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Research Perspective

Advocating for Action Design Research on IT Value Creation in Healthcare

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Abstract

Today there is mixed evidence that health IT decreases costs and/or improves care quality in the US. Some of the same factors that have driven delays in realizing the benefits from IT investments in other industries (i.e., time consuming process changes) are apparent in the U.S. healthcare industry, which is only now digitizing its fundamental patient data, the electronic health record. The healthcare industry itself is in transition and new IT may not provide full benefit unless it is accompanied with a restructuring of healthcare delivery. Traditional expert approaches to measuring IT value will limit the ability of healthcare IT value researchers to add value to practice now especially as government incentives in the US drive significant investment. But generalizing results from traditional IT value research to the healthcare setting is risky due to differences between healthcare and other industries. I advocate for action design research that uses existing theory as a foundation, but adapts it to the specific unique characteristics of this industry. By actively participating in the design and evaluation of new socio-technical systems, IT value researchers can generate grounded theory to explain value creation in healthcare while influencing practice now.

Keywords: Health IT, Value of Health IT, Benefits From Health IT, IT Value, Action Design Research, Action Research, Design Science Research.

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1. Introduction

While the US spends far more on healthcare than any other country, it does not provide superior care. In 2009, the US spent nearly \$8,000 per person on healthcare services, while 12 other industrialized nations spent just one-third to two-thirds as much. Meanwhile, in comparison to other nations, the US had the highest rates of potentially preventable deaths from asthma and amputations due to diabetes, and rates that were no better than average for in-hospital deaths from heart attack and stroke (Squires, 2012).

To address this problem, the U.S. Government has created several initiatives to increase IT's role in healthcare. However, thus far, there is mixed evidence on the benefits from health IT for decreasing costs, improving quality of care, and/or improving patient safety (Agarwal, Gao, DesRoches, & Jha, 2010; Committee on Patient Safety and Health Information Technology, 2012; DesRoches et al., 2010; Himmelstein, Wright, & Woolhandler, 2009). While many U.S. healthcare institutions are now implementing generic commercial applications, most of the studies that found positive impacts involved academic and institutional leaders that custom-developed systems optimized for their settings (Agarwal et al., 2010; Chaudhry et al., 2006; Shekelle, Morton, & Keeler, 2006). And some studies have actually found negative impacts (Black et al., 2011; Garg et al., 2005; Himmelstein et al., 2009; Reckmann, Westbrook, Koh, Lo, & Day, 2009).

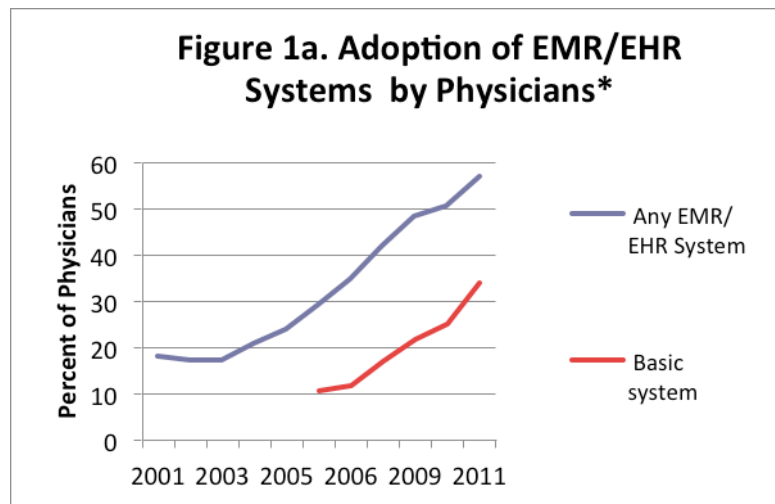
The mixed results of IT investments in healthcare are similar to those previously reported in other industries, such as finance and manufacturing, that digitized customer transactions and processing decades earlier. It took IT researchers years to unravel how, when, and why value is generated from IT investments. IT researchers now not only understand how to study IT value, but they also have a solid body of knowledge regarding the factors that generate it (Kohli & Grover, 2008), especially the time-consuming process changes required. IT value researchers are well positioned to use this knowledge to explain how IT might benefit the healthcare industry. However, since industry is an important differentiator in IT research (Chiasson & Davidson, 2005), it is likely that industry differences will affect how IT value is captured in the healthcare industry. Additionally, traditional IT value research approaches that deal with the outcome of past IT investments through post hoc analysis will be neither timely nor relevant to influence healthcare practice *now*, when substantial investment incentives are spurring adoption and industry change. IT researchers interested in studying value generation in the U.S. healthcare industry are well positioned to use traditional IT research as a foundation, adapting it as necessary for the differences in the health industry. I argue that they should actively participate in the design and evaluation of the IT and multi-organizational innovation that is currently underway. I advocate that these researchers adopt action design research approaches to answer the questions of what and how IT enabled interventions can add value in the unique healthcare environment.

2. The Healthcare IT Context in the US

The U.S. Government has made adoption of health IT a critical priority, particularly through its establishment of incentive payments for adopting electronic health records in the HITECH Act (part of the American Recovery and Reinvestment Act). Integrated electronic health records are believed to hold high promise to eliminate inefficiencies and improve quality of care throughout the healthcare system. Theoretically, an integrated health record containing complete patient history should enable critical clinical information to always be available to decision makers throughout the continuum of care, which should reduce costs and errors. Additionally, electronic health records have the potential to support administrative simplification and compliance with regulation and fraud reduction by linking clinical and billing systems. On the other hand, it has been argued that health IT that is inappropriately designed and applied can lead to unintended adverse consequences, such as dosing errors, failure to detect fatal illnesses, and delayed treatment (Committee on Patient Safety and Health Information Technology, 2012).

While the digitization of healthcare records is accelerating in the US, it is still in its early stages. Figure 1 shows adoption rates by U.S. office-based physicians and hospitals in the last decade. In 2011, almost 60 percent of office-based physicians reported that they had "any" EMR/EHR, defined as a medical or health record system that is all or partially electronic. But a little over one third had what is defined as a basic EMR/EHR, a system that includes patient information such as demographics, problem lists, medications, clinical notes, prescription orders, and capabilities to view lab and imaging results. Only 11 percent of all physicians had the ten capabilities necessary to support the first stage of the core meaningful-use objectives¹ (Hsiao, Decker, Hing, & Sish, 2012). For hospitals, in 2011, Figure 1b shows that just over one quarter had "any" EMR/EHR. Less than 20 percent had a basic system that involves full implementation in only one clinical unit in the hospital of a system that includes patient demographics, physician notes, nursing assessments, patient problem lists, laboratory and radiologic reports, diagnostic test results, and order entry for medications. Less than 9 percent had a comprehensive system that includes an additional fourteen functions necessary to meet the federal meaningful use standard and that is implemented in all major clinical units in the hospital (DesRoches, Worzala, Joshi, Kralovec, & Jha, 2012). The government incentives are expected to greatly increase adoption, especially of systems that more fully support meaningful use guidelines.

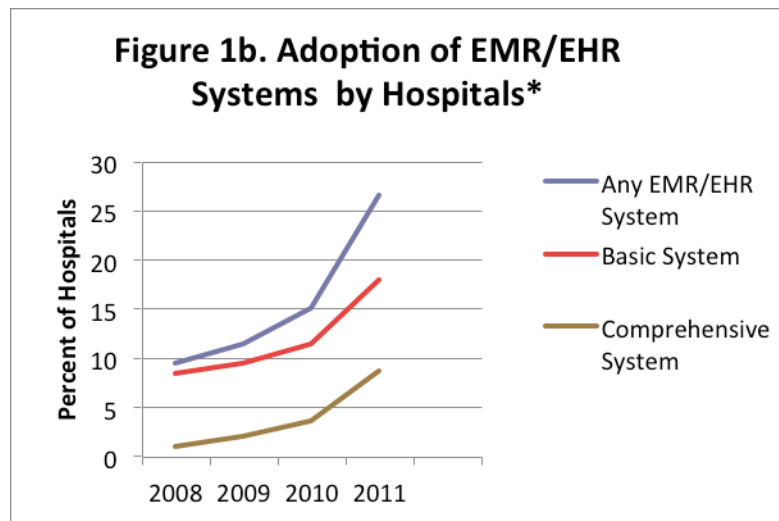
The reengineering of healthcare delivery in the US is only just beginning (Jones, Heaton, Riudin, & Schneider, 2012). The capture of fundamental clinical information on patients provides numerous opportunities. Multiple complicated changes are happening simultaneously, including the introduction of new forms of healthcare delivery such as accountable care organizations, new payment models such as pay for performance, new government policies such as meaningful use guidelines, and new forms of technology such as mobile patient self-management applications. Similar to other industries, it is expected that it will take time for all these technology-assisted developments and accompanying process changes to fully demonstrate value generation. But implementation decisions are being made now based on the fact that the U.S. Government has made funds available to adopters who demonstrate "meaningful use" of the systems as defined by government guidelines, rather than on research on how to insure that these investments will lead to greater value.



*Physician data for 2001-2007 from in-person National Ambulatory Medical Care Survey (NAMCS). Data for 2008-2009 from both in person NAMCS and email survey. Data for 2010-2011 based only on mail survey (Hsiao et al., 2009; Hsiao et al., 2012; Hsiao et al., 2011)

Figure 1a. Adoption of Electronic Health Records by Physicians

¹ The meaningful use of certified electronic health records, the basis for the CMS incentive payments established by the HITECH Act, is being instituted in three stages from 2011 to 2016.



*Data from American Hospital Association annual survey of health IT adoption (DesRoches et al., 2008; DesRoches et al., 2010; DesRoches et al., 2012)

Figure 1b. Adoption of Electronic Health Records by Hospitals

3. Applying Traditional IT Value Research Results to the Healthcare Industry

Traditional IT value research has shown that IT creates value under certain conditions, that this value can manifest itself in different ways and at many organizational levels, and that firms do not appropriate all the value they generate from IT (Brynjolfsson & Hitt, 1996; Deveraj & Kohli, 2003; Dewan & Kraemer, 2000; Hitt & Brynjolfsson, 1996; Kohli & Deveraj, 2003; Melville, Kraemer, & Gurbaxani, 2004). A variety of complementary organizational investments have been found to influence IT value, measured as economic impact (Kohli & Grover, 2008). Table 1 summarizes some of these factors, most of which are measured at the firm level (Schryen, 2013), and are therefore socially embedded in the context of organizations. For example, decision making is influenced by governing logic; culture, organizational change management, and process redesign are all influenced by participants' values, beliefs, and practices; strategic alignment is affected by market structure; and open communication is influenced by the institutional actors and governance systems.

Table 1. Complementary Factors Influencing IT Value Creation

Complementary factors	Reference
Decision making systems, job training, business process redesign	(Dedrick, Gurbaxani, & Kraemer, 2003)
Business process reengineering	(Barua, Kriebel, & Mukhopadhyay, 1995; Barua, Lee, & Whinston, 1996)
Organizational change management	(Sherer, Kohli, & Baron, 2003)
Absorptive capacity	(Francalanci & Morabito, 2008)
Culture	(Weill & Olson, 1989)
Strategic alignment	(Tallon, Kraemer, & Gurbaxani, 2000)
Reporting structures	(Barua et al., 1996)
Work reorganization investments	(Bresnahan, Brynjolfsson, & Hitt, 2002)
Shared knowledge	(Ray, Muhana, & Barney, 2005)
Open communication	(Jeffers, Muhanna, & Nault, 2008)

Healthcare has some unique differences that may influence the conditions that drive value, the complementary factors, the mechanisms through which value is added, and the ways in which value is measured: “Healthcare represents a markedly different social and technical context compared with many of the industries where IS research is conducted, and IS theory developed (e.g., manufacturing, transportation, financial services)” (Chiasson & Davidson, 2004, p. 157).

In addition to traditional benefits such as costs, profitability, customer satisfaction, and choice, healthcare benefits include societal values such as quality of life, absence of disease, and public health. While traditional IT value research has focused on economic impact, different outcomes may be desired by healthcare’s multiple and varied stakeholders. For example, physicians and nurses may emphasize quality of care, while managers and directors are more focused on efficiency (van den Broek, Boselie, & Paauwe, 2013). Even among the same group of stakeholders, value is influenced by a variety of behavioral, environmental, economic, and social factors. Values such as quality of life are highly personal and cannot be captured by formula and numbers (Paul, Ezz, & Kuljis, 2012). Traditional IT business value research does not typically distinguish between performance and its potentially different values in terms of the subjective interpretation of different stakeholders (Schryen, 2013). Additionally, while traditional IT value research has focused on increasing firm value, in healthcare, the more salient issue is increasing societal value, a much more complicated variable, since it can have different meanings for various stakeholders.

Traditional IT value research has not fully explained the causal relationships between IS investment and value (Schryen, 2013). The complex interactions and dependencies of all the healthcare participants and their goals are expected to influence the mechanisms by which value is generated. It is difficult to control for the significant heterogeneity among care providers and patients and the functionality of their applications, even those that bear the same name (e.g., electronic health records). The complexity of unique patient circumstances complicates IT’s role in adding value through traditional mechanisms such as the standardization of work processes and systems fostered through organizational change and business process realignment. It is also more difficult to control for the interdependence between different applications, such as basic electronic health records and decision-support components that leverage these records, due to the unique requirements of different care settings and stakeholders (Agarwal et al., 2010). Traditional IT value research has not addressed synergies and complementarities of IS assets (Schryen, 2013), and there are complex social interactions; for example, the existing workflows of professionals who have been a powerful force in

healthcare tend to have a direct impact on implementation success (Goh, Gao, & Agarwal, 2011). There are also additional mediating factors in healthcare that can impact value such as the risk to quality of life and patients' privacy concerns.

Likewise, as care delivery becomes more integrated (e.g., organized around medical conditions) rather than organized around separate specialists (Porter & Teisberg, 2006), delivering quality care is increasingly a joint responsibility of multiple providers, and some processes are no longer under the control of a single organization. Thus, it is not just complementary changes in an organization that are likely to influence value realization, but complementary changes across organizations. Healthcare is a complex mixture of different organizational forms, subject to multiple regulatory and market structures (Chiasson & Davidson, 2004). Interactions with participants such as insurers, who strongly influence pricing but traditionally do not participate in healthcare delivery, suggest that the conditions and mechanisms by which value will be achieved may differ from other industries in which all supply chain partners collaborate to create a final product or service. As complementary changes are implemented to promote value realization through information sharing, they could lead to work-arounds that may be more costly or even negatively affect care quality. For example, as providers and insurers began to share data to improve quality for certain patient populations, healthcare data security was compromised by participants sharing ad hoc databases and spreadsheets in an attempt to work around difficult-to-use enterprise systems (Johnson & Willey, 2011).

Early IT value research in healthcare does not say anything about which complementary factors are relevant to value creation in this industry (Goldzweig, Towfigh, Maglione, & Schekelle, 2009), nor about the mechanisms through which these factors impact value realization. Since we can expect that healthcare differences will influence value and how it is created, we have an opportunity to contextualize assumptions that reflect the material resources and institutional environment of this industry (Chiasson & Davidson, 2005) and to consider how these differences affect value and how it is created in healthcare. While we can draw on traditional IT theories, we cannot simply apply the results; instead, we need to pay systematic attention to the social context in which the existing theory will be tested (Chiasson & Davidson, 2004).

4. Action Design Research for IT Healthcare Value

Traditional IT business value research has been dominated by empirical, econometric approaches, the ex post perspective, variance theories, a firm-level perspective, and complementary influence of contextual factors and lag effects (Schryen, 2013). Industry differences that limit the application of traditional IT value research results, coupled with time pressures to influence change, have caused me to advocate for an action design research approach to study IT value.

Most traditional IT value research studies outcomes of past IT investments through post hoc analysis (Kohli & Grover, 2008). Traditional methods test validity through replicability or exhaustive elimination of alternative explanations (Baskerville & Stage, 1996). For the healthcare industry, it will take time to develop more granular data than we currently have to investigate the process changes that are just now beginning to complement the implementation of new systems and healthcare delivery models. Since there are significant time lags before value is demonstrated (Schryen, 2013), we expect that traditional ex post empirical, econometric approaches will not provide timely results. By the time that we have enough data to do post hoc analyses, much cost and effort will have been expended (and possibly wasted). It is *now* that IS researchers need to use their IT value knowledge to influence practice, not after the investments are made.

Action design research (ADR) is particularly appropriate to our needs: it combines action research (AR) and design research (DR) to generate prescriptive knowledge (Sein, Henfridsson, Sandeep, Rossi, & Lindgern, 2011). ADR simultaneously builds and/or implements innovative IT artifacts in an organizational context and learns from the intervention while addressing a problematic situation (Baskerville & Wood-Harper, 1998; Hevner, March, Park, & Ram, 2004; Sein et al., 2011). Design and action are predicated on theoretical frameworks and principles (Hevner et al., 2004; Mathiassen, Chiasson, & Germonprez, 2012; Sein et al., 2011). There are many theories that can be used as a basis

for designing innovative IT and organizational (and multi-organizational) innovation that can be adapted to the unique characteristics of the healthcare industry. These can then be subjected to organizational practice. The theory underlying the changes is validated by the extent to which these changes impact value creation in this unique setting (Baskerville & Stage, 1996). We can compare benefits before and after these innovations or between alternative models of care. While the complexity inherent in the healthcare industry cannot all be resolved through IT or organizational design, I believe that attention to existing theories, with appropriate adjustment for some of the contextual differences in healthcare, can improve our ability to influence and study IT value generation.

ADR specifically identifies a research continuum that incorporates organization-dominant and IT-dominant innovation. While IT innovation will be useful, particularly in developing newly emerging patient-centered applications, IT-dominant innovation by itself will be of limited use, particularly since many healthcare providers who lack the resources to custom develop innovative applications are increasingly turning to commercial applications (Agarwal et al., 2010). In order to achieve value from these investments, organizational innovation will be required. Since the healthcare industry is undergoing fundamental structural change, IT value research must consider not only organizational change, but also multi-organizational change and value creation across multiple participants (providers, insurers, device manufacturers, pharmaceuticals) in newly structured inter-organizational value chains. Both IT and simultaneous multi-organizational change will be required. Traditional IT value research methodologies using variance theories may limit our ability to incorporate the impact of specific contextual differences in healthcare, which require more process oriented analysis.

DR has been suggested as an appropriate research approach for “wicked problems”—those with unstable requirements and constraints based on ill-defined environmental contexts, complex interactions among subcomponents of the problem and its solution, and critical dependence on human cognitive and social abilities to produce effective solutions (Hevner et al., 2004). Healthcare has been promoted as a fertile ground for healthcare design research studies because of the conflicting roles of actors who interact with the systems (Kohli & Hoadley, 2007). In Sections 5 to 8, I identify some unique characteristics of the healthcare industry that are consistent with the types of problems that can be addressed with ADR. Table 2 summarizes these sections, including the implications of the unique healthcare industry characteristics for theory development. The last two columns in Table 2 provide some examples of kernel theories and frameworks in IT research that can provide guidance to researchers, and specific ways in which ADR can address these differentiating characteristics.

5. Payment Structure and Regulation

Healthcare is probably the most complex industry in the US today, primarily due to the separation between payers (health insurance companies, employers, and government) and consumers. In most industries, a consumer pays directly for a product or service. The price is influenced not only by availability, but also by value to the consumer. Each member of the supply chain adds value to the product/service and subsequently realizes a share of the revenue received from the consumer for their contribution. However, in the U.S. healthcare industry, consumers or patients do not pay directly for care service; they (or their surrogate; e.g., employer or government) pre-purchases insurance. The price of services is influenced by negotiations between insurers and providers, not directly by value to the consumer. The insurance company, employer, or government absorbs some financial risks and manages others by negotiating discounts with providers, but traditionally has not directly contributed to adding value to the care service (although this is beginning to change with integrated networks and broader insurer involvement in healthcare). The provider is reimbursed for service at levels set by others; the payment for the service is by a third party who is not traditionally involved in delivering the product or service to the customer. This greatly increases the administrative complexity of the industry.

Table 2. Implications of Healthcare Differences for IT Value Research

Differentiating characteristic	Implications for IT value research in healthcare	Impact on value creation	Theory development needed	Potential kernel theories and frameworks	How ADR can help
Payment structure and regulation	Participants who have not had a direct role in service provision may be influential in price setting and regulation	Conflicting goals affect value and how it is created; regulation can constrain realization of value	How can we co-create value from IT in healthcare? What is the role of payment providers vis-a-vis healthcare delivery providers in IT value generation? How does regulation influence IT value?	Co-creation of value (Dyer & Singh, 1998; Grover & Kohli, 2012); buyer-supplier collaboration (Lee, Clark, & Tam, 1999; Subramani, 2004); complementarity (Barua, Konana, & Whinston, 2004)	Design and/or implement systems/processes that support different features of new healthcare delivery structures that combine payers, regulators, and providers
Professional control	Professional logic, traditionally dominant, may conflict with bureaucratic and market logics; high power and scarcity of professionals	Conflicting goals impact complementary and mediating factors, particularly control mechanisms	How do we use IT to generate value in organizations with powerful professional dominance alongside bureaucratic and market logics?	Informating professionals (Kohli & Kettinger, 2004); professional logic (Freidson, 2001); cognitive fit (Vessey & Galletta, 1991); task technology fit (Goodhue & Thompson, 1995);	Design systems and/or organizational processes that support the balance between professionalism and control while adding value to the organization
Information asymmetry	High knowledge differential among stakeholders; lack of results information across the entire value chain; lack of incentives for a knowledge interpreter	Value metrics are personal; mechanisms for using information to create value are influenced by information asymmetry	How can we use IT to capture metrics that help measure value across the entire healthcare delivery value chain? How can IT support evolving healthcare delivery models that acknowledge knowledge differentials? How, when, and where is IT appropriate for supporting healthcare advisors? When can IT provide sufficient patient assistance for information interpretation?	Strategic alignment (Vachon, Halley, & Beaulieu, 2009); complementarity (Barua et al., 2004); social embeddedness and networks (Granovetter, 1978; Venkatesh, Zhang, & Sykes, 2011); technology acceptance (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003)	Determine optimum location and design for IT assisted advice and appropriate complementary changes to IT assisted work practices to support knowledge and results sharing
Failure impact and privacy concerns	Higher failure risk and privacy concerns	Personal values influence the outcomes variable	How can we generate value from IT when privacy concerns and failure risk are personal and very high?	Resilience theory (Hoffnagel, Woods, & Leveson, 2006); privacy boundary (Anderson & Agarwal, 2011)	Design resilient organizations and systems in privacy boundary constraints

The reimbursement system is also the primary mechanism for regulating healthcare in the US (Christensen, Grossman, & Hwang, 2009). The present healthcare regulatory structure in the US is neither uniform nor consistent, with regulations developed and enforced by all levels of government and a large assortment of private organizations that often operate without coordination (Field, 2007). Regulation can constrain the realization of IT value by restricting how IT is used in organizations (Melville et al., 2004), such as by creating payment schemes that do not reimburse provider email consultations.

The only other industry with perhaps such complex regulation is the financial services industry, which additionally has contended with different international regulations. Financial services firms have managed this regulatory complexity through standardization and consolidation (Bris, 2007). The U.S. healthcare industry has not been able to effectively use these mechanisms. Healthcare is more

regionally dispersed and often requires co-location with patients. Thus, it's subject to different state and local regulations. It involves more diverse services including many different types of specialists, hospitals, generalists, clinics, and laboratories that often provide very individualized services. Furthermore, healthcare, unlike financial services, is not as profitable, and there are significant mandated regulations that influence profit (e.g., regulations that require emergency service provision for non-insured patients or that cap service payments at mandated levels set by government or insurance firms).

Multiple participants who have not traditionally had a direct role in service provision but are influential in price setting can result in conflicting goals and mechanisms for measuring value. For example, if we simply measure the value for healthcare providers, we may not fully explain all outcomes. If we focus on government regulation, we may not capture the full potential from information systems, particularly if this regulation leads to non-optimal healthcare systems. These differences make the outcome variable and the mechanisms that lead to benefits much more complicated in the healthcare industry compared to other industries.

ADR can be helpful to IT healthcare value researchers because it can be used to test and evaluate the interaction between conflicting institutional goals and measures and different healthcare delivery structures on value creation. We can draw on existing theories to support the development of systems and processes that complement evolving modes of healthcare delivery. For example, co-creating value, itself not yet well studied in other industries (Kohli & Grover, 2008), has four key components: relationship-specific assets, knowledge-sharing routines, complementary resources and capabilities, and effective governance (Grover & Kohli, 2012). Alternative healthcare delivery models can be analyzed in terms of how they support these components given the goals of the participating members. Complementarity and collaboration theories suggest specific intra- and inter-organizational changes that support IT, which can be assessed in terms of their ability to enable the different participants to achieve their goals with these components. For example, specific knowledge sharing routines may be more difficult to achieve between healthcare providers and insurers compared to between primary and secondary care providers.

While there are many different evolving modes of healthcare delivery, I focus on the accountable care organization as one example of how we might use ADR research. An ACO is an organization of healthcare providers that agree to be accountable for the quality, cost, and overall care of beneficiaries who are enrolled in a traditional fee for service program such as Medicare. Between 2010 and 2013, almost 500 ACOs were developed (Petersen, Muhlestein, & Gardner, 2013). However, there are substantial variations with respect to approaches to ACO organizations, including the types of collaborative relationships with payers, shared savings agreements, performance measures, and mechanisms to engage physicians. ACOs require new information systems that collect and analyze clinical data and evaluate quality measures that support the goals of various stakeholders (PriceWaterhouseCoopers, 2010). There is limited evidence of the factors that contribute to success (Fisher, Shortell, Kreindler, Van Citters, & Larson, 2012; Larson et al., 2012; Muhlestein, Croshaw, Merrill, & Pena, 2012).

We can use the framework to co-create value to establish some guidelines for the types of systems and processes that could support different structures for ACOs. We would evaluate how different partner's goals might impact value and how value will be generated. For example, shared analytical capabilities, such as integrated claims and clinical data, predictive modeling, and risk scoring, are relationship-specific assets. Effectively using these assets to create value for an ACO organized through a collaboration of a physician provider organization and a private insurer would require adoption of specific complementary collaborative processes and new relationships among these partners. These changes may differ from that required by an ACO structured with an alternative governance mechanism, such as an integrated health network with public insurance. Government regulation at national, state, and local levels, and the competitive context for providers and payers, could impact the structuring of these relationships. ADR can be used to provide guidance to the healthcare participants who are structuring different networks by providing input into the types of systems, information sharing, and complementary capabilities they could best build in different

governance structures. We can then assess the value of these interventions by evaluating the extent to which the information and complementary process and relationship change successfully address value realization for the various participants and health outcomes for the population. In this way, IT researchers can support creators of ACOs through innovative IT and organizational designs that can capitalize on information and analytical capabilities, rather than simply waiting to compare the outcomes of emerging models. And we can learn from the ADR how we can extend complementarity, collaboration, and co-creation theory to the specific institutional forces in this industry. This approach also can be used with other types of new healthcare delivery models besides ACOs.

6. Professional Control

The healthcare industry has traditionally been organized around the “profession” as the source of control, rather than the market or bureaucracy (Freidson, 2001). Professionalism in medicine has a strong tradition that is currently under assault. In the U.S. healthcare industry, professional control evolved to government involvement and control, and now is moving towards management control and market mechanisms (Currie & Guah, 2007). However, conflicting values and goals may impact the mechanisms to achieve value compared to industries traditionally organized through either market or bureaucratic control. Institutional logics play a powerful role in shaping the interpretations of organizational actors and legitimizing their actions (Chiasson & Davidson, 2005), which, thus, impacts how complementary factors impact value. ADR can enable us to predict and evaluate how information systems, often used as control mechanisms, might interact with evolving organizing logic in healthcare to better design and implement them for healthcare professionals. Rather than ex post study how these systems and processes influence value, we can provide guidance for the types of systems and processes that can support the professional and then evaluate how this impacts value generation.

Bureaucratic or market driven industries traditionally used middle managers for information processing, but information systems have contributed to a flattening of hierarchies. Meanwhile, IT has provided more information and discretion to front-line employees, who now operate in the parameters set by the firm’s executives and institutionalized in information systems, rather than monitored via large numbers of middle managers. When these businesses grow, they typically expand by either hiring more customer facing employees, such as salesmen or financial advisors, rather than more middle managers, or using information systems to support and control their customer facing employees.

In contrast, the health industry has traditionally relied heavily on front-line professionals who have specialized knowledge gained through extensive training. The number of front-line professionals, in particular physicians, cannot as easily or quickly expand as in other industries due to the significant cost and training requirements. Dispensing healthcare requires a combination of technological and social skills that have traditionally been difficult to replicate. However, as the industry has responded to cost pressures, there has been growth in physician extenders including nurse practitioners, physician assistants, and medical assistants, moving physicians into more middle management supervisory roles. Whereas in other industries middle management personnel have shrank as more front-line employees were monitored and controlled with information systems; in healthcare, the traditional source of control, the physicians, have taken on more middle management functions, a move towards a more bureaucratic rather than professional logic. The externalization of knowledge so that others less skilled can perform the work risks work becoming less competently done, especially since the complexity of any particular clinical setting often requires specific IT artifacts and must be customized for individual differences. As a result, the physicians still retain considerable power by virtue of their expertise. This power can affect the impact of complementary change on value realization from IT.

Systems that are designed to support professionals may differ in their benefits from those that add value in more bureaucratic or market systems. For example, internal professional development, communication, and knowledge production systems are more aligned with professionals’ needs than monitoring systems (Freidson, 2001). The current systems that have recently been designed for the evolving healthcare organizations have not necessarily considered the current professional scarcity of the physician. For example, one of the major complaints that physicians have with today’s electronic

health records systems is that they have more administrative work than they did in the paper world, such as assigning billing and procedure codes. Many of the systems being introduced today to increase efficiency, such as electronic health record systems, impact clinical functions, which have generally been in the control of the professionals. But many commercial systems have poor interfaces; user-centered design principles have not been widely adopted by commercial health IT vendors (Jones et al., 2012). Predefined functionality may be incompatible with the existing practices of the predominant professionals (Goh et al., 2011). When the system's characteristics are inconsistent with the culture and values of the users, the implementation process is hindered (Rivard, Lapointe, & Kappos, 2011). Since commercial applications, not customized systems, will be the mainstream of HIT adoption in the next few years (Agarwal et al., 2010), process reengineering will be critical, but how reengineering affects value realization will be impacted by the tension introduced with professional control.

ADR can be useful to test the impact of different types of systems and complementary changes on value as the organizing logic changes. Organizational changes or decision making processes that lead to value in other industries will need to be adapted in recognition of the control requirements of the professionals. IT value research can provide fundamental guidelines that can be altered through studying the influence of professional control on value realization. Through expanding existing theory, we can suggest appropriate mechanisms for managing and coordinating the work of the physicians, while enabling them to increasingly manage the new extenders, so that value is increased. While traditional fit and complementarity theories can provide guidelines for system and process development, they must be adapted to account for the needs and values of the professionals as they move into their new roles. We will have to design and evaluate systems and/or processes that take into account the tension between evolving institutional logic and the tradition of professional control in healthcare in developing features that would enhance usage and acceptance.

Kohl and Kettinger (2004) is an exemplar of ADR that addressed this conflict with professional logic. Beginning with informing and agency theories, they guided the development of a physician profiling system that monitored and benchmarked physicians' clinical practices and outcomes to enhance transparency. They analyzed why some physicians did not use the system and identified lack of legitimacy as a key obstacle. Using the concept of a clan, they were able to provide guidance for additional process and system changes so that the professionals or "clan members" would introduce performance information into the control process to facilitate discourse, which resulted in changes to clinical practice. This study added to the theory of how to receive benefits from control systems among professionals. The authors found that professionals value specific control mechanisms, particularly those that stress legitimacy of both the information and the messenger. They identified features that improved value through either improved outcomes and/or lower costs.

7. Information Asymmetry

The healthcare industry has a high knowledge differential among its stakeholders. In the US, outcome metrics that are shareable with and interpretable by patients are unavailable (Porter & Teisberg, 2006). Moreover, there are currently few incentives for patient advisors or knowledge interpreters. Numerous social and environmental factors can impact outcomes and interpretations of benefits (e.g., attitudes toward smoking or obesity).

In the manufacturing supply chain, there are clearly interpretable metrics for quality, delivery, and cost that consumers and others in the supply chain use to evaluate and analyze activities in real time by using IT's monitoring capabilities. In financial services, information systems have also decreased information asymmetry regarding current prices by making real-time pricing available directly to customers. However, the information to evaluate the implications of the pricing of various investment and savings options, such as historical trends and projections, can still be difficult for the novice investor to interpret, hence the changing role of the broker to advisor/interpreter.

The healthcare industry is similar to the financial services industry in that its consumers, the patients, often find it difficult to interpret their healthcare information. Indeed, today most personal health

information is not even made available to patients, even regarding their own health status. While patient engagement tools such as personal health records or patient portals are touted as a solution to putting information into the hands of the patients (Clarke & Meiris, 2006; Krist & Woolf, 2011), this information is typically limited to a subset of their health information (e.g., allergies, medications, vaccinations, etc.). Most health professionals assume that the patient will not have the skills and knowledge to interpret data such as physician notes. Thus, patients do not currently have all the tools to monitor their own health, nor has this information been made “digestible” for them. In contrast to the financial services industry, in the US, there are few incentives for knowledge interpreters for patients. While some have advocated that primary care physicians should become “patient advisors” to navigate the complexity (Davis, Schoenbaum, & Audet, 2005), today they have neither the time nor incentives to do so in the predominant fee-for-service model. Traditional methods to measure value will be difficult to implement if patients lack knowledge of the value of information. Moreover, social and environmental factors can influence the value of outcomes for patients since attitudinal, behavioral, and enabling conditions affect behavioral change and therefore individual health outcomes (Kelley, Chiasson, Downey, & Pacaud, 2011). Thus, both the outcomes variable and the contribution of information to outcomes are much more complicated to assess in this industry.

Kelley et al. (2011) provide an example of an ADR project that adjusted traditional theories of IT adoption for factors that affect health behaviors and the environment. The authors incorporated a model that focuses on health promotion and educational programs that affect health behaviors to address the value of a Web-based intervention for diabetes. They recognized that predisposing, enabling, and reinforcing conditions must be aligned to influence behavior. They used ADR to manipulate the design of a Web-based system, and then studied how this system affected health of a chronic patient population. This is the type of proactive research that I am advocating. Theory drives design, and then the design is evaluated. These evaluations can help us fill the gaps in theory in healthcare, particularly those influenced by complex social and environmental factors.

Currently, healthcare advisors are beginning to be located in new care-delivery models to address the information asymmetry in healthcare. Some are positioned in managed care homes, independent organizations, integrated health networks, or even insurers. For example, the CIGNA HealthCare program enables employees of CIGNA's customers access to a nurse who serves as their personal health coach and benefits expert (Newswire, 2004). While IS scholars cannot address all the issues related to information asymmetry in healthcare, ADR can be applied to help implement appropriate IT that assists these advisors in influencing behavioral change and therefore health outcomes. Research has demonstrated the importance of strategic alignment between customer requirements and supply chain partners (Vachon et al., 2009). In healthcare, partner objectives may not be as well aligned. Insurers' objectives, for example, may be more aligned with cost reduction through lifestyle change than providers' objectives in a fee-for-service model that incentivizes treatments. Patient objectives are influenced by attitudinal and other social and environmental factors. By evaluating the various objectives of the different stakeholders in healthcare delivery, we can assist in the design of information systems and/or complementary processes that support strategic alignment with appropriate metrics, communication, and knowledge sharing and interpretation capabilities. We can support the design of new IT assisted forms of communication such as facilitated social networks that support the goals of the participants. For example, patients may not be as comfortable with the lifestyle advice provided by their insurer as they might be with the advice of their providers. For the insurers, perhaps complementing this advice with a facilitated patient social network in which participants share information and provide support to each other may add more value. Provider assistance might be better supplemented with email messaging systems, which would need to be incentivized, along with work practice change. Our research would support the implementation of processes and systems with functionality that matches the incentives of the advisors and addresses the needs of the patients, and evaluate what combinations of incentives/systems/processes add most value.

8. Failure Impact and Privacy Concerns

The difference between IT failure risk in healthcare and most other industries is that the probability of failure impacting loss of life or decreased quality of life is typically greater in healthcare. While other

industries can have failures that affect life (e.g., a power plant explosion), the primary risk is financial loss, and IT value is typically measured as economic impact (Kohli & Grover, 2008). For those hazards that do pose risks on individuals' lives in these industries, secondary processes have been built in to minimize the probability of their occurrence. Thus, the probability of life threatening impacts is low. However, in healthcare, hazards that can result in loss of life (or quality of life) exist for many daily activities, making it much more difficult to build in secondary processes. As healthcare organizations digitize clinical records and depend more on information systems to deliver care, erroneous information processing can impact critical life-threatening decisions on a daily basis. Thus, there is a higher probability of IT failure leading to loss of life than in other industries. This strongly influences the outcomes variable in IT value research in healthcare. Efficient and cost effective systems that do not reduce this high failure risk do not provide value.

ADR can be useful to address this high failure risk in healthcare by building on resilience theory. Resilience engineering focuses not only on recognition, but adaptation to and absorption of variations, changes, disturbances, disruptions, and surprises, especially those that fall outside of the set of disturbances that the system is designed to handle (Hoffnagel et al., 2006). Resilience is an organization's or system's ability to keep, or recover quickly to, a stable state, allowing it to continue operations during and after a mishap or in the presence of continuous significant stresses. Since failure risk is high in healthcare, one can expect that we need to put additional effort into safe design and design of appropriate backup systems in this industry. Creating resilient systems and organizations involves developing organizational and other performance indicators that provide current and leading information on safety performance, data analysis related to safety culture and climate, observations about how work is carried out, and the timing and extent of resources necessary for harm absorption. It requires improved understanding of decision making, particularly how work processes and human behavior can be sources of failure, and how they act to make safety better. We need to insure that the systems do not overload personnel. In fact, minimal information systems with additional personnel to validate processes may be more resilient than complicated systems that overload personnel. Building on resilience theory, ADR can support the design and/or implementation of information systems along with organizational processes that support resilience. Alternative system and organizational designs can be evaluated to determine their impact on value, measured not just economically, but also by their potential to improve resilience and reduce risk of loss of life (or quality of life).

Healthcare information is highly personal, and there are major concerns regarding this personal information falling into the wrong hands (Fichman, Kohli, & Krishnan, 2011). Perceived privacy concerns, both real and actual, also exist in the financial industry, but perhaps are even greater in the healthcare industry. There are a variety of risks inherent in the compromise of sensitive health information and individuals are very emotional regarding details about their medical history and its use (Anderson & Agarwal, 2011). Privacy is particularly critical in the US with its private insurance system, where there are concerns about usage of patient data for de-insurance purposes. Angst and Agarwal performed an experiment in which they manipulated argument framing and privacy issue involvement and evaluated the impact on EHR adoption intention (Angst & Agarwal, 2009). They show that individuals can be persuaded to support the use of EHRs, even in the presence of significant privacy concerns, when they receive appropriate messages about their value and safety. We can extend this type of research to study the impact of privacy on value. ADR can support the design of elements in organizations that support positively framed messages and/or design delivery processes that further deliver these messages at appropriate times. They can then evaluate the impact of these designs in different systems and processes by comparing their impact on privacy concerns, which ultimately impact economic outcomes. For example, if individuals do not divulge particular types of health information for fear that it will be used inappropriately once captured electronically, then the ability of these records to serve as a complete source of information for diagnosis will be limited

9. Conclusions

Healthcare delivery in the US is currently undergoing substantial innovation spurred by government efforts. New methods of healthcare delivery are being tested. New systems, often developed by commercial vendors, are being adopted in response to government incentives. All of this is happening now. If we wait to utilize traditional ex post research methods to understand how IT value is created in this industry. We will miss the opportunity to influence practice now as these changes are taking place.

ADR enables IT researchers to adapt existing theories in a unique industry. We cannot simply apply traditional IT value research results from other industries due to industry differences that affect how value is measured and achieved. But if we wait until all the changes are made and then ex post study what factors led to value, we will miss a chance to influence practice. I advocate using kernel theories from existing research, modifying them for this industry, using these modified theories to influence the design of technical and/or social processes, and evaluating the impact on value generation. While we cannot resolve the industry differences through improved design, we can use theories developed in other industries to suggest alternative socio-technical designs that might better lead to value in this industry. ADR can enable researchers to actively participate in the design and/or implementation and evaluation of new socio-technical systems in order to generate new theory.

This will be no easy task. IT value researchers will need to collaborate with others to do this research. They will need to partner with experts in healthcare management, economics, and informatics, who understand relationships, processes, and social issues in this industry and their impact on value. They will also need to partner with both healthcare IT and delivery providers. I do not suggest that IT value researchers alone design the IT artifacts or organizational innovations, but that they provide guidance to those who do by drawing on fundamental IT theories to guide design and implementation and then evaluate the impact on value. Since IT theory is remote to most practitioners and researchers in healthcare fields (Chiasson & Davidson, 2004), we need to actively seek out these collaborations and demonstrate the applicability of our theory. Since healthcare providers are familiar with clinical research and evidence-based medicine, which, similar to ADR, attempts to determine effectiveness of practice, we can expect that this approach will be facilitated through the providers' active participation in testing new IT and organizational models and measuring benefits including better health outcomes and lower costs. Meanwhile, the IT value researcher will focus on developing theory based on this evaluation. This research will be time intensive because design, implementation, and evaluation can take years. However, waiting until the innovations are implemented and then using ex post analysis will take even longer. The efforts to develop these collaborative relationships will enable us to improve the ability of healthcare IT value researchers to contribute to practice when it will make the most difference.

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