

Electronic Health Records Assimilation and Physician Identity Evolution: An Identity Theory Perspective

Abhay Nath Mishra

Robinson College of Business, Georgia State University, Atlanta, Georgia 30303,
amishra@gsu.edu

Catherine Anderson

School for Continuing and Professional Studies, University of Virginia, Falls Church, Virginia 22043,
cla3bw@virginia.edu

Corey M. Angst

Mendoza College of Business, University of Notre Dame, Notre Dame, Indiana 46556,
cangst@nd.edu

Ritu Agarwal

Robert H. Smith School of Business, University of Maryland, College Park, Maryland 20742,
ragarwal@rhsmith.umd.edu

With the lack of timely and relevant patient information at the point of care increasingly being linked to adverse medical outcomes, effective management and exchange of patient data has emerged as a strategic imperative for the healthcare industry. Healthcare informaticians have suggested that electronic health record systems (EHRS) can facilitate information sharing within and between healthcare stakeholders such as physician practices, hospitals, insurance companies, and laboratories. We examine the assimilation of EHRS in physician practices through a novel and understudied theoretical lens of physicians' identities. Physician practices and the physicians that lead them occupy a central position in the healthcare value chain and possess a number of unique characteristics that differentiate them from other institutional contexts, including a strong sense of affiliation with other physicians, potent professional identities, and a desire for autonomy. We investigate two salient physician identities, those of careprovider and physician community, grounded in the roles physicians play and the groups with which they affiliate. We argue that these identities and their evolution, triggered by EHRS, manifest as both identity reinforcement and deterioration, and are important drivers of EHRS assimilation. We use survey data from 206 physician practices, spread across the United States, to test our theoretical model. Results suggest that physician community identity reinforcement and physician community identity deterioration directly influence the assimilation of EHRS. We further find that the effects of careprovider identity reinforcement and careprovider identity deterioration on EHRS assimilation are moderated by governmental influence. Theoretical and pragmatic implications of the findings are discussed.

Key words: assimilation; careprovider identity; EHR; electronic health records; health informatics; health IT; identity deterioration; identity reinforcement; identity theory; physician community identity; physician practices; professional identity; role identity; self-categorization theory; social identity; social identity theory

History: Anandhi Bharadwaj, Senior Editor; Radhika Santhanam, Associate Editor. This paper was received on November 2, 2011, and was with the authors 14 months for 4 revisions. Published online in *Articles in Advance* April 18, 2012.

Introduction

In nothing do men more nearly approach the gods than in giving health to men.

—Cicero

The medical profession occupies a unique position in society. For centuries, physicians have been held in great esteem for the consequential services they provide and have carved a special status for themselves because of the nature of their work—saving lives. They have also garnered substantial respect

from others by virtue of their specialized training, and endowment of esoteric skills and knowledge not available to most. Increasing specialization of the occupation of medicine has not only created a community with strong professional bonds that is relatively impervious to external pressures or control but also resulted in physicians enjoying unprecedented levels of autonomy and independence in the conduct of their work (Freidson 1994). As a consequence of their close affiliation with a professional community

and a well-defined delineation of their function in society, physicians have developed powerful identities that guide their sensemaking and enactment of the environment (Weick 1995). It is these identities and their evolution that we suggest are central to understanding physician decision making and behavior in the healthcare industry (Real et al. 2009).

Recently, in response to growing concerns about rising costs and poor quality in healthcare delivery in the United States, the independence and autonomy of the medical profession has been threatened, with the government seeking to nudge physicians in directions that promise to streamline and transform healthcare delivery by encouraging a greater use of technology. Although the healthcare profession has a longstanding tradition of using medical technologies, information technology (IT) adoption and use by clinicians and care-delivery organizations for the storage, management, and exchange of *patient* information is still relatively limited (DesRoches et al. 2008, Jha et al. 2009). Hence, there is considerable interest among U.S. policymakers to use various policy levers to enhance the use of IT for patient care. To this end, the American Recovery and Reinvestment Act (ARRA) of 2009 provides sizeable financial incentives for physicians who adopt and demonstrate “meaningful use” of electronic health records (ARRA 2009) and disincentives if they fail to do so by 2015.

An electronic health record (EHR) system constitutes a key enabling technology that facilitates the creation and sharing of patient information in the healthcare delivery system. EHR systems (EHRS) are the software platforms that physician offices and hospitals use to create, store, update, and maintain electronic health records for patients. They represent the primary mechanism through which the much-desired interoperability of health information can take place such that stakeholders are able to seamlessly share, exchange, and access relevant patient data (Shortliffe 1999). Additionally, whereas earlier clinical information systems, such as those for laboratory results, pharmacy, and picture archiving and communication, focus on specific tasks or departments within a hospital, EHRS have the potential to integrate various systems and serve as a platform technology. To the degree that EHRS exhibit considerable value potential, and in light of the fact that EHRS assimilation is low in the U.S. healthcare sector (Angst et al. 2010, Audet et al. 2004, Miller et al. 2005), it is important to understand the dynamics underlying this phenomenon.

In this paper we investigate the assimilation of EHRS, i.e., the extent to which EHRS use is integrated with the care delivery process and becomes routinized in the activities associated with the process (Chatterjee et al. 2002) in physician practices.

Although a robust body of research in information systems (IS) has narrated, explained, and predicted IT adoption and use, the healthcare industry exhibits unique characteristics that constrain its ability to implement technological innovations successfully, requiring greater attention to, and deeper theorizing about, how industry dynamics alter the nature of IT-related decisions, activities, and outcomes (Chiasson and Davidson 2005, Nembhard et al. 2009). Indeed, features of EHRS, when coupled with the idiosyncrasies of a health system that is characterized by strong physician identities and a complex web of connections between physicians and other stakeholders, create a context that necessitates a reframing of traditional adoption models (Attewell 1992, Bharadwaj 2000).

Physician practices represent a key link in the care-delivery process because they typically have the first encounter with a patient, maintain the relationship for a considerable length of time, and are responsible for the vast majority of care-delivery and healthcare spending, thus occupying a significant position in the U.S. healthcare system (Burns 2002, Schoen et al. 2006, Sirovich et al. 2008). The capture, storage, and management of patient information through EHRS assimilation at the practice level is a critical prerequisite to ensuring that the information can be integrated with that of other stakeholders. Despite its importance, IT assimilation in physician practices has not been examined in detail in the literature (DesRoches et al. 2008). We approach the focal phenomenon through a distinctive and understudied theoretical lens: that of physician identities. Our motivation for the use of an identity lens is grounded in a rich literature that implicates identities as proximal and potent influences on perceptions, emotions, and behavior (Stets and Burke 2000, Swann et al. 2009), supplemented by our extensive fieldwork with physicians. Identity is fundamentally the social fact of “how an individual self-defines him- or herself” (Pratt et al. 2006, p. 236) that acts as a sensemaking filter through which the environment is assessed and drives the acts in which the individual will engage, such as the use of technological innovations.

Identity theories isolate two distinctive forms of social aspects of identity: role identity and social identity (Hogg et al. 1995, Stets and Burke 2000). The former is a construal of a particular role that the individual plays (e.g., a scholar, an advocate, a consultant) and entails not only performing tasks associated with the role but also attempting to control the resources for which the role has responsibility. The latter, social identity, involves identification with a social category and acceptance of the values and norms

of the group (Stets and Burke 2000). Although distinct, individuals' role and social identities are simultaneously active and influence actions taken by them (Stets and Burke 2000).

Physicians' role and social identities together constitute their professional identity, which is a reflection of their enactment of a role and their self-definition as a member of a profession (Chreim et al. 2007). We label the *professional role* identity of physicians as that of a *careprovider*. In this identity, physicians view themselves as central to patient treatment and consider themselves an integral part of the physician practice where patients receive care (Chreim et al. 2007, Pratt et al. 2006). The physician practice setting is characterized by an established hierarchy in which the physician is regarded as the source of expertise and all other members, such as nurses and technicians, defer to this expertise (Nembhard et al. 2009), further reinforcing the careprovider role identity of the physician (Lichtenstein et al. 2004). Patients reaffirm this identity when they rely on their doctors to "make them better." We call the *professional social* identity of physicians, in which they view themselves a part of the extended community consisting of physician practices, hospitals, and other medical professionals, as *physician community identity*. Years of stringent medical training followed by grueling rotations typically foster a strong sense of "profession" among physicians (Freidson 1994, Pratt et al. 2006). This community identity consolidates their association with "reference others," which represents a collective aspect of self, has a strong influence on self-definition, establishes the value significance of the professional group, and separates their collective from other groups (Brickson 2005, Foreman and Whetten 2002).

Identity scholars have noted that role and social identities are malleable and can evolve. Environmental shifts such as rapid technological changes can engender significant role transitions and identity modifications, including both identity reinforcements and deteriorations, and cause individuals to take action that promotes identity maintenance (Chreim et al. 2007, Ibarra and Barbulescu 2010). Tripsas (2009) persuasively argues that although identity and its evolution are critical to understanding organizational innovation, extant research has largely ignored their relationships. In the context of EHRS, although impending changes have been widely discussed, no work that we are aware of has investigated perceived changes to physician identity and EHRS use. However, the fact that physician identities are likely to be affected by EHRS is implicit in the literature. Research suggests that the introduction of EHRS in the physician practice entails a significant strategic change that can transform clinical workflows, information availability, and doctor-patient relationships,

thereby challenging identity. Yet the ease of information access enabled by EHRS can also enable physicians to perform their tasks more competently and efficiently, thus reinforcing identity (DesRoches et al. 2008, Fiks et al. 2011, Ford et al. 2009, Jha et al. 2009).

We consider the role and social identities of physicians, draw upon and extend the concepts of identity reinforcement and deterioration, and examine their influence on EHRS assimilation. Despite significant theoretical work in social identity, identity enhancement and threat are understudied in extant literature (Tripsas 2009), and empirical work examining identity and identification is limited (Foreman and Whetten 2002). Finally, although identity theories have been applied in a variety of contexts, including healthcare (Brewer and Gardner 1996, Dukerich et al. 2002, Johnson et al. 2006, Pratt and Foreman 2000, Real et al. 2009), they have yet to be utilized to study IT-related phenomena. In this paper, we address these theoretical and empirical gaps in the literature. Grounded in identity theories, we conceptualize physician identity reinforcement and deterioration and develop a research model that investigates EHRS assimilation through the lens of identity. We draw upon the medical informatics literature to inform our understanding of the healthcare context. Acknowledging the highly visible and active role of a key stakeholder in healthcare technology policy, the government, we examine the moderating effect of governmental influence on the relationship between the physician's perceptions of reinforcements and threats posed to his/her careprovider identity and EHRS assimilation. We suggest that this powerful stakeholder is likely to condition the actions physicians take in response to perceived role identity reinforcement and deterioration, but not social identity reinforcement and deterioration, because as members of a professional community, physicians enjoy protection from external threats not available to them as individuals. We empirically test our research model using physician practice-level survey data obtained from key informants representing 206 physician practices spread across the United States.

Theoretical Background

Technology adoption and use has attracted significant attention from the academic community and has been studied from a variety of theoretical perspectives, such as diffusion of innovations (Premkumar et al. 1994), the technology acceptance model and its extensions (Davis 1989, Kim 2009, Ortiz de Guinea and Markus 2009, Venkatesh and Davis 2000), learning (Attewell 1992), institutional theory (Teo et al. 2003), social exchange theory (Hart and Saunders 1997), knowledge- and resource-based views

(Armstrong and Sambamurthy 1999), rational economics (Brynjolfsson and Kemerer 1996) and power and politics (Markus 1983). Some of these theoretical lenses have been applied in the past decade to investigate various aspects of health IT adoption and use, the majority of which has appeared in health informatics journals. We briefly review the existing state of research on health IT adoption in IS and the medical informatics literatures. This is followed by a discussion of identity theories and their application to unique aspects of the healthcare context. We then describe our research model and develop specific research hypotheses.

Healthcare IT Adoption and Use

IS and organizational science research involving health IT has typically examined use in a case study context. For example, examining computerized physician order entry at an acute care hospital, Davidson and Chismar (2007) found that institutional and technology changes triggered processes facilitating the effective use of IT. Investigating the implementation of two clinical information systems in three Canadian hospitals, Lapointe and Rivard (2005) found that physician resistance to IT increased as the perceived threat shifted from one involving solely individual-level conditions to one involving group-level initial conditions, providing evidence for physician “clan” culture. The resistance exhibited by physicians when a threat was perceived to be an individual-level condition was essentially uncoordinated, but resistance among physicians converged once a group-level condition materialized (Lapointe and Rivard 2005). The presence of a clan culture was also highlighted by Kohli and Kettinger (2004), who studied the implementation of a physician profiling system in a community hospital in the United States. They suggest that informing the clan becomes legitimized through both internal and external influences. In subsequent work, Lapointe and Rivard (2007) argued for the need to explore alternative yet complementary models of implementation, which may operate at different levels; focus on more than one key phenomenon; and examine a variety of antecedents to compensate for the limitations of existing research that focuses on a single level, a unitary phenomenon, and one set of antecedents. Collectively, although conducted in settings other than physician practices, these studies provide insights into IT adoption and use in the healthcare industry and underscore the importance of physician perceptions, technological characteristics, and the external environment.

In contrast to the IS literature where investigations at the level of the physician practice setting are limited, the medical informatics literature reports several case studies and surveys addressing barriers and

facilitators of EHRS adoption and use (e.g., Miller et al. 2005, Ventres et al. 2006). The majority of informatics research comprises large-scale, survey-based *descriptive studies* that examine the effects of various factors on adoption decisions (e.g., DesRoches et al. 2008, Miller and Sim 2004, Simon et al. 2007b) or the functions for which the EHRS are used (Hsiao et al. 2008). Findings suggest that larger practices and those located within a hospital are more likely to adopt (Simon et al. 2007b). Commonly cited barriers to adoption include high financial costs, perceived losses in productivity, and physician attitude toward technology (Miller and Sim 2004, Simon et al. 2007b). Although informative, these studies are nevertheless not theoretically grounded, nor do they explore the complex determinants that are likely to exist in a dynamic professional, environmental, and organizational setting (Angst et al. 2010, Kazley and Ozcan 2007).

Our review reveals that although prior research has examined IT adoption and use in considerable breadth and depth, important opportunities exist for extending it in the context of the healthcare industry. In particular, examining the ambiguities and uncertainties inherent in a transformational technology such as EHRS, the consequent sensemaking physician decision makers need to engage in, and their perceptions about how their careprovider and physician community identities may evolve as a result of EHRS offer a rich opportunity to extend the literature.

Identity Theories and Physicians’ Identities

The psychology literature defines identity as a cognitive construct of the self, which answers the question, “Who am I?” (Hogg 2001, Kreiner et al. 2006). Personal identity focuses primarily on the individualized self or characteristics of an individual that separate him/her from others. Researchers have noted that in the contemporary world, however, when individuals define themselves based on their membership in various collectives such as organizations and professional groups and attach a significant importance to these associations (Dukerich et al. 2002), such a singular focus on individuals is frequently at odds with observed behavior in collectives (Turner and Onorato 1999). Accordingly, researchers in social psychology have conceptualized social identity as “what defines us?” to examine the individual as a member of a collective and to explain actions and behaviors by such collectives (Tajfel and Turner 1979).

Extant literature discusses two manifestations of the social aspects of self—role identities and social identities (Hogg et al. 1995, Stets and Burke 2000). Role identities refer to specific roles people perform, distinguish a particular role from others, and provide meaning for self. Roles do not exist in isolation; rather,

others respond to them and reinforce the basis for self-definition (Hogg et al. 1995). Role identities comprise meanings that emerge in the form of expectations regarding people's own and others' behavior (Stets and Burke 2000). Social identities, in contrast, are derived from the social categories or collectives to which one belongs (Hogg and Terry 2000, Tajfel and Turner 1979). Such associations provide members an avenue to establish relationships with similar others, to differentiate between in-group and out-group members, and to derive their sense of social worth (Ashforth and Mael 1989). Role and social identities exist and operate concurrently, i.e., people such as physicians simultaneously occupy roles and participate in professional groups, and both identities influence perceptions and behavior (Stets and Burke 2000).

The notion of role-based identity draws upon the core foundation of identity theory (Stryker 1980, Stets and Burke 2000) that conceptualizes identity as the classification of self as an occupant of a role, with the attendant meanings and expectations of the role and its performance. These meanings and expectations constitute a standard that guides behavior. A belief that one is enacting a role competently reinforces feelings of self-esteem and role-related behavior, whereas perceptions of poor role performance cause distress and diminish role-related behavior (Hogg et al. 1995). Role identity focuses on the match between individual meaning ascribed to occupying a role and the behavior that the individual enacts in that role while interacting with others. The assumption of a role identity is accompanied by the adoption of self-meanings and expectations to accompany the role as it relates to others and a desire to preserve these meanings and expectations (Stets and Burke 2000).

Social identities are theoretically anchored in social identity theory and self-categorization theory (Foreman and Whetten 2002, Hogg 2001, Johnson et al. 2006, Scott and Lane 2000) that explore how individuals view themselves in relation to social groups and whether they are likely to adopt the identities of various collectives (Kreiner and Ashforth 2004). People create these associations based on perceived overlap between self and collectives. The larger the overlap, the more people prefer the membership of a collective, and the higher the emotional and value significance of these associations. Social identities represent internalization of the identities of the collectives as part of the self and result in psychological acceptance of the values and norms of the collective (Scott and Lane 2000). Members evaluate such collectives, also called in-group, more positively than others and expend efforts to establish positive distinctness for them (Hogg 2001).

As discussed, the dual self-construals of physicians, i.e., their role and social identities, are fostered

by selection, education, training, and communication processes (Apker and Eggly 2004). In their role as a careprovider—the most consequential and focal player in the physician practice—physicians view themselves as the orchestrator of care delivery and view others such as nurses, pharmacists, and technicians as aids that follow instructions. The roles performed by other professionals are called counter-roles in identity theory. The interactions and negotiations between roles and counter-roles contribute to role identity creation and sustenance.

As a part of the extended physician community, physicians identify with their medical specialty, other physicians, and medical professionals as a whole (Johnson et al. 2006). In his in-depth analysis of the medical profession, Freidson (1994) characterized it as highly autonomous and controlling of the conditions and content of medical work. Clinicians place a high value on autonomy in decision making and setting the standards of clinical performance (Ford et al. 2009) and, acknowledging the deep knowledge and expertise required for the practice of medicine, society has typically granted this autonomy (West and Barron 1999). Moreover, the physician community's culture is very close-knit and views external attempts at instituting controls as an assault on its autonomy (Friedson 1994; Ford et al. 2006, 2009; Pont 2000). The community feeling is central to the organization and experience of professional work (Adler et al. 2008). Indeed, the medical profession has been portrayed as a clan (Kohli and Kettinger 2004) where the physician community and group culture are identified as proximal influences of behavior. The practice of medicine also involves a high degree of uncertainty and ambiguity which leads physicians to rely extensively on one another and their social networks (Mano-Negrin and Mittman 2001, West and Barron 1999). In the presence of greater uncertainty surrounding a behavior, attitudes and behaviors tend to be more strongly influenced by peers (Bandura 1986). In the medical field, such peer influence has previously been found to be an effective means of enacting changes in physician clinical behavior (Lomas et al. 1991).

Both identity theory and social identity theory examine the social aspect of the self, with the former casting behavior in terms of roles and the latter in terms of group membership and joint norms and values. Although the two theories differ in their focus—roles *versus* groups—and the dynamics of identity formation, to the degree that they share a common goal of explaining social behavior, it has been recommended that they be applied together in studies of social behavior (e.g., Hogg et al. 1995, Stets and Burke 2000). Such integration, however, is lacking in the literature. Our work addresses this gap. We note that our expectation that identity is likely to

drive physician decision making about new information technologies in healthcare is supported not only by theories of social behavior but also in our extensive fieldwork that often highlighted the significance of physician identity in their attitudes and choices.¹

Identity Reinforcement and Deterioration

Although identities doubtless influence behavior, they are not immutable. Both the roles individuals perform as well as the salience of the groups they associate and identify with are vulnerable to evolution and change (Abdelal et al. 2006, Stets and Burke 2000). Environmental, contextual, and circumstantial shocks may modify people's evaluative schema, change taken-for-granted views that are used to make sense of the world, and necessitate modifications of identity and image (Elsbach 2003). These modifications can take two forms—identities are either reinforced or they are threatened as a result of environmental changes, including technological shifts (Chreim et al. 2007, Tripsas 2009). Technological changes, in particular, can result in fundamental modifications in workflows, relationships, balance of power, control dynamics and current modes of cognition, and require different modes for getting tasks accomplished (Ibarra and Barbulescu 2010, Tripsas 2009). In this process, if a person's role or standing in the in-group is compromised, downgraded, or attacked, people experience a threat to their identity because such changes are considered a regression or a nuisance or a discomfort, resulting in loss of status and prestige, which may not be socially desirable (Bartel 2001). To illustrate, in an interview, commenting about the use of a palm-sized electronic prescribing device, a doctor notes, "If I feel uncomfortable with the device—it's too small or I don't like where the buttons are—I'm going to be concerned and not use it when I'm with a patient." In this instance the use of the electronic device, in the mind of the treating physician, implicitly threatened his role identity of careprovider because he does not know how to use it.

Alternatively, technological developments and environmental changes may serve to reinforce identities (Stets and Burke 2000, Tripsas 2009). When technological changes enhance people's roles and their relative position in a social group, and allow them to use the same cognitive schema they have used in the past for behaviors, such modifications result in identity reinforcement. In another interview a doctor noted that electronic health records are "definitely much quicker. I love it...can't imagine life without it. It may not make me a better doctor but it can definitely cut down on errors...handwriting,

alerts...[pause] maybe it does make me a better doctor?" In our focus groups with physicians, even doctors who were unwilling to concede to the immediate value of electronic systems acknowledged in the presence of their peers that IT was the future of medicine and sustained resistance was futile.

As may be expected, identity reinforcement and deterioration yield different responses, such as identity endurance and identity change, to adapt to the needs and demands of internal and external stakeholders (Abdelal et al. 2006, Scott and Lane 2000). When there is no explicit threat or an imminent need for self-protection, the current cognitive schema is preserved and reinforced. By contrast, when confronted with a threat, people use cognitive tactics to maintain positive perceptions of their identities and take actions to thwart or slow down the change to identity (Elsbach and Kramer 1996). When the collective identity is under threat, people selectively highlight traits and characteristics from their identities that portray them and the collective in a positive light. They may also resort to highlighting another identity or to reframing the threat so it is consistent with the identity, obviating the need for change (Tripsas 2009).

Physicians and Physician Practices

After social identification has occurred, either through roles or collectives or both, there is a transition from individual to social identity, and although the potency of social identity varies, it is generally more powerful than individual identity (Hogg and McGarty 1990). Such identities are particularly strong for top managers and owners of organizations (Johnson et al. 2006, Scott and Lane 2000). In an organizational context, top managers' identities tend to overlap significantly with the organizations they lead (Pratt and Foreman 2000). This is especially true for owners of small organizations where the owners identify almost entirely with their organization (Johnson et al. 2006). Thus, it is entirely possible for people to ignore external changes and take steps to reduce the perceived threat to the identity because of vested power interests, biased cognition, inertia, and a preference for dominance and autonomy (Abdelal et al. 2006, Scott and Lane 2000). Additionally, during periods of change and turbulence, which are characterized by uncertainty, ambiguity, and reservations about the appropriate action, top management performs the critical task of sensegiving (Fiss and Zajac 2006). Organizational "elites" routinely play the central role in managing identity by shaping the beliefs of the entire organization (Pratt and Foreman 2000), as evocatively illustrated during a field visit to a urology practice in a midwestern U.S. town. Commenting on the physician practice-owner and his perception of EHRs, a certified medical assistant observed, "It's not

¹ The vignettes in this document were extracted from a qualitative study including interviews, focus groups, and onsite observations.

more work, it's just 'different work' [pause]...but he is the boss," suggesting that the view of the physician is likely to prevail at the level of the practice.

In physician practice settings, physicians are considered the authoritative source of knowledge that is critical to providing better care to patients; they are the key actors in these knowledge-intensive organizations. Healthcare organizations such as physician practices are prototypical professional bureaucracies wherein much decision-making power and autonomy is granted to the operating core—the physicians (Lapointe and Rivard 2007). Others employed in the practice, such as staff assistants, nurses, and technicians, simply complement the physician's performance; they do not generate direct revenues (Adler et al. 2008). To the degree that physicians' roles in patient care are dominant to the counter-roles played by nurses, technicians, and administrators, they are uniquely positioned to exert a significant amount of influence on the practice. Additionally, because of the hierarchical structure of physician practices, the opinions of physicians and physician owners carry significant weight (Johnson et al. 2006), suggesting that the cognitive schema and identity of the physicians are likely to be represented in the actions and behaviors of the physician practice. Furthermore, in comparison to the sporadic nature of interactions that occur in

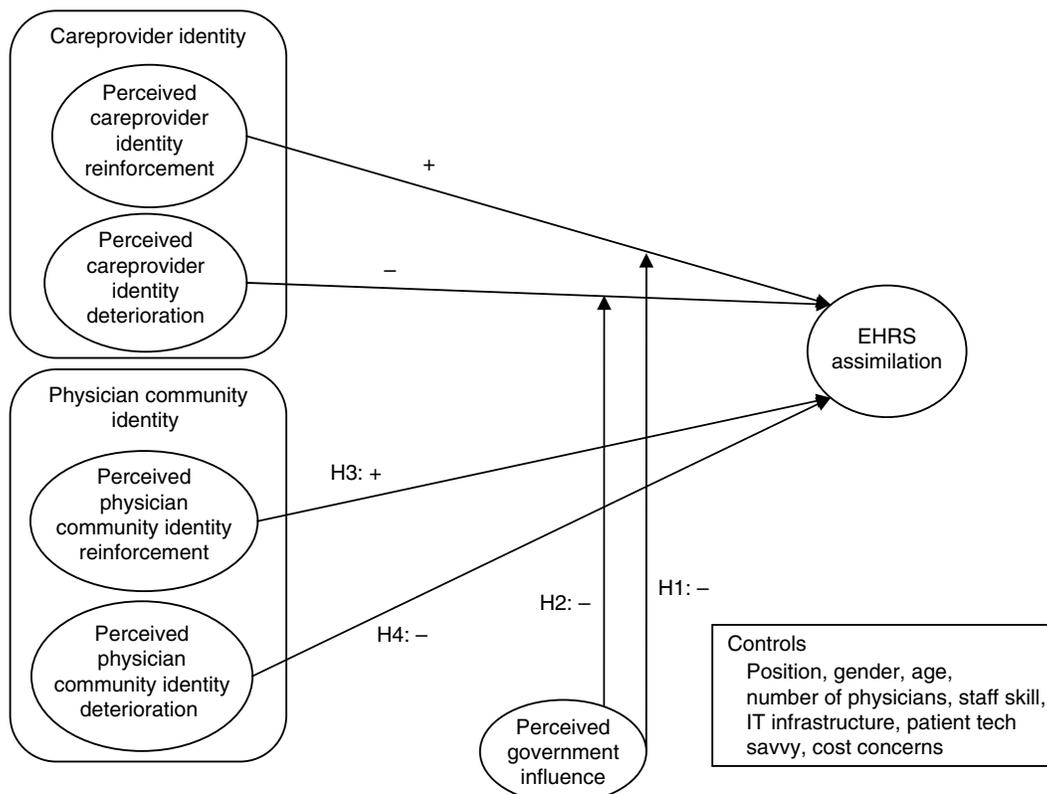
larger hospitals between various medical professionals, the interactions between physicians and nurses, technicians, and other support staff, through complex workflows, are more frequent, intimate, and intense, providing numerous opportunities for physicians to influence the opinions of others. These exchanges facilitate the coalescence of perspectives toward the one held by the physician.

In summary, our synthesis of extant research suggests that EHRS assimilation in physician practices is likely to be determined by physicians' assessment of how EHRS will change the care-delivery process and the characteristics and attributes considered important for the in-group of medical professionals. Physician sensemaking about whether such changes reinforce or threaten their social and role identities then serve as key drivers of technology use behaviors.

Research Model and Hypotheses

Our research model is illustrated in Figure 1. The model depicts the relationship between EHRS assimilation in physician practices, the evolution in physicians' role and social identities, and governmental influence. Consistent with the recommendations of researchers in organization theory and IS that the implementation aspects of new practices and innovations be studied rather than simply adoption,

Figure 1 Identity Model of EHRS Assimilation in a Physician Practice



(Ansari et al. 2010, Jasperson et al. 2005), the focal outcome of interest is EHRS assimilation in physician practices. Notably, we examine how physician practices that adopt an EHR system assimilate it to accomplish various clinical tasks. We conceptualize the antecedents of assimilation as perceived reinforcements and deteriorations to the two focal identities, careprovider and physician community, evoked by EHRS. Additionally, we examine the moderating role of governmental influence on the relationship between careprovider identity constructs and EHRS assimilation. We develop specific hypotheses in the next section.

Careprovider Identity

Perceived Careprovider Identity Reinforcement

Perceived careprovider identity reinforcement represents the belief among physicians that the implementation of EHRS will enable them to retain and strengthen their autonomy and dominant role in the care-provision process. Physicians, in general, consider themselves to be knowledgeable and competent (Chreim et al. 2007, Pratt et al. 2006) and believe that they are central to many of the accomplishments taking place in the physician practice. Additionally, because of their unique and complex knowledge and almost complete autonomy in patient treatment regimens, they drive a significant proportion of healthcare decisions and stake a claim on patient outcomes. Thus, to the extent that an EHR system is believed to augment physician roles, protect resources vital for these roles, enhance their self-perception of competence, and complement physician knowledge, physician practices are likely to be motivated to assimilate EHRS.

In the process of providing patient care, physicians perform two key activities—information retrieval and information synthesis and diagnosis (Clayton et al. 2005). Because of their unique knowledge and skills, physicians' time is a highly valued and scarce resource and indeed is priced as such in the market. The optimal use of a physician's human capital is in the delivery of care. In traditional paper-based settings, a considerable amount of time is wasted on information retrieval from disparate systems and paper documents. EHRS enable physicians to access all the medical information about patients efficiently at one place, thereby enabling them not only to retain control of information resources but also to use their time more effectively for synthesizing this information, diagnosing patient problems, and determining treatment regimens for them. Additionally, by relinquishing routine components of their role and delegating patient education activities to other professionals such as nurses and technicians, physi-

cians can use the released time to undertake complex problems that provide opportunities for professional growth and where their expertise is most needed (Ibarra and Barbulescu 2010), thereby augmenting the careprovider role.

From the perspective of patients, the physician is still the source of information—it is the physician who explains to the patients what different disease conditions entail, what test results mean, what medicines they need to take, and what precautions are necessary for them. From the perspective of nurses, technicians, and pharmacists, it is still the physician who drives decisions regarding tests, medicines, and surgeries. To the extent that the use of an EHR system may make the physicians less dependent on nurses and administrative staff for information retrieval and provide them with additional time to enable the provision of more effective and efficient care to patients, their image and identity of being a competent, knowledgeable, and autonomous careprovider should be enhanced. As noted in identity theory, individuals seek to maintain and preserve role identity and will engage in actions that enable this. Thus we expect perceived careprovider identity reinforcement to be positively related to EHRS assimilation.

Perceived Careprovider Identity Deterioration

Perceived careprovider identity deterioration is reflective of the belief among physicians that the implementation of EHRS will compromise their autonomy and dominant role in the care-provision process. According to Elsbach and Kramer (1996), individuals may feel threatened when the central and distinctive dimensions of their roles or perceived positional status is devalued. When the status quo is changed drastically, individuals experience anxiety and identity conflict. The dissonance may arise not only from having to learn new ways to perform tasks but also from relinquishing certain desirable features of the old role. However, when a person's identity is threatened, his or her primary self-defensive goal is to affirm the integrity of the self rather than seek ways to resolve the particular threat (Elsbach 2003). Bartel (2001) suggests that in such circumstances, people are likely to activate a prevention focus and engage in concerted efforts to preserve the desirable features of the identity.

A change that assaults the very fabric on which physicians base their identity—autonomy and competence—and questions or modifies their role in the care-delivery process is likely to induce substantial identity threat. Many researchers have suggested that the introduction of an EHR system entails significant clinical and administrative changes in physician practices and transformations in the way care delivery would take place (DesRoches et al. 2008, Ford et al.

2009, Jha et al. 2009), signaling to physicians that their role identity may be altered significantly. There has also been speculation that because physicians would need to use a handheld device or a computer to enter and access information, they would not be able to focus on the patient and discuss their problems and treatment options, resulting in adverse patient reactions, including dissatisfaction (DesRoches et al. 2008, Ford et al. 2009, Jha et al. 2009). One physician noted, “I still write a lot of paper scripts. When I’m in an exam room, I write things on paper. I don’t want the device in the room. I’m very old-fashioned. I walk out of the exam and enter a script and then give it to my assistant to enter. I don’t want my patients waiting for me.” Another doctor stated, “My patients are used to it. But sometimes patients stop talking when I’m working on the computer in the exam.”

Finally, there may be some fear among physicians that the introduction of a technology that can access patient data and match it with the latest treatment options available threatens the very foundation on which their identity is predicated—the exclusive ownership of valued knowledge and skills—and may render them obsolete. These changes may appear to compromise physician-patient relationships and challenge the control physicians have over patient treatment, thereby adversely impacting their careprovider identity. Dissatisfaction with a role leads professionals to redefine it and to take proactive measures to modify the role and circumstances to preserve identity. As discussed earlier, when confronted with threats, physicians are likely to reject activities perceived as detracting from their careprovider identity, thus preserving the status quo and safeguarding their autonomy and source of power. We therefore expect that perceived careprovider identity deterioration will be negatively related to EHRS assimilation.

The Moderating Effect of Governmental Influence

One of the limitations of identity theory is that although it acknowledges the importance of others in identity formation and subsequent behavior, it underplays the influence of the immediate larger context (Chreim et al. 2007, Hogg et al. 1995), attributing identity evolutions predominantly to changes in role positions. Identity theory pays relatively limited attention to the roles, identities, and behaviors of external stakeholders (Stets and Burke 2000). We believe that in the context of healthcare provision in the United States, one particular external stakeholder—the government—may have a significant influence on the possible options available to physician practices and their subsequent behaviors.

The healthcare industry is among the most regulated sectors in the United States. Different organizations with varied jurisdictions, missions, and

affiliations wield influence and often chart the future course of the healthcare industry. For example, federal, state, and local governments regulate various players in the industry to facilitate access to healthcare, such as requiring emergency departments in hospitals to accept patients regardless of insurance coverage. Efforts by regulatory bodies to coerce physicians’ decisions are often treated contemptuously as physicians resolutely guard their autonomy and independence and are satisfied with their competence (Chreim et al. 2007, Ford et al. 2009). However, because governments have the power to legislate, governmental edicts may cause fundamental changes in the healthcare industry and compel physician practices to alter the way they provide care.

Health information digitization and EHRS have recently received a significant amount of attention in the press. In 2004, President Bush issued executive orders to promote the movement toward paperless health records and issued a directive that by 2014, a majority of U.S. citizens would have electronic health records (Bush 2004). President Obama and the current administration have repeatedly emphasized the role of IT. Such deadlines, surveillance, and evaluations trigger a change in perceived locus of control from internal to external. In addition, there are frequent and alarming reports about medical errors that could have been prevented with better use of technology. All of this attention serves to create a sense of environmental pressure and threat around the EHRS adoption and use issue.

As shown in Figure 1, we suggest that governmental influence will be salient to physicians because it relates to their careprovider role identity but not to their perception of the physician community identity. The existence of a role identity implies acting to meet specific expectations of the role with respect to others and is more directly related to day-to-day actions and behaviors. Changes in the environment potentially have a more immediate influence on the behaviors required to maintain and shape role identity at the level of physicians because they translate to changes in work processes (see ARRA 2009, “Meaningful Use” criteria, HITECH Act). For example, a policy mandate that would compensate physicians for electronic “Web visits” in the same way as for a face-to-face consultation with the patient could have profound implications for the way in which patients and physicians interact and consequently for the care provider role identity. Furthermore, as noted by Ethier and Deaux (1994), although severe threats can challenge the existence of an identity or the meanings and values associated with it, threats can be managed by controlling one’s association with the social collective. Thus, government mandates can impact a physician’s role as a careprovider, but only the physician controls

the extent to which s/he identifies with the broader physician community.

It is also true that as members of a collective, individuals are better insulated from external shifts by the power of the group that can serve as an advocate for its members (Chreim et al. 2007). To illustrate, recently the Center for Medicare and Medicaid Services announced that it would require physicians to report quality measures to the public (PQR 2011). To proactively shape how these quality measures are defined, the American Medical Association has taken a vocal advocacy role and is guiding the discourse around quality measurement (AMA 2011). Thus, we posit that governmental influence will alter the relationship between careprovider identity constructs and EHRS assimilation.

In the presence of governmental influence, the positive effects of careprovider identity reinforcement will be diminished and the negative effects of careprovider identity deterioration further accentuated. In the case of careprovider identity deterioration, physicians may feel that they have to learn new ways to provide care to patients because of the need to conform to the edicts of the government, thereby causing even greater changes in their roles. In other words, the loss of autonomy and independence may arise not only from clinical and administrative changes but also from governmental mandates. Furthermore, physician practices will be required to perform onerous tasks and submit extensive documentation to the federal and state government bodies to demonstrate that they are using EHRS meaningfully. The strict and nonnegotiable timeline set for meaningful use stages 1 through 3 under the HITECH Act and the specific goals imposed regarding electronic documentation, e-prescribing, and patient information capture and sharing, although beneficial for the greater good, may be perceived as forced by the government and thus be resented by physicians. We saw instances of these perceptions during our field work. A urology physician commented, "I am doing more 'secretarial work.' When I had this [referring to a paper script pad] I didn't care what pharmacy they [patients] went to, to get it filled. Now I have to look it up. You know there are three CVSs on [route XYZ] in [medium-sized Midwestern city]." In addition, a few physicians felt as though EHRS and electronic prescribing opened up the possibility that federal and state agencies could monitor their practices' behavior. One doctor noted, "[electronic prescribing] is a sensitive issue . . . will we be profiled?"

To an extent, several of these issues are relevant for physicians who believe that EHRS reinforce their careprovider role identity. Although these physicians believe in the value of EHRS, they are not likely to welcome government mandates and edicts

because such attempts are viewed as coercive and threatening to their autonomy. Although it could be argued that government mandates surrounding EHRS use institutionalize and legitimize the initiative, physicians traditionally have not responded well to "heavy-handed" approaches that threaten autonomy but rather have attempted to circumvent mandates by various means (Pont 2000). In addition, government mandates have the potential to increase information privacy concerns among patients because of the fear that their medical data could be used in unauthorized ways by third parties, ultimately creating backlash for practice owners. It is important to remember that physicians desire to remain the source of all knowledge and the orchestrator of care provision, not a middleman between a powerful external entity and the patient, with the former mandating that they use technology more extensively. Finally, even those physicians who believe in the inherent potential of EHRS may be skeptical of government intentions, believing that the end goal of meddlesome intervention may be a reduction in reimbursement rates in the future. There is a deep-seated distrust of the government among medical professionals. Following these arguments, we hypothesize:

HYPOTHESIS 1 (H1). Government influence diminishes the positive relationship between perceived careprovider identity reinforcement and EHRS assimilation in a physician practice. Thus, the original positive relationship is weaker at higher levels of government influence.

HYPOTHESIS 2 (H2). Government influence exacerbates the negative relationship between perceived careprovider identity deterioration and EHRS assimilation in a physician practice. Thus, the original negative relationship is more negative at higher levels of government influence.

Physician Community Identity

Perceived Physician Community Identity Reinforcement

Perceived physician community identity reinforcement refers to the belief among physicians that the implementation of EHRS will enable them to adhere to the norms established by their reference group—the physician community, comprising of other physicians and organizations engaged in the practice of medicine—and continue their membership in the social collective. As discussed earlier, physicians identify closely with other physicians and their profession and value their links and connections because of the need to collaborate frequently during the provision of patient care. The complex and highly specialized nature of medicine frequently requires multiple physician practices to cooperate with one another. For example, in treating a particular patient, a pulmonary

specialty practice may share information with oncology, radiology, and cardiology practices as well as with other local hospitals. Physician practices typically hold admitting rights to one or more local hospitals to support the acute care needs of their patients. Because of repeated interactions with other physician practices and hospitals, the actions of these entities may influence the focal practice because they serve as signals of what referent others value and have accepted as important. Perceptions that change is being embraced from *within* the referent group can be a powerful motivation for change because it enables the physician to simultaneously maintain control and autonomy and amplify affiliation with the in-group (Chreim et al. 2007, Kohli and Kettinger 2004).

The availability of standardized electronic information using EHRS can enhance cooperation between physicians and augment their knowledge about patients and the care provided to them by other physicians. The extent to which other practices and hospitals have already assimilated EHRS provides an impetus to the focal practice as a result of the shared values within the peer group (Gagne and Deci 2005). We note that such behavior is unlikely to be viewed as externally imposed and non-volitional; physicians will experience significant autonomy because the behavior is congruent with the values of the peer group into which they have self-selected and because the changes are not forced upon the focal practice by other practices or hospitals. Physicians self-determine and elect to take this action because they believe that it enables them to remain a part of the in-group and to maintain their desired self-image. If other collaborators have already assimilated EHRS and the focal practice has not, it may be motivated to assimilate in order to strengthen its professional identity by keeping pace with its peers and the broader professional community.

Furthermore, through its connections to other practices and hospitals using EHRS, the focal practice can learn about EHRS and associated costs and benefits. The actions of others within a professional community characterized by a strong identity are important signals of the value of the action and improve the likelihood of change within the focal practice (Chreim et al. 2007, Kohli and Kettinger 2004). In summary, physician practices working in an environment in which other practices, medical professionals, and hospitals with which they interact have already adopted EHRS will be more likely to assimilate because it is congruent with their professional goals and affirms their community identity.

HYPOTHESIS 3 (H3). *Perceived physician community identity reinforcement associated with EHRS is positively related to EHRS assimilation in a physician practice.*

Perceived Physician Community Identity Deterioration

In the process of care provision to patients, physician practices interact with a variety of non-governmental stakeholders such as technology vendors, insurance companies, and pharmaceutical companies. Although these organizations are vital components of the healthcare ecosystem because of the inputs and services they provide, from a physician's perspective, these entities are not a part of the physician community because they are not *directly* responsible for the provision of patient care. Consequently, a physician engaged in social comparison would consider these entities to be out-group. In their effort to streamline business processes and increase revenues, these non-governmental stakeholder entities may exhort care providers to share information with them electronically. For instance, insurance companies may require documents to be submitted electronically and pharmaceutical companies may want access to patient data for segmentation and targeting. However, because these entities are not considered to be a part of the physician community in-group, their requests are unlikely to be received in the same manner as those from the in-group. There is evidence that the development of favoritism for the in-group is generally accompanied with greater hostility for the out-group (Stets and Burke 2000, Swann et al. 2009) because individuals seek to accentuate differences between the in- and out-groups. Perceived physician community identity deterioration refers to the belief among physicians that their identity may be threatened by the imposition of EHRS by non-governmental entities that represent the out-group and the result is resistance to, or suspicion of, such efforts. During a physician focus group study, one doctor angrily exclaimed, "Now we get a packet from an insurance company that says, 'we don't want them [the patients] on Statins,' and that bothers me!"

Demands from these stakeholders exert pressure on physician practices and interfere with the autonomy with which physicians treat patients. Although physicians have an element of discretion in how much importance and salience to attach to such demands because this set of stakeholders does not have the same level of authority to mandate as does the government, they may nevertheless believe that their identity is threatened by virtue of decreased autonomy and power that would result over their practice of medicine.

As discussed earlier, physicians "fiercely" value their autonomy and react adversely to attempts to regulate their behavior by the out-group (Ford et al. 2009). Studies of physician decision making in a healthcare setting find internal influences to be more persuasive than those that are externally imposed

(Ford et al. 2006, Kohli and Kettinger 2004). The underlying rationale is that influences such as pressure and evaluation can be detrimental to physicians' identity, creativity, and problem-solving behavior. Thus, when faced with externally imposed influences from out-group stakeholders to adopt and use EHRS, physician practices may perceive such demands as detracting from their community identity and resist such exhortations in order to maintain their community identity. Thus:

HYPOTHESIS 4 (H4). Perceived physician community identity deterioration associated with EHRS is negatively related to EHRS assimilation in a physician practice.

Research Methods

Sample and Data Collection

Physician practices across the United States served as the research setting for this study. To test our research model, we collected survey data from a sample of these practices. We developed the survey instrument based on a thorough literature review and interviews with physicians, administrators, and staff at a multifacility family health clinic in a southern state in the United States. Based on subsequent feedback from healthcare informaticians and physicians actively involved in health IT implementations, we refined the preliminary survey instrument. These steps ensured face and content validity of the survey. We pilot tested this survey with the members of the Center for Practice Innovation (CPI) at the American College of Physicians (ACP). After creating an online version of the survey using Zoomerang (<http://www.zoomerang.com>), we sent an email including a link to the survey to all 34 member practices of CPI. Twenty-four member practices responded to our survey for a response rate of 70.6%. Statistical tests conducted on these responses led to further refinements in the survey instrument, including dropping three items with low factor loadings.

Data were collected in waves with assistance from three health-related member organizations. In November 2006, the ACP sent its monthly electronic newsletter including a link to the online version of our survey to a randomly selected subset of member recipients. Two weeks after the link was sent, ACP members received an electronic reminder. We obtained a total of 190 responses from this wave of data collection. In January 2007, a link to the same electronic survey was sent to a randomly selected subset of the members of the American Medical Informatics Association (AMIA). We received an additional 25 responses from this second wave. To protect their membership, ACP and AMIA did not disclose the email addresses

or the number of recipients who received our invitation; therefore response rate could not be calculated. Finally, in April 2007, ACPnet, a practice-based research network of ACP that volunteers to examine healthcare processes, allowed us to survey its member practices. Seven hundred and thirty ACPnet member practices constituting the entire population received the electronic survey and we obtained 58 responses for a response rate of roughly 8%. Post data-collection discussions with ACP and AMIA officials confirmed that response rates for surveys with no financial incentives tend to stay below 10%. Although we are only able to determine a response rate for one wave of the study because of the nature of our data collection, response rate alone is a poor proxy for study quality because it yields scant information about the presence or absence of non-response bias (Rogelberg and Stanton 2007). Consequently, we conducted several tests to assess bias. We conducted an ANOVA test to assess differences in responses from the three different sources ($F_{(2,203)} = 1.37; p > 0.1$) and a two-sample *T*-test to assess any systematic differences in "early" versus "late" responses (t -value = 0.52; $p > 0.1$). We also conducted two-sample *T*-tests to compare commonly available variables such as the size of 100 randomly chosen U.S. physician practices and those in our sample (t -value = 0.68; $p > 0.1$). Our tests indicated that there were no systematic differences, providing evidence that non-response bias is not a significant problem with our data (Rogelberg and Stanton 2007).

In summary, through three waves of data collection, we gathered data from 273 respondents. An examination of the data deemed observations from 67 practices to be unusable because of key missing values, yielding a final sample of 206 total usable responses representing unique physician practices. Although we did not require the respondent to identify him/herself, at the end of the survey, we offered to send results to those who provided contact information. From this information combined with the requirement that they provide the name of the physician practice and the zip code, we were able to determine that there were no duplicates. Practices in the Midwest, West, South, and Northeast constitute 17%, 20%, 28%, and 35% of the sample, respectively. Respondents at these practices had an average tenure of 11 years. Their job titles varied, but the vast majority of them (87%) were Practice/Physician Owner, Physician Partner, and Physician President, suggesting that they served dual clinical and managerial roles, an ownership trend that is becoming more common (Adler et al. 2008). Thus, our respondents can be considered well-informed and competent to answer questions at the level of the practice. Physician informants are also used commonly in studies conducted at the practice level in the medical informatics literature (e.g., Simon

et al. 2007a). The unique characteristics embedded in physician practices, including highly trained physicians with much autonomy and decision-making power (Adler et al. 2008), coupled with frequent interactions with staff who seek the physician's guidance and direction, suggest that the physician is likely to play an important role in EHRS assimilation, and this viewpoint predominates the overall attitude at the organizational level of the physician practice.

Operationalization of Constructs

Because of the relative recency of electronic health records, limited research on health IT in the IS domain, and limited empirical work in social identity theory, several constructs had to be developed specifically for this study. The extensive literature on IT adoption and use served as guidance while developing survey items, and we adapted these existing measures to the context of healthcare and EHRS in particular. Most constructs were measured with multiple indicators coded on a seven-point Likert scale (see online appendix for items and reliability coefficients).²

The identity enhancement and deterioration constructs were operationalized based on a comprehensive review of medical informatics and IS literature, an appraisal of the popular press, and extensive observational data collection through site observations, interviews, and focus groups. Perceived care-provider identity reinforcement (*PCIR*) is a four-item scale assessing the viewpoints of doctors about how EHRS influence their role in diagnosing and treating patients. We drew on social network and institutional research to inform our development of the perceived physician community identity reinforcement (*PPCIR*) construct (Teo et al. 2003). In addition we used the popular press and interviews to identify key stakeholders that physicians would consider their in-group. The four items constituting *PPCIR* reflect our review and discussions.

Perceived careprovider identity deterioration (*PCID*) is a three-item scale that assesses the perception among clinicians that there may be negative consequences to their role behaviors associated with EHRS assimilation.³ To develop the perceived physician community identity deterioration (*PPCID*) construct, we also drew upon interviews, focus groups, and popular press reports of physician attitudes toward EHRS adoption and use. In this case, we noted the most common entities to which

physicians referred as influential stakeholders that do not provide direct care to patients. This resulted in a four-item scale. Finally, the two items used for perceived government influence (*PGI*), which focus on the impact from governmental entities, were derived from prior theoretical work suggesting that powerful external entities impact cognition, incentives, perceptions, and actions (Deci et al. 1999, Gagne and Deci 2005).

To control for alternative explanations of assimilation, IT infrastructure (*ITInfrastructure*), staff IT skill (*StaffSkill*), and patient technology savvy (*PatientTechSavvy*) were used as control variables and measured using three item scales each. Many of these items are based on prior work in IT adoption, use, and capabilities (Armstrong and Sambamurthy 1999, Bharadwaj 2000). We also control for several contextual and demographic variables that have been found to be influential in prior adoption and use studies including the size of the practice (*Size*), cost concerns (*CostConcerns*); and gender, position, and age of the respondent (Miller et al. 2005). Our controls are similar to those used by Devaraj and Kohli (2003) in their study of the link between IT usage and performance in a healthcare setting (see online appendix).

The dependent variable—*EHRS assimilation*—is operationalized using four indicator items. As recommended in IT adoption and use literature (e.g., Jaspersen et al. 2005), rather than employing a binary measure of use, we utilize a scale that taps into the nature and extent of EHRS use in various activities related to patient care. Our qualitative analysis identified EHR assimilation as a four-item factor consisting of key functions EHRS provide. These include managing the patient's medical history and clinical care record (through electronic notes and documentation); the ability to transmit prescriptions directly to the pharmacy (e-prescribing), thereby avoiding data recording and communication errors in medication dispensing; electronic linkages to other players involved in patient care such as specialty practices; and electronic receipt of patient data that may be generated by other entities for medical procedures (e.g., blood tests performed at a laboratory). The extent of use of these features was assessed using a seven-point scale anchored by "Not at all" and "Extensively." Descriptive data and correlations for constructs are shown in Table 1.

Data Analysis and Results

Data were collected from a single key respondent using one instrument, therefore, we checked for common method bias. As suggested by Podsakoff and Organ (1986), we conducted Harman's one-factor test. Principal components analysis (PCA) resulted in nine

² An electronic companion to this paper is available as part of the online version at <http://dx.doi.org/10.1287/isre.1110.0407>.

³ Item-level correlations were extremely small for careprovider identity deterioration indicators. The highest inter-item correlation was only 0.2. We modeled it both as a reflective and formative construct and our results stayed qualitatively the same.

Table 1 Correlation Matrix at the Construct Level

No.	Descriptive statistics construct	Mean	StdDev	1	2	3	4	5	6	7	8	9	10	11	12	13
1	PCIR	5.192	1.479	1.000												
2	PPCIR	4.329	1.328	<i>p</i> -val 0.146	1.000											
3	PCID	3.751	0.985	0.185 0.008	0.179 0.010	1.000										
4	PPCID	3.970	1.285	0.002 0.975	0.518 0.000	0.160 0.022	1.000									
5	PGI	4.720	1.605	-0.190 0.006	0.448 0.000	0.010 0.887	0.500 0.000	1.000								
6	Position within practice	0.886	0.319	-0.054 0.444	-0.073 0.307	-0.023 0.749	-0.060 0.401	0.031 0.661	1.000							
7	Gender of respondent	0.791	0.407	0.071 0.311	0.107 0.128	0.097 0.167	0.133 0.058	0.052 0.460	0.084 0.234	1.000						
8	Age of respondent	2.913	0.851	-0.044 0.532	-0.093 0.185	0.034 0.627	-0.039 0.583	-0.032 0.651	-0.019 0.785	0.046 0.515	1.000					
9	Size	3.054	2.155	0.091 0.216	0.024 0.744	0.147 0.045	0.096 0.194	0.086 0.244	0.003 0.963	-0.180 0.014	0.003 0.966	1.000				
10	Staff IT skill	5.296	1.237	0.222 0.001	0.001 0.989	-0.005 0.938	-0.058 0.410	-0.054 0.446	0.049 0.493	0.072 0.306	0.037 0.597	-0.057 0.444	1.000			
11	IT infrastructure	5.407	1.376	0.261 0.000	0.070 0.321	0.098 0.160	-0.019 0.787	-0.125 0.073	0.090 0.206	0.126 0.071	0.004 0.949	0.019 0.793	0.607 0.000	1.000		
12	Patient tech-savvy	4.217	1.411	0.067 0.338	0.000 0.996	0.099 0.160	0.094 0.181	-0.002 0.974	0.076 0.286	0.064 0.361	0.024 0.730	0.063 0.393	0.349 0.000	0.283 0.000	1.000	
13	Concerns about cost of EHRS	6.300	1.274	-0.194 0.005	0.211 0.002	-0.008 0.907	0.223 0.001	0.303 0.000	0.003 0.966	0.066 0.347	-0.065 0.358	-0.019 0.793	-0.207 0.003	-0.253 0.000	0.011 0.878	1.000
14	EHRS assimilation	2.185	2.505	0.282 0.000	0.027 0.700	0.071 0.310	-0.158 0.023	-0.240 0.001	0.005 0.941	0.043 0.541	-0.030 0.673	0.053 0.474	0.272 0.000	0.431 0.000	0.086 0.220	-0.340 0.000

Notes. PCIR: Perceived careprovider identity reinforcement; PPCIR: Perceived physician community identity reinforcement; PCID: Perceived careprovider identity deterioration; PPCID: Perceived physician community identity deterioration; PGI: Perceived government influence.

components, accounting for 71.3% of the total variance. The first component accounted for only 17.5% of the variance; hence, there was no general factor accounting for more than 50% of the variation. The generalized tests recommended by Podsakoff et al. (2003) also failed to detect significant common method bias. These results indicate that common method bias is not a significant problem in our study.

The reliability of constructs, as measured by composite reliability, varied from 0.72 to 0.92, suggesting adequate reliability. PCA showed that all items loaded highly on their expected construct but not on other constructs, establishing unidimensionality (see Table 2). We assessed convergent validity by reviewing indicator loadings. The loadings varied

from 0.29 to 0.94 and were significant ($p < 0.001$), establishing convergent validity of the scale (Gerbing and Anderson 1988). We assessed discriminant validity by performing the confidence interval test. For each pair of constructs, a confidence interval was calculated using the estimated correlation plus or minus twice the standard error. None of the intervals included 1.0 (see Table 3), supporting discriminant validity for all the constructs (Gerbing and Anderson 1988).

Results

We employed ordinary least squares (OLS) regression using PASW Statistics version 18 (formerly SPSS) to test our hypotheses. We estimated the research model using moderated regression analysis (Cohen

Table 2 Principal Component Analysis to Establish Unidimensionality and Validity

	1	2	3	4	5	6	7	8	9
1 ITInfrastructure									
infra2	0.838	0.118	0.263	-0.033	0.109	0.075	0.117	-0.234	0.013
infra1	0.806	0.249	0.171	0.057	0.053	0.048	0.149	-0.232	-0.061
infra3	0.727	0.336	0.204	-0.003	0.023	-0.037	-0.026	-0.018	0.073
infra4	0.701	0.325	0.193	0.057	0.023	0.043	-0.072	0.082	0.107
2 StaffSkill									
stf_skl4	0.142	0.892	0.055	0.165	0.291	0.013	0.124	-0.023	0.033
stf_skl5	0.259	0.742	0.050	0.158	0.217	-0.052	-0.235	0.274	-0.044
stf_skl1	0.446	0.666	0.082	0.145	0.171	0.066	-0.122	0.173	-0.007
3 EHRS assimilation									
USE_ERX	0.135	0.023	0.887	0.008	0.057	0.013	-0.037	-0.014	-0.048
USE_NOTE	0.238	0.121	0.857	0.081	0.025	-0.024	-0.085	-0.126	0.032
USE_COMM	0.159	0.096	0.908	0.093	0.044	0.058	0.000	0.005	0.040
USE_LAB	0.207	0.125	0.820	0.097	-0.067	0.086	-0.031	-0.102	0.085
4 PCIR									
enh_cir1	0.078	0.108	0.094	0.804	0.024	0.138	0.080	-0.043	0.159
enh_cir2	0.082	0.075	0.076	0.827	-0.015	0.055	0.115	-0.159	0.099
enh_cir3	0.052	-0.057	0.009	0.737	0.051	0.149	0.016	-0.088	0.123
enh_cir4	0.140	0.101	0.134	0.831	0.021	0.029	-0.058	0.136	0.027
5 PatientTechSavvy									
pt_tech1	0.143	0.123	-0.023	-0.011	0.915	-0.036	0.031	-0.013	0.070
pt_tech2	0.155	0.150	-0.015	-0.003	0.943	-0.032	0.066	-0.021	0.040
pt_tech3	0.249	0.275	0.099	0.113	0.873	0.026	0.042	-0.014	-0.024
6 PPCIR									
enh_comp	0.093	0.073	0.073	0.067	0.084	0.659	0.404	0.022	0.210
enh_hosp	0.007	0.055	-0.002	0.070	0.039	0.754	0.233	0.240	0.243
enh_docs	0.113	0.113	0.119	0.106	-0.035	0.709	0.073	-0.020	-0.233
enh_admt	-0.074	-0.096	-0.006	0.044	-0.105	0.744	-0.011	0.256	0.000
7 PPCID									
inf_jcah	0.017	-0.022	-0.173	0.083	0.013	0.335	0.443	0.259	-0.011
inf_vend	-0.051	-0.121	-0.109	0.042	0.052	0.089	0.766	0.025	-0.135
inf_drug	0.053	0.042	0.020	-0.007	0.077	0.202	0.733	0.138	0.078
inf_insu	-0.001	0.057	-0.038	0.113	-0.020	0.113	0.607	0.555	0.173
8 PGI									
inf_govt	0.070	0.127	-0.196	-0.039	-0.007	0.210	0.308	0.766	-0.043
enh_fed	-0.128	-0.128	-0.053	-0.152	-0.043	0.229	0.052	0.733	-0.057
9 PCID									
thr_cid2	-0.003	-0.222	0.087	0.114	0.111	0.051	0.246	-0.209	0.432
thr_cid3	0.071	0.043	0.050	0.135	0.042	0.042	-0.047	0.019	0.854
thr_cid1	-0.023	-0.145	0.044	-0.663	-0.064	0.127	0.034	-0.033	0.290

Notes. PCIR: Perceived careprovider identity reinforcement; PPCIR: Perceived physician community identity reinforcement; PCID: Perceived careprovider identity deterioration; PPCID: Perceived physician community identity deterioration; PGI: Perceived government influence.

Table 3 Confidence Interval Tests to Establish Discriminant Validity

	PCIR	PCID	PPCID	PGI	StaffSkill	ITInfrastructure	PatientTechSavvy
PCIR	0.102 (0.078) [-0.054, 0.258]	0.185 (0.103) [-0.021, 0.391]	0.002 (0.081) [-0.160, 0.164]	-0.190 (0.064) [-0.318, -0.062]	0.222 (0.082) [0.058, 0.386]	0.261 (0.073) [0.115, 0.407]	0.067 (0.074) [-0.081, 0.215]
PPCIR		0.179 (0.093) [-0.007, 0.365]	0.518 (0.062) [0.394, 0.642]	0.448 (0.052) [0.344, 0.552]	0.001 (0.075) [-0.149, 0.151]	0.070 (0.068) [-0.066, 0.206]	0.000 (0.065) [-0.130, 0.130]
PCID			0.160 (0.053) [0.054, 0.266]	0.010 (0.043) [-0.076, 0.096]	-0.005 (0.056) [-0.117, 0.107]	0.098 (0.050) [-0.002, 0.198]	0.099 (0.043) [0.001, 0.197]
PPCID				0.500 (0.049) [0.402, 0.598]	-0.058 (0.073) [-0.204, 0.088]	-0.019 (0.066) [-0.151, 0.113]	0.094 (0.063) [-0.032, 0.220]
PGI					-0.054 (0.091) [-0.236, 0.128]	-0.125 (0.081) [-0.287, 0.037]	-0.002 (0.079) [-0.160, 0.156]
StaffSkill						0.607 (0.050) [0.507, 0.707]	0.349 (0.058) [0.233, 0.465]
ITInfrastructure							0.283 (0.066) [0.151, 0.415]

Notes. Correlation coefficient (standard error); [95% confidence interval]; PCIR: Perceived careprovider identity reinforcement; PPCIR: Perceived physician community identity reinforcement; PCID: Perceived careprovider identity deterioration; PPCID: Perceived physician community identity deterioration; PGI: Perceived government influence.

and Cohen 1983). We estimated the model initially using only the control variables and subsequently added the main effects and interaction effects to the base model. The full model estimated can be expressed as:

$$\begin{aligned}
 \text{Assimilation}_i &= \beta_0 + \beta_1 * \text{Position}_i + \beta_2 * \text{Gender}_i + \beta_3 * \text{Age}_i \\
 &+ \beta_4 * \text{Size}_i + \beta_5 * \text{StaffSkill}_i + \beta_6 * \text{ITInfrastructure}_i \\
 &+ \beta_7 * \text{PatientTechSavvy}_i + \beta_8 * \text{CostConcerns}_i \\
 &+ \beta_9 * \text{PCIR}_i + \beta_{10} * \text{PCID}_i + \beta_{11} * \text{PPCIR}_i \\
 &+ \beta_{12} * \text{PPCID}_i + \beta_{13} * \text{PGI}_i + \beta_{14} * (\text{PCIR}_i * \text{PGI}_i) \\
 &+ \beta_{15} * (\text{PCID}_i * \text{PGI}_i) + \varepsilon_i
 \end{aligned}$$

where β_0 is the constant term; β_1 through β_{15} are the coefficients associated with study constructs and control variables; Position_i , Gender_i , and Age_i reflect respondent details; StaffSkill_i , $\text{ITInfrastructure}_i$, and CostConcerns_i represent practice details; $\text{PatientTechSavvy}_i$ accounts for the technological savvyness of patients; PCIR_i = perceived careprovider identity reinforcement for the i th practice; PCID_i = perceived careprovider identity deterioration for the i th practice; PPCIR_i = perceived physician community identity reinforcement for the i th practice; PPCID_i = perceived physician community identity deterioration for the i th practice; PGI_i = perceived government influence for the i th practice; and ε_i is the error term.

A series of tests were performed to confirm the suitability of the OLS approach to analyze the data. Outlier analysis conducted using DFBETAS values indicated that there were no influential outliers from among the 206 usable responses. Next, the distributional assumptions of the error terms were verified.

Visual inspection of the normal probability plot suggested that the error terms can be assumed to be from a normal population. The Shapiro-Wilk test (Shapiro and Wilk 1965) also suggested that at the 5% significance level, the assumption of normality of error terms was not violated. The correlations between constructs and values for variance inflation factors (VIF) indicate that multicollinearity is not a problem (highest VIF = 1.6). The Breusch-Pagan test was performed to test for heteroscedasticity, and it was not detected at $\alpha = 0.05$. These steps suggest that the OLS regression approach is appropriate for our data.

The regression results are reported in Table 4. Model 1 includes only control variables. The results indicate that two control variables—*ITInfrastructure* and *costConcerns*—are significantly related to EHRS assimilation, and the overall model is insignificant. Model 2 includes the main effects, in addition to control variables. The overall model is significant, and four out of the five main effects coefficients are significant, as is the change in R^2 compared to the base model (F change = 2.26; $p < 0.05$). Model 3 includes the moderating effects, in addition to the main effects and control variables. The change in R^2 between the main effects model and the moderated effects model is significant (F change = 3.04; $p < 0.05$), with both the interaction effects having significant coefficients. Model 3 accounts for 22.9% of the variance in EHRS assimilation and the variance explained increases significantly from Models 1 to 2 and 2 to 3.

In H1, we posited that government influence would diminish the positive relationship between perceived careprovider identity reinforcement and EHRS assimilation. As shown in Table 4, Model 3, the coefficient for the first interaction term is negative and significant ($\beta_{14} = -0.147$, $p < 0.05$); therefore, H1 is

Table 4 Regression Results: *EHRS Assimilation* is Dependent Variable

		Model 1	Model 2	Model 3
Constant	Unstd coefficient [Standard error]	-0.029 [0.066]	-0.029 [0.065]	-0.031 [0.066]
Job title of respondent	Position	-0.062 [0.068]	-0.039 [0.068]	0.013 [0.066]
Gender of respondent	Gender	0.021 [0.069]	0.017 [0.069]	0.024 [0.067]
Age of respondent	Age	-0.048 [0.067]	-0.028 [0.066]	-0.016 [0.069]
Number of physicians in practice	Size	0.043 [0.068]	0.058 [0.068]	0.068 [0.052]
Staff IT skill	StaffSkill	0.019 [0.088]	0.022 [0.088]	0.021 [0.088]
IT infrastructure	ITInfrastructure	0.326*** [0.084]	0.283*** [0.084]	0.221*** [0.069]
Patient tech-savvy	PatientTechSavvy	-0.040 [0.072]	-0.045 [0.071]	-0.047 [0.070]
Cost Concerns	CostConcerns	-0.255*** [0.070]	-0.224*** [0.071]	-0.220*** [0.072]
Perceived careprovider identity reinforcement	PCIR		0.136** [0.074]	0.208*** [0.078]
Perceived careprovider identity deterioration	PCID		-0.002 [0.068]	0.022 [0.069]
Perceived physician community identity reinforcement	PPCIR		0.185** [0.080]	0.182** [0.082]
Perceived physician community identity deterioration	PPCID		-0.120* [0.070]	-0.140* [0.083]
Perceived government influence	PGI		-0.161** [0.080]	-0.164** [0.081]
PCIR × PGI	PCIR * PGI			-0.147** [0.074]
PCID × PGI	PCID * PGI			0.081* [0.049]
	Adj-R ²	0.119	0.180**	0.229**
		$\alpha = 0.05$	$F_{\text{calc}} = 2.84$ $F_{191}^4 = 2.26$	$F_{\text{calc}} = 6.01$ $F_{189}^2 = 3.04$

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

supported. In H2 we hypothesized that government influence would intensify the negative relationship between perceived careprovider identity deterioration and EHRS assimilation, and as shown, the coefficient is positive and significant ($\beta_{15} = 0.081$, $p < 0.10$), which does not support H2. In H3 and H4 we argued that perceived physician community identity reinforcement and perceived physician community identity deterioration would, respectively, be positively and negatively related to EHRS assimilation. Both these relationships are supported ($\beta_{11} = 0.182$, $p < 0.05$; $\beta_{12} = -0.14$, $p < 0.10$).

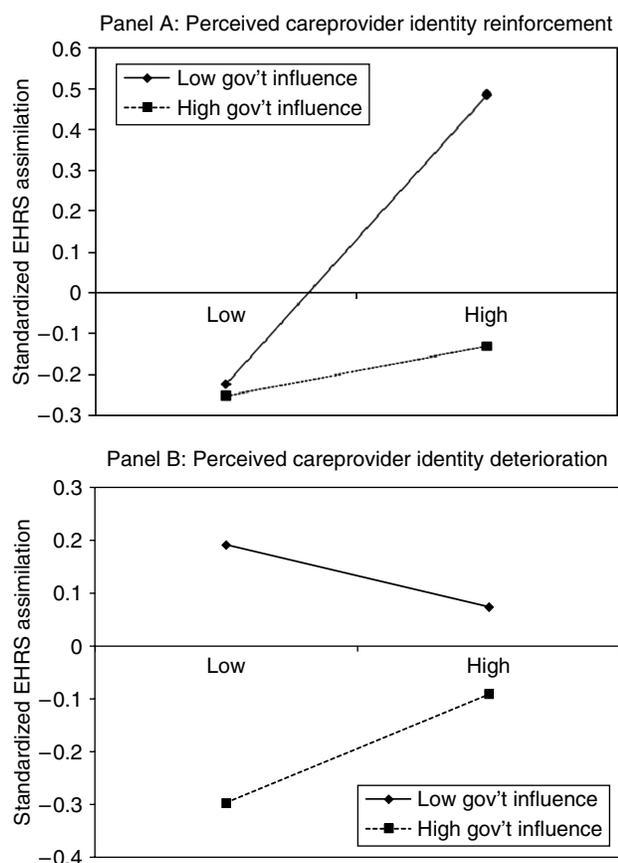
To obtain a more fine-grained understanding of the nature of moderation, we inspected the interactions between the two careprovider identity constructs and government influence visually (see Figure 2). Two levels of moderator and main effects constructs were created by calculating the mean level of the vari-

ables and adding one standard deviation to the mean (high) and subtracting one standard deviation from the mean (low).

The graph displaying the moderating impact of government influence on the relationship between PCIR and EHRS assimilation (Panel A, Figure 2) shows that for every level of reinforcement, assimilation is higher when government influence is low. Furthermore, when perceived reinforcement is low, assimilation is low for both high and low levels of government influence; however, when perceived reinforcement is high, EHRS assimilation increases only marginally for high government influence, whereas it increases strikingly for low government influence.

The graph displaying the moderating impact of government influence on the relationship between PCID and EHRS assimilation (Panel B, Figure 2) indicates that at low levels of government influence,

Figure 2 Graphical Representation of Interaction Results



the relationship between identity deterioration and assimilation is negative, whereas at high levels of government influence, the relationship is positive. When deterioration is perceived to be low and government influence is high, physician practices use EHRS sparingly. However, at each level of perceived deterioration, EHRS assimilation is higher when governmental influence is low. We discuss our results next.

Discussion

This study was motivated by the observation that although EHRS offer considerable promise in alleviating problems associated with the delivery of healthcare, their assimilation has been limited. Low assimilation among physician practices is particularly vexing because EHRS can facilitate access to consistent data among a wide variety of dispersed stakeholders in the healthcare value chain such as hospitals, laboratories, pharmacies, and physician practices. Although practitioner-oriented articles have discussed and speculated about the reasons for low adoption rates, theoretically grounded academic research examining the assimilation of EHRS in physician practices has been sparse. Drawing upon the role and social identities of physicians, we suggested that

perceived identity reinforcements and deteriorations are simultaneously consequential in explaining the assimilation of EHRS in physician practices. To our knowledge, ours is among the first studies in IS to use identity theories to conceptualize notions of identity reinforcement and deterioration and apply them to understand the assimilation of technological innovations in the healthcare industry. We thus provide a novel lens that extends extant theory development in IT adoption and use. The support obtained for the proposed research model underscores the applicability of the conceptual foundation and suggests that it can serve as a robust basis for researchers to examine the adoption of technological innovations in other professional organizations.

Tripsas (2009) asserts that identity is the core essence of entities, directing and constraining actions and reflecting the totality of capabilities, resource bases, procedures, and information filters. Not surprisingly then, individuals and organizations alike actively try to manage their identities by claiming, maintaining, revising, or totally altering them. A threat to identity may elicit a visceral reaction. Identity changes and evolutions for physicians are particularly noteworthy because such changes can have serious consequences, including life and death implications. Identity changes can be triggered by seemingly small technological shifts (Tripsas 2009), and thus it is critical to examine the evolution of roles and identity triggered by transformational technological innovations such as EHRS that have the potential to affirm, as well as to challenge, the core of physician practices.

We posited direct relationships between the two social identity constructs—perceived physician community identity reinforcement and perceived physician community identity deterioration—and EHRS assimilation. Both relationships were found to be significant, supporting our arguments that perceptions of social identity evolution are associated with subsequent actions. In the first case, when the action is consistent with referent others and enhances physicians' standing within their group, they openly embrace EHRS. In the second case, when out-group others' insistence is perceived as meddlesome, physicians take action to preserve their identity from threats.

We also proposed two moderated relationships for the effect of government influence on the relationships between (1) perceived careprovider identity reinforcement and EHRS assimilation and (2) perceived careprovider identity deterioration and EHRS assimilation. As predicted, the former relationship is negatively moderated, but contrary to expectations, the latter relationship is positively moderated. That is, government influence negatively impacts the positive relationship between perceived careprovider identity reinforcement and EHRS assimilation and

dampens the negative relationship between perceived careprovider identity deterioration and EHRS assimilation rather than exacerbating it. The first result suggests that when physician practices feel coerced, this pressure dominates their perceptions about reinforcements and undermines the direct effect of reinforcements. Such dampening effects are particularly strong for complex tasks such as EHRS assimilation (Gagne and Deci 2005).

To better understand the counterintuitive finding in the second result, we turn to the interaction graphs (Panel B, Figure 2). The visual inspection of moderation suggests an increasing value of EHRS assimilation when government influence is high. *Ceteris paribus*, one would not expect assimilation to increase when the perceived threat to careprovider identity is greater. One explanation for this result is that physicians who perceive strong government influence and believe EHRS are threatening elect to use them to conform to mandates and avoid sanctions and reprisals. By contrast, doctors who believe the threat to be small simply do not respond to mandates. The moderation graphs illustrate the complex nature of interactions between governmental influence and physician role identity reinforcements and threats in their joint effects on EHRS assimilation.

Limitations of the Research

Prior to discussing the implications of this study, we acknowledge its limitations. We used three independent samples to gather data, and it is possible that there was some overlap in the samples. In other words, it is possible that a physician practice received our survey multiple times; however, we did not see evidence of this in our data set. The tested relationships are at best correlational; the cross-sectional nature of data limits our ability to assess causality. Future research can undertake a longitudinal study. Such studies will be particularly useful to investigate the evolution of identities among physicians and to assess if such changes have any impact on their technology assimilation. Finally, common-method bias and non-response bias are persistent concerns in survey-based research. We tested for common-method bias and found that it was not a significant issue affecting our results. As per the suggestions of Podsakoff et al. (2003), we also (1) allowed responses to be anonymous and assured respondents that there were no right or wrong answers and (2) attempted to have simpler and more direct questions through iterative pilot testing for ease of understanding. These steps collectively mitigate the threat of common-method bias (Podsakoff et al. 2003). However, future research can circumvent the issue of common-method bias by employing data collection from multiple sources, including secondary sources. Furthermore, although

our tests demonstrated a lack of substantive non-response bias, future research can take additional measures such as active and passive non-response analysis (Rogelberg and Stanton 2007). We note that we are able to obtain a robust sample size and sampling frames were randomized by ACP and AMIA, thereby increasing the likelihood that our sample is representative of the population.

Research Contributions and Implications

This paper makes several useful contributions to theory. We conceptualize two distinct identities of physicians drawing upon notions of role identity and social identity, careprovider and physician community. We theorize and empirically demonstrate that expected evolution in these identities caused by a technological innovation affects assimilation of the innovation. In demonstrating this, we advance the literature in several ways. First, we inform technology adoption and use research by applying identity theories in the novel context of EHRS assimilation. Although the practice of medicine is known to engender strong identities, especially in physicians (Real et al. 2009), other professions are likely to exhibit equally powerful identities—for example, investment bankers, lawyers, and professors. To the extent that our work informs IT assimilation in the context of potent professional identities, it is likely to provide new insights into organizational behavior when innovations are introduced. We believe that social identity theories hold significant potential for explaining several phenomena of interest to IS and health informatics researchers. Second, although the broad and deep research drawing upon and contributing to identity theories has added significantly to the knowledge base, a vast majority of it has been theoretical, and large-sample empirical research in this domain is very limited. This large-sample empirical study attempts to fill an important gap in the literature.

Third, we adapt and use measures for various components of the theoretical model that are instantiated to the specific context of the physician practice. These measures can serve as the basis for related future research. In particular, we conceptualize and operationalize physician identity enhancement and deterioration constructs that can be applied to other contexts with relatively minor adaptations.

Several promising opportunities for future work remain. First, drawing upon sociological studies of the practice of medicine and social psychology research, we explored two significant identities that define physicians. However, as underscored in the literature, individuals can hold numerous identities simultaneously. Additions to the physician identity set can be explored through qualitative field work, especially in light of the impending changes to the

healthcare system. Second, our focus was on EHRS assimilation by physician practices, but the overarching goal of integration and interoperability in healthcare requires other entities to adopt this technology as well. Theoretical models and empirical studies that examine EHRS adoption and use by other stakeholders such as hospitals and insurance companies would provide a useful complement to this research. The evolution of organizational identity could be explored for these entities. Furthermore, individual-level studies are important to understand the micro-level dynamics of incorporating EHRS into the work practices of physicians, nurses, and other key personnel, and group-level studies are important to understand outcomes related to resistance to technology implementation (Lapointe and Rivard 2007).

Although the focus of this paper was on explaining the assimilation of a technological innovation through the lens of identity, the notion of identity and its formation, evolution, and impacts can serve as a powerful theoretical foundation to inform a variety of IS phenomena. For example, although concepts of identity have been applied in the context of technology-mediated communities to understand knowledge contribution and satisfaction (Ma and Agarwal 2007), emerging interaction channels in the form of social media that can allow individuals to “affiliate” with multiple collectives simultaneously raise interesting questions. Is there an “optimal” number of collectives beyond which an individual experiences identity conflict? What are the effects of simultaneous social identities when the referent groups from which these identities are constructed are characterized by incongruent norms and values? Can identities evolve over time in response to external feedback such as that provided by member recommendations and feedback? There are also interesting questions related to individual personality traits and the interplay with online identities. For instance, can an offline introvert take on personality characteristics of an extrovert when participating in an online social network?

Implications for Practice

Our findings have significant practical implications and suggest that care should be taken when implementing policy and designing incentives targeted toward increasing EHR system adoption and use within physician practices. There has been a perception among physicians that the introduction of an EHR system will fundamentally alter the way they practice medicine in their clinic and provide care to patients. Indeed, considerable negative emotion is being generated among some physicians about the impending digitization of healthcare. It is important for IT vendors, policymakers, and professional

organizations such as the ACP, American Medical Association, AMIA, and Health Information and Management Systems Society to craft messages for physicians and reiterate that EHRS have the potential to reinforce their roles as careproviders. Policymakers need to carefully manage the negative symbolism of EHRS before a vicious cycle, characterized by resistance and innovation implementation failure, takes hold. Professional networks—physicians practices, hospitals, and other physicians—with whom physicians associate play a central role in the adoption and use of EHRS. Identity-reinforcing messages from these practices, hospitals, and physicians, who have successfully adopted and implemented an EHR system, can wield a particularly powerful influence on the decision of the practice to assimilate.

We also find that physician identity is threatened by pressures from other organizations such as vendors and insurance companies, and threat affects EHRS assimilation negatively. We conjecture that such attempts are harmful at best and create downright hostility at worst. We also find that government influence does not have desirable impact on EHRS assimilation. Whereas physicians who perceive EHRS as a threat to their role may use EHRS under government pressure to avoid sanctions, those physicians who believe in the technology may rebel against the pressure. Policymakers need to reconsider how much and what type of external mandates and fiats they wish to impose.

Finally, two control variables, which are not the focus of our study, also provide useful directions to physician practices and policymakers. From the perspective of the physician practice, our findings underscore the importance of the IT infrastructure and the existing state of digitization within the organization in facilitating the adoption of new technologies. Often, infrastructure investments are challenging to justify because they do not appear to contribute directly to business outcomes. However, in the absence of a strong foundation, the practice may forgo the “option value” of the infrastructure (Fichman et al. 2005) and find itself unable to exploit critical developments in health IT. As the nearly \$20 billion allocated toward health IT in the American Recovery and Reinvestment Act is being released, it may be worthwhile to remember that IT infrastructure in physician practices has a direct and significant impact on EHRS adoption, and hence a significant proportion of the allocation should be spent on practices that are lagging in IT infrastructure creation. Additionally, our results show that staff IT skill has an insignificant impact on EHRS adoption and use. This may be good news for practices where the staff is not technology savvy, because the prior expertise of the staff may not be a significant factor and may not be directly applicable in the new context

of EHRS. The rationale is that whereas the focus of most prior technologies is predominantly internal and the scope limited to a few activities, EHRS focus on internal processes as well as integration with external stakeholders. Consequently, the skills and experience of staff familiar with other technologies may not enable them to be sufficiently agile and responsive and may not be a differentiator in EHRS assimilation. Thus, while designing training programs, relatively more content should be EHRS-specific and not general IT training because the latter may not have a significant impact.

Conclusion

This paper examined EHRS assimilation among physician practices in the United States, a topic that, for the most part, has not been studied using perspectives strongly rooted in theory. We utilized a novel theoretical lens: that of physicians' identities. As policymakers and stakeholders in the healthcare industry endeavor to enhance access to patient information as one mechanism for reducing medical errors and improving quality of care, it will become important for researchers to study EHRS and a variety of other technologies among physician practices. To that end, this study has contributed to theory and practice by applying the lens of identity theory and social identity theory to understand EHRS assimilation, a context in which it has not been used before. Our research model and results present a fine-grained perspective of the role of perceived physician identity reinforcement and threat on EHRS adoption and use and extend the empirical research employing social identity theories. Our results indicate how various identity enhancements and threats and governmental influence are likely to be consequential in assimilation, providing levers that managers and policymakers can manipulate. These results contribute to a nascent but emerging stream of literature that investigates various phenomena associated with healthcare IT adoption, use, and impacts. We hope that this study stimulates further research to enrich our understanding of health IT and the institutional contexts within which it operates.

Electronic Companion

An electronic companion to this paper is available as part of the online version at <http://dx.doi.org/10.1287/isre.1110.0407>.

Acknowledgments

The authors thank the American College of Physicians and the American Medical Informatics Association for allowing them to survey their members. Financial support for this research was provided by Pfizer Healthcare Informatics. Comments and suggestions provided by colleagues at

Georgia State University and the University of Maryland significantly improved the quality of the paper. The authors are deeply indebted to the Senior Editor, Anandhi Bharadwaj, the Associate Editor, Radhika Santhanam (whose name was revealed to them after the paper was accepted), and three anonymous reviewers for their excellent comments and suggestions throughout the review process.

References

- Abdelal, R., Y. M. Herrera, A. I. Johnston, R. McDermott. 2006. Identity as a variable. *Perspect. Politics* 4(4) 695–711.
- Adler, P. S., S.-W. Kwon, C. Heckscher. 2008. Professional work: The emergence of collaborative community. *Organ. Sci.* 19(2) 359–376.
- AMA—American Medical Association. 2011. Physician quality measure reporting. Accessed July 18, 2011, <http://www.ama-assn.org/ama/pub/physician-resources/clinical-practice-improvement/clinical-quality/physician-quality-reporting-system-2011.page>.
- Angst, C. M., R. Agarwal, V. Sambamurthy, K. Kelley. 2010. Social contagion and information technology diffusion: The adoption of electronic medical records in U.S. hospitals. *Management Sci.* 56(8) 1219–1241.
- Ansari, S. M., P. C. Fiss, E. J. Zajac. 2010. Made to fit: How practices vary as they diffuse. *Acad. Management J.* 35(1) 67–92.
- Apker, J., S. Eggly. 2004. Communicating professional identity in medical socialization: Considering the ideological discourse of morning report. *Quant. Health Res.* 14(3) 411–429.
- Armstrong, C. P., V. Sambamurthy. 1999. Information technology assimilation in firms: The influence of senior leadership and IT infrastructures. *Inform. Systems Res.* 10(4) 304–327.
- ARRA—American Recovery and Reinvestment Act: Title XIII, Health Information Technology for Economic and Clinical Health Act (HITECH Act). 2009. About the recovery act. Pub.L.No.111-5,123 stat.115. Accessed March 26, 2012, <http://www.whitehouse.gov/recovery/about/>.
- Ashforth, B., F. Mael. 1989. Social identity theory and the organization. *Acad. Management Rev.* 14(1) 20–39.
- Attewell, P. 1992. Technology diffusion and organizational learning: The case of business computing. *Organ. Sci.* 3(1) 1–19.
- Audet, A. M., M. M. Doty, J. Peugh, J. Shamasdin, K. Zapert, S. Schoenbaum. 2004. Information technologies: When will they make it into physicians' black bags? *Medscape General Medicine* 6(4) 1–4.
- Bandura, A. 1986. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice-Hall, Englewood Cliffs, NJ.
- Bartel, C. A. 2001. Social comparisons in boundary-spanning work: Effects of community outreach on members' organizational identity and identification. *Admin. Sci. Quart.* 46(3) 379–413.
- Bharadwaj, A. S. 2000. A resource-based perspective on information technology capability and firm performance: An empirical investigation. *MIS Quart.* 24(1) 169–196.
- Brewer, M., W. Gardner. 1996. Who is this "we"? Levels of collective identity and self representations. *J. Personality Soc. Psych.* 71(1) 83–93.
- Brickson, S. L. 2005. Organizational identity orientation: Forging a link between organizational identity and organizations' relations with stakeholders. *Admin. Sci. Quant.* 50(4) 576–609.
- Brynjolfsson, E., C. F. Kemerer. 1996. Network externalities in microcomputer software: An econometric analysis of the spreadsheet market. *Management Sci.* 42(12) 1627–1647.
- Burke, P. J., D. C. Reitzes. 1991. An identity theory approach to commitment. *Soc. Psych. Quart.* 54(3) 239–251.
- Burns, L. R. 2002. *The Healthcare Value Chain*. John Wiley & Sons, San Francisco.

- Bush, G. W. 2004. Exec. Order No. 13335, Incentives for the Use of Health Information Technology and Establishing the Position of the National Health Information Technology Coordinator, 69 Fed. Reg. 24059.
- Chatterjee, D., R. Grewal, V. Sambamurthy. 2002. Shaping up for e-commerce: Institutional enablers of the organizational assimilation of Web technologies. *MIS Quart.* 26(2) 65–89.
- Chiasson, M., E. Davidson. 2005. Taking industry seriously in information systems research. *MIS Quart.* 29(4) 591–605.
- Chreim, S., B. Williams, C. Hinings. 2007. Interlevel influences on the reconstruction of professional role identity. *Acad. Management J.* 50(6) 1515–1539.
- Clayton, P. D., S. P. Narus, W. A. Bowes III, T. S. Madsen, A. B. Wilcox, G. Orsmond, B. Rocha et al. 2005. Physician use of electronic medical records: Issues and successes with direct data entry and physician productivity. *AMIA Annu. Symp. Proc.* 2005, AMIA, Bethesda, MD, 141–145.
- Cohen, J., P. Cohen. 1983. *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences*. Lawrence Erlbaum Associates, Hillsdale, NJ.
- Davidson, E., W. G. Chismar. 2007. The interaction of institutionally triggered and technology-triggered social structure change: An investigation of computerized physician order entry (CPOE). *MIS Quart.* 31(4) 739–758.
- Davis, F. D. 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quart.* 13(3) 319–339.
- Deci, E. L., R. Koestner, R. M. Ryan. 1999. A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psych. Bull.* 125(6) 627–668.
- DesRoches, C., E. Campbell, S. Rao, K. Donelan, T. Ferris, A. Jha, R. Kaushal et al. 2008. Electronic health records in ambulatory care: A national survey of physicians. *New England J. Medicine* 359(1) 50–60.
- Devaraj, S., R. Kohli. 2003. Performance impacts of information technology: Is actual usage the missing link? *Management Sci.* 49(3) 273–299.
- Dukerich, J., B. Golden, S. Shortell. 2002. Beauty is in the eye of the beholder: The impact of organizational identification, identity, and image on the cooperative behaviors of physicians. *Admin. Sci. Quant.* 47(3) 507–537.
- Elsbach, K. 2003. Relating physical environment to self-categorizations: Identity threat and affirmation in a non-territorial office space. *Admin. Sci. Quant.* 48(4) 622–654.
- Elsbach, K. D., R. M. Kramer. 1996. Members' responses to organizational identity threats: Encountering and countering the *Business Week* rankings. *Admin. Sci. Quant.* 41(3) 442–476.
- Ethier, K. A., K. Deaux. 1994. Negotiating social identity when contexts change: Maintaining identification and responding to threat. *J. Personality Soc. Psych.* 67(2) 243–251.
- Fichman, R. G., M. Keil, A. Tiwana. 2005. Beyond valuation: "Options thinking" in IT project management. *California Management Rev.* 47(2) 74–96.
- Fiks, A., E. Alessandrini, C. Forrest, S. Khan, A. Localio, A. Gerber. 2011. Electronic medical record use in pediatric primary care. *J. Amer. Medical Inform. Assoc.* 18(1) 38–44.
- Fiss, P., E. Zajac. 2006. The symbolic management of strategic change: Sensegiving via framing and decoupling. *Acad. Management J.* 49(6) 1173–1193.
- Ford, E. W., N. Menachemi, M. T. Phillips. 2006. Predicting the adoption of electronic health records by physicians: When will health care be paperless? *J. Amer. Medical Inform. Assoc.* 13(1) 106–112.
- Ford, E. W., N. Menachemi, L. T. Peterson, T. R. Huerta. 2009. Resistance is futile: But it is slowing the pace of EHR adoption nonetheless. *J. Amer. Medical Inform. Assoc.* 16(3) 274–281.
- Foreman, P., D. A. Whetten. 2002. Members' identification with multiple-identity organizations. *Organ. Sci.* 13(6) 618–635.
- Freidson, E. 1994. *Professionalism Reborn: Theory, Prophecy, and Policy*. University of Chicago Press, Chicago.
- Gagne, M., E. L. Deci. 2005. Self-determination theory and work motivation. *J. Organ. Behav.* 26(4) 331–362.
- Gerbing, D. W., J. C. Anderson. 1988. An updated paradigm for scale development incorporating unidimensionality and its assessment. *J. Marketing* 25(2) 186–192.
- Hart, P., C. Saunders. 1997. Power and trust: Critical factors in the adoption and use of electronic data interchange. *Organ. Sci.* 8(1) 23–42.
- Hogg, M. A. 2001. A social identity theory of leadership. *Personality Soc. Psych. Rev.* 5(3) 184–200.
- Hogg, M. A., C. McGarty. 1990. Self-categorization and social identity. D. Abrams, M. A. Hogg, eds. *Social Identity Theory: Constructive and Critical Advances*. Harvester Wheatsheaf, London, 10–27.
- Hogg, M., D. Terry. 2000. Social identity and self-categorization processes in organizational contexts. *Acad. Management Rev.* 25(1) 121–140.
- Hogg, M., D. Terry, K. White. 1995. A tale of two theories: Critical comparison of identity theory and social identity theory. *Social Psych. Quart.* 58(4) 255–269.
- Hsiao, C. J., C. W. Burt, E. Rechtsteiner, E. S. Hing, D. A. Woodwell, J. E. Sisk. 2008. Preliminary estimates of electronic medical records use by office-based physicians: United States, 2008. Centers for Disease Control, <http://www.cdc.gov/nchs/products/pubs/pubd/hestats/hestats.htm>.
- Ibarra, H., R. Barbulescu. 2010. Identity as narrative: Prevalence, effectiveness, and consequences of narrative identity work in macro work role transitions. *Acad. Management Rev.* 35(1) 135–154.
- Jaspersion, J., P. E. Carter, R. W. Zmud. 2005. A comprehensive conceptualization of post-adoptive behaviors associated with information technology enabled work systems. *MIS Quart.* 29(3) 525–557.
- Jha, A. K., C. M. DesRoches, E. G. Campbell, K. Donelan, S. R. Rao, T. G. Ferris, A. Shields et al. 2009. Use of electronic health records in U.S. hospitals. *New England J. Medicine* 360(16) 1628–1638.
- Johnson, M., F. Morgeson, D. Ilgen, C. Meyer, J. Lloyd. 2006. Multiple professional identities: Examining differences in identification across work-related targets. *J. Appl. Psych.* 91(2) 498–506.
- Kazley, A. S., Y. A. Ozcan. 2007. Organizational and environmental determinants of hospital EMR adoption: A national study. *J. Medical Systems* 31(5) 375–384.
- Kim, S. 2009. The integrative framework for technology use: An extension and test. *MIS Quart.* 33(3) 513–537.
- Kohli, R., W. Kettinger. 2004. Informating the clan: Controlling physicians' costs and outcomes. *MIS Quart.* 28(3) 363–394.
- Kreiner, G. E., B. E. Ashforth. 2004. Evidence toward an expanded model of organizational identification. *J. Organ. Behav.* 25(1) 1–27.
- Kreiner, G., E. Hollensbe, M. Sheep. 2006. On the edge of identity: Boundary dynamics at the interface of individual and organizational identities. *Human Relations* 59(10) 1315–1341.
- Lapointe, L., S. Rivard. 2005. A multilevel model of resistance to information technology implementation. *MIS Quart.* 29(3) 461–491.
- Lapointe, L., S. Rivard. 2007. A triple take on information system implementation. *Organ. Sci.* 18(1) 89–107.
- Lichtenstein, R., J. A. Alexander, J. F. McCarthy, R. Wells. 2004. Status differences in cross-functional teams: Effects on individual member participation, job satisfaction, and intent to quit. *J. Health Soc. Behav.* 45(3) 322–335.
- Lomas, J., M. Enkin, G. M. Anderson. 1991. Opinion leaders vs. audit and feedback practice guidelines: Delivery after cesarean section. *J. Amer. Medical Assoc.* 265(17) 2202–2207.

- Ma, M., R. Agarwal. 2007. Through a glass darkly: Information technology design, identity verification, and knowledge contribution in online communities. *Inform. Systems Res.* **18**(1) 42–67.
- Mano-Negrin, R., B. Mittman. 2001. Theorising the social within physician decision making. *J. Management Medicine* **15**(4–5) 259–265.
- Markus, M. L. 1983. Power, politics and MIS implementation. *Comm. ACM.* **26**(6) 430–444.
- Miller, R. H., I. Sim. 2004. Physicians' use of electronic medical records: Barriers and solutions. *Health Aff.* **23**(2) 116–126.
- Miller, R. H., C. West, T. M. Brown, I. Sim, C. Ganchoff. 2005. The value of electronic health records in solo or small group practices. *Health Aff.* **24**(5) 1127–1137.
- Nembhard, I., J. Alexander, T. Hoff, R. Ramanujam. 2009. Why does the quality of health care continue to lag? Insights from management research. *Acad. Management Perspect.* **23**(1) 24–42.
- Ortiz de Guinea, A., M. Markus. 2009. Why break the habit of a lifetime? Rethinking the roles of intention, habit, and emotion in continuing information technology use. *MIS Quart.* **33**(3) 433–444.
- Podsakoff, P. M., D. Organ. 1986. Self-reports in organizational research: Problems and prospects. *J. Management* **12**(4) 531–544.
- Podsakoff, P. M., S. B. MacKenzie, J.-Y. Lee, N. P. Podsakoff. 2003. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J. Appl. Psychol.* **88**(5) 879–903.
- Pont, E. A. 2000. The culture of physician autonomy: 1900 to present. *Cambridge Quart. Healthcare Ethics* **9**(1) 98–113.
- PQR—Physician Quality Reporting. 2011. Special open door forum: Physician quality reporting system for the beginner—What you need to know to succeed. Accessed July 18, 2011, https://www.cms.gov/PQRS/Downloads/SODF_March22-2011_v03-15-2011_Final.pdf.
- Pratt, M., P. Foreman. 2000. Classifying managerial responses to multiple organizational identities. *Acad. Management Rev.* **25**(1) 18–42.
- Pratt, M., K. W. Rockmann, J. B. Kaufmann. 2006. Constructing professional identity: The role of work and identity learning cycles in the customization of identity among medical residents. *Acad. Management J.* **49**(2) 235–262.
- Premkumar, G., K. Ramamurthy, S. Nilakanta. 1994. Implementation of electronic data interchange: An innovation diffusion perspective. *J. Management Inform. Systems* **11**(2) 157–186.
- Real, K., R. Bramson, M. S. Poole. 2009. The symbolic and material nature of physician identity: Implications for physician-patient communication. *Health Comm.* **24**(7) 575–587.
- Rogelberg, S., J. Stanton. 2007. Introduction: Understanding and dealing with organizational survey nonresponse. *Organ. Res. Methods* **10**(2) 195–209.
- Schoen, C., R. Osborn, P. T. Huynh, M. Doty, J. Peugh, K. Zapert. 2006. On the front lines of care: Primary care doctors' office systems, experiences, and views in seven countries. *Health Aff.* **25**(6) w555–w571.
- Scott, S. G., V. R. Lane. 2000. A stakeholder approach to organizational identity. *Acad. Management Rev.* **25**(1) 43–62.
- Shapiro, S. S., M. B. Wilk. 1965. An analysis of variance test for normality (complete samples). *Biometrika* **52**(3 and 4) 591–611.
- Shortliffe, E. H. 1999. The evolution of electronic medical records. *Acad. Medicine* **74**(4) 414–419.
- Simon, S. R., R. Kaushal, P. D. Cleary, C. A. Jenter, L. A. Volk, E. J. Orav, E. Burdick et al. 2007a. Physicians and electronic health records: A statewide survey. *Arch. Intern. Medicine* **167**(5) 507–512.
- Simon, S. R., R. Kaushal, P. D. Cleary, C. A. Jenter, L. A. Volk, E. G. Poon, E. J. Orav et al. 2007b. Correlates of electronic health record adoption in office practices: A statewide survey. *J. Amer. Medical Assoc.* **14**(1) 110–117.
- Sirovich, B., P. M. Gallagher, D. E. Wennberg, E. S. Fisher. 2008. Discretionary decision making by primary care physicians and the cost of U.S. health care. *Health Aff.* **27**(3) 813–823.
- Stets, J. E., P. J. Burke. 2000. Identity theory and social identity theory. *Soc. Psych. Quart.* **63**(3) 224–237.
- Stryker, S. 1980. *Symbolic Interactionism: A Social Structural Version*. Benjamin Cummings, Menlo Park, CA.
- Swann, W. B. Jr., A. Gomez, C. Seyle, J. Morales, C. Huici. 2009. Identity fusion: The interplay of personal and social identities in extreme group behavior. *J. Personality Soc. Psych.* **96**(5) 995–1011.
- Tajfel, H., J. Turner. 1979. An integrative theory of intergroup conflict. W. G. Austin, S. Worchel, eds. *The Social Psychology of Intergroup Relations*. Brooks/Coole, Monterey, CA, 33–47.
- Teo, H. H., K. K. Wei, I. Benbasat. 2003. Predicting intention to adopt interorganizational linkages: An institutional perspective. *MIS Quart.* **27**(1) 19–49.
- Tripsas, M. 2009. Technology, identity, and inertia through the lens of "the digital photography company." *Organ. Sci.* **20**(2) 441–460.
- Turner, J., R. Onorato. 1999. Social identity, personality, and the self-concept: A self-categorization perspective. T. R. Tyler, R. M. Kramer, O. P. John, eds. *The Psychology of the Social Self Applied Social Research*. Lawrence Erlbaum Associates, Inc., Mahwah, NJ, 11–46.
- Venkatesh, V., F. D. Davis. 2000. A theoretical extension of the technology acceptance model for longitudinal field studies. *Management Sci.* **46**(2) 186–204.
- Ventres, W., S. Kooienga, N. Vuckovic, R. Marlin, P. Nygren, V. Stewart. 2006. Physicians, patients, and the electronic health record: An ethnographic analysis. *Ann. Family Medicine* **4**(2) 124–131.
- Weick, K. E. 1995. *Sensemaking in Organizations*. SAGE Publications, Thousand Oaks, CA.
- West, E., D. N. Barron. 1999. Hierarchies and cliques in the social networks of health care professionals: Implications for the design of dissemination strategies. *Soc. Sci. Medicine* **48**(5) 633–646.