychiatry, (4) Internal Medicine and ER, and (5) Other.[8] This measure is consistent with specifying mimetic forces as the extent of adoption by and perceived success of competitors in supply chains [39,62,87,90]. We expect that higher adoption by others in the same specialty is a function of successful information shared through conferences and journals within that specialty. While physicians in one location may not compete directly with others in their specialty in different locations, the high level of professionalism in this industry leads to a strong identity within practice specialties. A higher percentage of adopters within the specialty group is therefore a stronger force for adoption.

Finally, X_{ikr} in Eq. (1) represents a vector of other control variables associated with EHR adoption. These include indicators for the physician's age ($29 \leq \text{age} < 45$; $45 \leq \text{age} < 65$; $\text{age} \geq 65$); the number of physicians in the practice, and indicator variable for whether the number of physicians in the practice was not reported in 2008; indicators for practice ownership (solo/physician group, HMO, community health center, medical/academic center, hospital, other); and indicators for urban/rural status (large central metro, large fringe metro, median metro, small metro, micropolitan, and nonmetro). In order to control for competitive forces, we include a state- and specialty-specific Herfindahl index, which measures the size of a provider in terms of patient volume compared to other providers in the same state and specialty.[9] Higher levels of the index indicate lower competition and more market power for physicians. Finally, we include indicator variables for the U.S. census region and a continuous variable for state per capita income in order to control for differences in financial and institutional resources for EHR adoption across states.

Our observed variable measuring EHR adoption, Y_{iks} is categorical and maps to the latent variable as follows:

$$Y = \begin{cases} 1 & \text{if} \quad Y^* \leq \mu_1 \\ 2 & \text{if} \quad \mu_1 < Y^* \leq \mu_2 \\ 3 & \text{if} \quad Y^* > \mu_2 \end{cases}, \quad (2)$$

where $Y = 1$ indicates the physician does not use an EHR; $Y = 2$ indicates partial EHR adoption (part paper, part electronic);

[5] http://www.cdc.gov/nchs/ahcd.htm.

[6] http://www.dartmouthatlas.org/data/region/.

[7] Note that this requirement applies only to physicians and physician groups, not hospitals.

[8] The specialty categories in the 2012 sample are general/family practice, internal medicine, pediatrics, general surgery, obstetrics & gynecology, orthopedic surgery, cardiovascular diseases, dermatology, urology, psychiatry, neurology, ophthalmology, otolaryngology, and other specialties.

[9] Specifically, the Herfindahl index is the sum of squared ratios of physician–patient volume to total physician–patient volume within a given specialty and state.

and $Y = 3$ indicates full EHR adoption (fully electronic). Under the assumption that ε_{iks} follows a logit distribution, we estimate Eq. (2) using an ordered logit model.

5. Results

Descriptive statistics for our analysis variables, reported in Table 2, indicate that the percentage of adoption of full EHRs doubled between 2008 and 2012 from 24% to 51%. During this time period, the percentage without any EHR decreased from 49% to 28%, and that with partial EHRs decreased slightly from 27% to 21%. Our data show an increase in the percentage of physicians who do not receive any Medicare or Medicaid revenue, from 18% to 23% for Medicaid and 12% to 14% for Medicare.

Table 3 contains coefficient estimates from our ordered logit model of EHR adoption. The coefficients on the concentration of physicians adopting partial or full EHR within the same specialty, which measure mimetic forces, are positive and significant in 2008, but not in 2012, thus providing partial support for our first hypothesis: *Physicians subject to higher mimetic forces will be more likely to adopt EHRs.* The coefficients on the concentration of physicians adopting partial or full within the same HRR, which measure normative forces, are all positive and significant. This is consistent with our second hypothesis: *Physicians subject to higher normative forces will be more likely to adopt EHRs*. The coefficients on the Medicare revenue variables are both positive and significant in 2012. In 2008, the coefficient on Medicare revenue between 1% and 30% is only marginally significant and the coefficient on Medicare revenue >30% is not significant. The coefficients on Medicaid revenue are positive and significant in 2008 as is the coefficient on Medicaid revenue between 1% and 15% in 2012. Thus, we have partial support for our third hypothesis: *After passage of the HITECH Act, physicians subject to higher coercive forces will be more likely to adopt EHRs.* While the impact of the Medicare variables is consistent with this hypothesis, Medicaid revenue has a positive impact on full EHR adoption both pre- and post-HITECH.

We also find that age, practice type, and practice size are correlated with EHR adoption. Older physicians and smaller independent practices are less likely to adopt full EHRs. Organizations (as measured by physicians that work for these organizations) are more likely to adopt full EHRs compared to independent physicians or group practices. These results are fairly consistent over time. There is no statistical difference in the likelihood of EHR adoption between large central metro areas (the base category) and other types of smaller metropolitan and micropolitan areas. However, in 2012, practices in nonmetropolitan locations were less likely to adopt EHRs than those in large central metro areas. We do not find evidence that competitive forces significantly influence adoption, as both the Herfindahl index and per capita income are imprecisely estimated.

It is difficult to interpret the coefficients of an ordered logit because they only indicate the direction of the effect of a given variable on the highest and lowest ordered values. Therefore, in Table 4, we report the marginal effects of variables measuring mimetic, normative, and coercive forces on the probability of EHR adoption. In 2008, normative and mimetic forces exhibit a similarly sized impact on EHR adoption, with normative forces slightly higher. For example, a 10% increase in the number of physicians with full EHRs in the HRR increases the probability of full EHR adoption by 6.5 percentage points, or 27% relative to the mean level of full EHR adoption. A 10% increase in the percentage of physicians with full EHRs within a physician's specialty increases the probability of full EHR adoption by 4.5 percentage points, or 18%. Receiving positive revenue from Medicaid increases the probability of full EHR adoption between 16% and 19% relative to the mean, rivaling the impact of mimetic forces, but lower than the impact of normative forces. In 2012, normative forces remain important, but coercive forces rival their influence on full EHR adoption. Receiving positive revenue from Medicare increases the probability of full EHR adoption between 7 and 9 percentage points, or 13–18% relative to the mean, while a 10% increase in the

Table 2
Descriptive statistics.

Survey year	2008		2012	
Observations	4699		4512	
Variables	Mean	Standard deviation	Mean	Standard deviation
EHR usage				
No EHR (0/1)	0.486	0.500	0.278	0.448
Partial (0/1)	0.272	0.445	0.212	0.409
Full EHR (0/1)	0.242	0.428	0.510	0.500
Coercive forces				
No Medicaid revenue (0/1)	0.183	0.387	0.234	0.423
1% ≤ Medicaid revenue ≤ 15% (0/1)	0.478	0.500	0.349	0.477
Medicaid revenue > 15% (0/1)	0.339	0.473	0.264	0.441
Medicaid revenue missing (0/1)	N/A	N/A	0.154	0.361
No Medicare revenue (0/1)	0.119	0.324	0.142	0.349
1% ≤ Medicare revenue ≤ 30% (0/1)	0.444	0.497	0.38	0.485
Medicare revenue > 30% (0/1)	0.437	0.496	0.323	0.468
Medicare revenue missing (0/1)	N/A	N/A	0.155	0.362
Normative forces				
% physicians with partial EHRs within HRR	0.268	0.101	0.209	0.059
% physicians with full EHRs within HRR	0.244	0.119	0.507	0.092
Mimetic forces				
% physicians with partial EHRS within specialty	0.271	0.049	0.211	0.034
% physicians with full EHRs within specialty	0.239	0.043	0.516	0.07
Controls				
Age				
Physician age between 29 and 44 (0/1)	0.312	0.463	0.251	0.434
Physician age between 45 and 64 (0/1)	0.605	0.489	0.616	0.486
Physician age above 65 (0/1)	0.083	0.276	0.133	0.34
Size				
Number of physicians	8.010	14.267	9.784	19.158
Number of physicians missing (0/1)	0.165	0.371	N/A	N/A
Practice type				
Solo/physician group (0/1)	0.721	0.449	0.632	0.482
HMO (0/1)	0.035	0.184	0.028	0.166
Community health center (0/1)	N/A	N/A	0.034	0.18
Medical/academic center (0/1)	0.073	0.26	0.107	0.309
Hospital (0/1)	0.131	0.337	0.076	0.265
Other (0/1)	0.041	0.198	0.123	0.329
Region				
Northeast (0/1)	0.231	0.422	0.223	0.416
Midwest (0/1)	0.224	0.417	0.212	0.409
South (0/1)	0.325	0.469	0.34	0.474
West (0/1)	0.22	0.414	0.225	0.418
Urbanization				
Large central metro (0/1)	0.344	0.475	0.352	0.478
Large fringe metro (0/1)	0.264	0.441	0.243	0.429
Median metro (0/1)	0.202	0.402	0.206	0.405
Small metro (0/1)	0.088	0.283	0.098	0.298
Micropolitan (0/1)	0.071	0.258	0.075	0.264
Nonmetro (0/1)	0.031	0.173	0.025	0.157
Competition: State/specialty Herfindahl index	0.067	0.111	0.078	0.082
Income: State per capita (1000 dollars)	40.956	5.966	44.444	6.362

Table 3
Coefficient estimates from ordered logit model of EHR adoption.

Variables	2008	2012
1% ≤ Medicaid revenue ≤ 15%	0.309***	0.253*
	(0.092)	(0.132)
Medicaid revenue > 15%	0.256***	0.153
	(0.097)	(0.151)
Medicaid revenue missing		0.033
		(0.503)
1% ≤ Medicare revenue ≤ 30%	0.191*	0.431***
	(0.100)	(0.154)
Medicare revenue > 30%	−0.014	0.324**
	(0.107)	(0.162)
Medicare revenue missing		0.852*
		(0.510)
% physicians with partial EHRs within HRR	2.139***	1.953***
	(0.313)	(0.524)
% physicians with full EHRs within HRR	4.368***	4.154***
	(0.287)	(0.365)
% physicians with partial EHRS within specialty	2.180***	−1.355
	(0.720)	(5.563)
% physicians with full EHRs within specialty	2.991***	2.743
	(0.725)	(2.760)
Physician age between 45 and 64	−0.318***	−0.436***
	(0.066)	(0.109)
Physician age above 65	−0.874***	−0.957***
	(0.120)	(0.165)
Practice type-HMO	2.345***	1.810***
	(0.222)	(0.553)
Practice type-community health center	0.655***	0.510
	(0.101)	(0.347)
Practice type-medical/academic center		0.718***
		(0.170)
Practice type-hospital	0.408***	0.285**
	(0.084)	(0.145)
Practice type-other	0.043	0.103
	(0.153)	(0.147)
Number of physicians	0.018***	0.018***
	(0.002)	(0.005)
Number of physicians missing	0.879***	
	(0.081)	
Midwest	−0.128	−0.218
	(0.108)	(0.152)
South	−0.013	−0.072
	(0.101)	(0.150)
West	−0.218**	−0.188
	(0.103)	(0.185)
Large fringe metro	−0.002	0.214
	(0.079)	(0.135)
Median metro	0.102	−0.015
	(0.085)	(0.133)
Small metro	−0.019	0.226
	(0.111)	(0.155)
Micropolitan	0.011	0.111
	(0.125)	(0.158)
Nonmetro	−0.251	−0.436**
	(0.194)	(0.219)
State/specialty Herfindahl index	0.020	0.599
	(0.316)	(0.533)
State per capita income	−0.005	−0.007
	(0.007)	(0.007)
m1	3.103***	2.691
	(0.456)	(2.628)
m2	4.556***	3.772
	(0.459)	(2.627)

Notes: Standard errors in parentheses are adjusted for the complex design of the 2008 Health Tracking Physician Survey and the 2012 National Electronic Health Records Survey.

* $p < 0.1$
** $p < 0.05$
*** $p < 0.01$

Reference categories include: no Medicaid revenue, no Medicare revenue, physician age between 29 and 44, Solo/group practice, Northeast, and Large central metropolitan area. Each ordered logit coefficient indicates the increase in the log odds of having a higher level of EHR adoption for a one-unit increase in the independent variable, given that all other independent variables are held constant.

percentage of physicians within the HRR adopting full EHRs increases the probability of full EHR adoption by 17%.

6. Discussion

The finding that mimetic forces significantly influenced EHR adoption in 2008, but not in 2012, may be explained by the reduction in uncertainty about the benefits from these systems resulting from passage of the HITECH Act. Organizations model themselves after others within their institutional field that they consider more progressive, legitimate, or successful, particularly when there is uncertainty [29]. They mimic others to hedge against perceived risks and thereby acquire legitimacy [56,106]. A complex and uncertain environment encourages organizations to mimic and benchmark themselves against their competitors [55]. For example, Liu et al. found that coercive and normative pressures, but not mimetic pressures, increased a firm's intention to adopt electronic supply chain management (e-SCM) systems. They suggest that this might be due to the easy implementation format of Internet-enabled systems, which reduced uncertainty and risk [64].

The HITECH Act made it clear that virtually all providers would need to adopt EHRs eventually in order to participate in regional health information exchanges. As a result, there was less concern that a provider would bear the cost of adoption but then not realize the full benefits if other physicians decided not to adopt. There is still uncertainty over when the health information exchanges will be implemented, but HITECH put to rest concerns that they may not be developed for quite some time.

We find that physicians with positive Medicare revenue were more likely to adopt EHRs post HITECH. In particular, while the percent Medicare revenue >30% was not a significant predictor of EHR adoption in 2008, in 2012, the probability of adoption of a full EHR by physicians who earned >30% of their revenue from Medicare was 6.8 percentage points higher than those without Medicare revenue. In 2012, for those who earned between 1% and 30% of their revenue from Medicare, the probability of adoption of a full EHR was 9 percentage points higher than those without Medicare revenue, whereas this probability was only 3 percentage points higher than those without Medicare revenue in 2008. The fact that the likelihood of EHR adoption is similar across both positive categories of Medicare revenue in 2012 is consistent with the design of HITECH incentives, which do not require a threshold level of Medicare patient volume for qualification.

In contrast, receipt of Medicaid revenue is positively and strongly correlated with full EHR adoption in both time periods. There are several potential reasons for these trends. First, Medicaid reimbursements are low so in order to maintain revenue, physicians may need to see more patients [32]. If the EHR allowed them to do that before HITECH, this may explain the consistent adoption among practices that treat Medicaid patients. Second, physicians who accept Medicaid patients are more likely to work at community health centers or hospital-based practices with higher patient volumes [86]. These facilities were more likely to adopt EHRs prior to HITECH. Finally, the potential for Medicaid incentive payments to exert coercive force on EHR adoption by office-based physicians is more limited than for Medicare incentive payments. Although Medicaid incentive payments are higher than Medicare incentive payments, fewer physicians qualify for EHR incentives under the Medicaid program than the Medicare program.[10] Besides, Medicaid providers do not have the same potential penalties as Medicare providers. While Medicare eligible professionals who

[10] Most physicians must have 30% Medicaid patient volume in order to qualify for Medicaid HITECH incentives, but only 12.3% of office visits are by Medicaid patients, on average. Twenty-four percent of office-based visits are by Medicare patients and there is no volume requirement for Medicare HITECH incentives [47].

Table 4
Marginal effects of variables measuring mimetic, normative, and coercive forces on EMR adoption from ordered logit model.

Variables	2008			2012		
	No EHR	Partial EHR	Full EHR	No EHR	Partial EHR	Full EHR
1% ≤ Medicaid revenue ≤ 15%	−0.065***	0.019***	0.046***	−0.044**	−0.009*	0.053*
	(0.019)	(0.006)	(0.014)	(0.023)	(0.005)	(0.028)
Medicaid revenue > 15%	−0.054***	0.016***	0.038***	−0.027	−0.005	0.032
	(0.020)	(0.006)	(0.014)	(0.026)	(0.005)	(0.031)
1% ≤ Medicare revenue ≤ 30%	−0.040*	0.012*	0.028*	−0.075***	−0.015***	0.090***
	(0.021)	(0.006)	(0.015)	(0.027)	(0.005)	(0.032)
Medicare revenue > 30%	0.003	−0.001	−0.002	−0.057**	−0.011*	0.068**
	(0.022)	(0.007)	(0.016)	(0.028)	(0.006)	(0.034)
% physicians with partial EHRs within HRR	−0.449***	0.131***	0.319***	−0.341***	−0.066***	0.408***
	(0.065)	(0.020)	(0.046)	(0.092)	(0.018)	(0.108)
% physicians with full EHRs within HRR	−0.918***	0.267***	0.650***	−0.726***	−0.142***	0.867***
	(0.056)	(0.018)	(0.043)	(0.060)	(0.018)	(0.070)
% physicians with partial EHRS within specialty	−0.458***	0.133***	0.325***	0.237	0.046	−0.283
	(0.151)	(0.044)	(0.107)	(0.972)	(0.189)	(1.162)
% physicians with full EHRs within specialty	−0.628***	0.183***	0.445***	−0.479	−0.093	0.573
	(0.152)	(0.044)	(0.108)	(0.482)	(0.094)	(0.575)

Notes: Standard errors in parentheses are adjusted for the complex design of the 2008 Health Tracking Physician Survey and the 2012 National Electronic Health Records Survey.
* $p < 0.1$
** $p < 0.05$
*** $p < 0.01$
Reference categories include: no Medicaid revenue, no Medicare revenue.

do not adopt and successfully demonstrate meaningful use with EHRs will have their fee schedule adjusted, Medicaid providers do not face penalties. In other situations, such as work team motivation, penalties have been shown to be more coercive than prizes [28]. We do find, however, that in 2012, while the probability of adoption is not as strong for Medicaid compared to Medicare, physicians with positive Medicaid revenue were still more likely to upgrade their systems from partial EHRs to full EHRs.

7. Conclusions and limitations

Our results suggest that institutional forces can have a major impact on technology adoption decisions in health care. Mimetic forces influence adoption primarily when there is uncertainty about the benefits. In the case of EHRs, we find that mimetic forces had almost as strong an effect as normative forces on EHR adoption in the absence of coercive forces. However, coercive forces provided by government regulation had a similar impact on adoption as normative forces.

This study contributes to the literature on the role of institutional theory in IT adoption. It also addresses the need to account for the contextual environment of health care in IS research. This is an industry that not only is highly institutionalized but also has traditionally had a strong professional logic that is currently being eroded via market mechanisms as well as government regulatory forces. We show that in such an industry institutional forces can have a strong influence on adoption decisions.

In addition, this study contributes to practice by demonstrating the role of government policy on IS adoption. Prior to the HITECH regulations, adoption by other physicians within similar specialties had a slightly lower effect than that by physicians within the same hospital referral region, but neither resulted in high adoption by physicians. However, the coercive forces introduced with the HITECH Act rivaled normative forces and contributed to a doubling of adoption rates. While it is not surprising that federal regulations and incentives are an effective means of accelerating technological adoption, the fact that normative forces remain important after the implementation of such policies is a notable finding. It suggests that the benefits of EHR adoption are persistent in areas with the potential to link individual systems both within health-care networks and across networks through regional health information exchanges. By linking systems, more data will be available for analytics and "big data" analysis, with greater potential to reduce costs and improve quality. Finally, it is important to note that normative forces and the coercive forces exerted by the HITECH Act primarily benefit patients and third-party payers of medical services rather than physician decision makers.

One limitation of our study is that measures of various types of isomorphism or contagion effect can overlap and capture more than one isomorphic pressure [29,63]. Both institutional and contagion theories face the issue of identification of the hypothesized effects [16,67]. In addition, we can only identify the correlation between mimetic, normative, and coercive forces and EHR adoption, but not the causal effect of these forces. Identification of the latter in the case of coercive forces, for example, would require the use of some type of exogenous change in Medicare and Medicaid revenue that was unrelated to the unobservable determinants of EHR adoption decisions. Another limitation is that there are differences in EHR technologies over time and across physicians that we cannot fully observe. For example, the level of technology associated with a full EHR may differ significantly between 2008 and 2012.

This study is also limited by its reliance on secondary data and comparison of data collected from two different sources. There are clearly many advantages to using the surveys that we did, as these are large-scale nationally representative efforts that would be difficult to replicate. However, the usage of secondary data often leads to concerns over construct validity. Both surveys had similar goals (to increase understanding of U.S. health care and to develop reliable information about ambulatory medical care practices in the U.S.) and similar samples (non-federal-employed office-based physicians primarily engaged in direct patient care) and used similar data collection techniques (mail surveys). However, the 2008 survey was privately funded by the Robert Wood Johnson Foundation and conducted by the Center for Studying Health Systems Change, while the 2012 study was federally funded and carried out by the National Center for Health Statistics under the authority of the Public Health Service Act. 42.[11]

[11] While the National Center for Health Statistics collected some data on EHRs in 2008, their sample size was small, leading to issues with data quality, reliability, and precision. Moreover, some of the data were collected through in-person rather than mail surveys.

Finally, we have measured institutional forces by variables, which is a significant simplification on understanding how forces play out in an institutional environment. Cultural-cognitive, regulative, and normative forces evolve over time and affect processes and operations within and across organizations as they evolve. In particular, within U.S. health care, there has been an evolution over time from professional dominance to market mechanism forces [82]. The operation of institutionalization processes acts to undermine variance-based predictions that are based upon variables and their relationships as opposed to the series of occurrences of events [81]. Despite these limitations, we believe that this study makes an important contribution to the literature on EHR systems, as it is the first study that we are aware of to provide empirical validation of the application of institutional theory to EHR adoption decisions in the U.S.

Future studies will consider the changing nature of coercive forces and the role of penalties currently introduced by the U.S. government. Beginning in 2015, Medicare eligible professionals who did not adopt and successfully demonstrate the meaningful use of a certified EHR had their payments reduced by 1% per year. Depending on the overall rate of EHR meaningful use in the U.S., penalties for non-adoption could escalate to 5% by 2019 and remain at that level thereafter. Some physicians may opt out because the penalties are not as significant as the incentives [18]. Thus, while the different types of institutional forces may all continue to influence adoption, their individual contributions may change as coercion is achieved through penalties rather than incentives.

Acknowledgement

This research was funded by a Lehigh University Faculty Research Grant.

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