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Path to Sustainability for Health Information Exchanges in the US

A Case Study of the Indiana HIE through Alignment and Enactment Frameworks

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ABSTRACT

Unlike most industrialized nations, the United States has a highly fragmented healthcare system in which patient information is not typically shared across different providers. In recent years, however, the federal government has attempted to foster the development of health information exchanges (HIEs) by making funds available to states and local governments. As this paper seeks to demonstrate, what is most critical is not the economic business model chosen, but the degree to which system designers are able to generate value for the main actors involved. This paper will analyze the characteristics of the successfully implemented Indiana Health Information Exchange through alignment theory and enactment frameworks, highlighting its ability to meet the expectations of its most important users, embedded within the specific historical, organizational, and cultural environment, and how this interaction of factors has augmented its prospects of long-term sustainability.

Introduction

Health Information Exchanges (HIEs) are electronic systems which facilitate the aggregation, transmission, access, and retrieval of patient data across practices, hospital systems, and different levels of government agencies. Unlike many countries with already well-integrated health information systems (IS), the U.S. healthcare system is highly decentralized wherein patients commonly frequent different, unaffiliated health providers, each of which maintains its own private medical records. The aims of HIEs are to make disparate clinical data available to a multitude of providers in the vein of efficiency, accuracy, and timeliness (HealthIT.gov 2014). Additionally, HIEs can help providers avoid redundant re-entry or duplication of data as well as aid public health officials in analysing macro-health data regarding clinical quality and related research across large segments of the population (Grossman et al., 2008). The end goal in HIEs is to provide high-quality patient healthcare through digital integration (HealthIT.gov, 2014).

The Economist places annual U.S. healthcare spending at $2.8 trillion (1st February 2014). This figure highlights the need to make the entire healthcare system much more efficient. With the ever-increasing benefits and possibilities of health IT, faith has been instilled in the HIE movement to address these gaps in clinical care across the nation. According to Grossman et al. (2008), HIEs are a principal element of the U.S. government's strategy, initiated in 2004, to create a national health information network. Programs and funding are available from the federal government, while public and private sector stakeholders are making investments at the local and state levels. The federal government additionally sponsors a program to establish and advance HIE efforts within and between states through the Health Information Technology for Economic and Clinical Health (HITECH) Act (Covich et al., 2011).

However, the path to success for HIEs has been fraught with difficulty and a high rate of failure (Grossman et al. 2008). Furthermore, the stakes are high, as the cost of HIEs is no small figure. According to Sipkoff (2010), some examples of states which have made heavy investments in HIEs are Washington ($4.4 million), Rhode Island ($6 million), and, notably, New York ($100 million). Though, as this paper will demonstrate, not all investments lead to success.

The problem of sustainability, or the degree to which a system can be administratively and financially maintained, has always been a key issue in technology implementations. This paper will examine the following questions: how might a complexity of factors generate sustainability for a given system, and what might these, sometimes less apparent, factors be for an HIE?

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The analysis will focus on alignment and enactment theories as one way of contextualizing sustainability. Starting with the notion of stakeholders and their role in the IS adoption process, I will leverage these research themes to highlight the extent to which stakeholder values and system design must be aligned in the creation of HIEs, and the impact that the various historical, environmental, organizational, and cultural contexts they are embedded within have on long-term sustainability. In the HIE field, there exists different literature attributing certain characteristics to HIE failures and successes, including whether privately- or publicly-funded business models are better apt to achieve sustainability. Other debates centre around government policy and regulation; privacy and confidentiality; technical issues (e.g., system architecture, integration, and connectivity); and governance models (Truscott et al., 2010). I will touch on these debates, but use the case of the Indiana Health Information Exchange (IHIE) in relation to the overarching alignment and enactment literature to demonstrate that what is of primary importance is the depth and breadth to which system designers address key stakeholder value propositions.

The intended contribution of this paper to the IS domain is two-fold. Firstly, it seeks to offer a theoretical contribution by analysing HIE sustainability through a unique combination of alignment and enactment frameworks. From an empirical perspective, it seeks to offer a qualitative explanation for the success of an HIE case study, as comprehensive qualitative research is less prevalent in mainstream HIE discussions. Often users and technical systems are assumed to be "black boxes" and, as such, failures are attributed to exogenous factors such as business model or technical implementation inadequacies. This paper, instead, will approach common HIE issues from an endogenous assessment of the human and technical factors involved and, in particular, the synergies between them.

Literature Review

Importance of Stakeholder Buy-In & Sustainability

The issue of stakeholder value proposition is a recurring theme in the e-health literature. Weak perceived value propositions among those who support or use the systems are a general attribute of many HIE failures. Grossman et al. (2008) note that stakeholders, as information providers, users, and funders, are crucial to the sustainability of any HIE. They are the ones supplying the clinical data which must be deemed valuable by physicians in terms of both quality and quantity to make the information exchange services worthwhile. Additional stakeholder concerns are loss of competitive advantage, data misuse (e.g., privacy concerns), technological and regulatory limitations, and unclear best practices on how to finance HIEs (Grossman et al., 2008).

In a 2010 Accenture report, developing sustainable business models is cited as one of the major challenges for HIE programs (Truscott et al., 2010). However, the issue is deeper than mere financing, which is what this paper seeks to demonstrate. The problem begins when providers cannot justify using HIE services, and certainly not paying for them (McIlwain & Lassetter, 2009). After touching on the public vs. private sector debate and its consequences, I will elaborate on how the theoretical frameworks of alignment and enactment contribute to stakeholder buy-in.

Public vs. Private Sector Business Models & Sustainability

According to The National Opinion Research Center, sustainability is characterized by the successful interaction of many different variables (or "drivers") over time and is not contingent on any single factor, such as revenue source (Texas Health Services Authority [THSA], 2013). HIEs have been widely classified by the following four main business models: Not-For-Profit, Public Utility, Physician & Payor Collaborative, and For-Profit (Deloitte Center for Health Solutions [CHS] 2006, Lee et al. 2010, THSA 2013). The source of funding for HIEs can be grouped into several categories, ranging from public grants, private grants, subscription fees, transaction fees, and more (THSA, 2013).

The THSA (2013) notes that long-term financial sustainability will most likely not come from federal grants, as these programs are subject to end with little notice, depending on the political and economic climate. Private investment proves contentious as well, as HIEs can easily become solely focused on revenue targets, inherently ignoring patient or physician best interests. However, the importance of stakeholder alignment is something that is uncontested. As the authority describes, "Most importantly, a clear value proposition of participation is crucial to providers and hospitals. The benefits of participation in an HIE must always exceed the cost of participation, if the HIE is to remain sustainable" (THSA 2013). This implies that the most promising way forward would be through the right mix of public or private initial funding, followed by an eventually self-sustainable fee structure. However, it should not be assumed that this is the only feasible model. South Carolina's SCHIEx and New York's THINC are two HIEs which are viewed as public goods, primarily use grant funding, and are considered relative successes (Lee et al. 2010; National eHealth Collaborative 2011). Building upon this idea, I will demonstrate how the overarching IS themes of alignment and enactment are factors in this success.

Alignment & Enactment Frameworks

Theories relating to the socio-technical construction of technology have long been used in IS to investigate technological implementation in different organizational contexts, accounting for the unique interplay of humans and technical systems (Lee et al., 2008). Pursuing the human focus further, more socially-embedded theories (e.g., Social Shaping of Technology, Sensemaking, and Institutionalism) focus on the virtual construction of technology by humans who impose their ingrained experiences on the artefact, which affects not only how a technology is used, but how it is actually shaped by this use. Two often-employed frameworks that fall on the spectrum of social-embeddedness are alignment and enactment. I have chosen to rely on this particular combination to highlight the social explanations behind public policy phenomena, such as health programs, which are often justified from technically-rational or administrative points of view, failing to integrate the expectations actors throughout the healthcare ecosystem hold in the appropriation of new work processes and technologies, especially those that touch so closely the very private matter of personal healthcare data. Enactment is a particularly socio-cultural and institutionally-aware framework that serves to compliment alignment models, which can neglect the individual sensemaking processes actors undergo when enacting a new technology. Conversely, alignment, unlike positivistic theories (such as Actor-Network Theory), can prove very relevant to the practitioner discussion of user acceptance in the modern healthcare realm. Paired together, the two theories, beyond offering a deeper theoretical understanding of the issues at play, could potentially lead to actionable recommendations for HIE providers.

In the following sections, I will discuss the main premises of these frameworks and how they can complement one another in critically examining the sustainability of the IHIE deployment.

Alignment

According to Luftman & Brier (1999), alignment is defined by "the activities that management performs to achieve cohesive goals across the information technology and functional… organizations." It is, therefore, a reflection of how IT integrates with the business and vice versa. In traditional methods of implementing business strategies, IT has often been considered a cost-centric expense and not the propeller of value that newer perspectives, including within the alignment dialogue, tend to stress, thereby overlooking the full advantage that IT can bring (Luftman & Brier, 1999). As many scholars have noted, the search for a universal recipe for strategic alignment is futile, as alignment strategy is completely situationally-contextual (Chorn, 1991; Luftman & Brier, 1999; Reich & Benbasat 2000). Strategic fit is acknowledged as the extent of alignment "between competitive situation, strategy, organisation culture and leadership style" (Chorn, 1991). It is widely considered a key indicator of organizational effectiveness, an accurate predictor of sustained competitive advantage, and an ongoing, rather than static, managerial process (Chorn, 1991; Luftman & Brier 1999).

Reich & Benbasat (2000) discuss another element of business-IT alignment: the social. The authors contrast this dimension with the more widely-covered theme of rational, managerial alignment - what Horovitz (1984) calls the "intellectual" dimension. The social dimension, on the other hand, "investigates the actors in organizations, examining their values, communications with each other, and ultimately their understanding of each other's domains [and is] more likely to focus on the people involved in the creation of alignment" (Reich & Benbasat, 2000). They describe the social dimension of alignment as being, potentially, more difficult to perfect and more crucial to success. They cite Berger & Luckmann's (1967) study of the social construction of reality which posits that managers should understand "the contents of the players' minds" such as stakeholders' understandings and attitudes towards the technological artefacts at hand. According to Reich & Benbasat (2000), communication between stakeholders, both from the IT and business domains, is regarded as the most important indicator of alignment. Effective communication distinguishes systems that merely offer the best technical solution and those that deliver the most value to the stakeholders involved.

Alignment on its own cannot always provide a strong enough assessment of sustainability within a given context, which is why I will next discuss enactment to augment alignment theory and, consequently, allow for a more comprehensive evaluation.

Enactment

Enactment is the process of social construction by which actors bring and set in motion past events, conscious and subconscious beliefs, attitudes, and general preconceptions in interactions with new situations (Weick, 1988). In this light, actors cannot recognize the meaning they are subconsciously imposing on the event, environment, other members of the organization, and themselves. These "preconceptions" affect the sensemaking process that all individuals undergo when confronted with a situation. As Weick (1988) notes, "the external environment literally bends around the enactments of people." Through the process of enactment viewed from an external point of view (i.e., from a third-party perspective, such as a research study), one can start to objectively understand a given organizational

structure.

The convergence of technology within enactment theory led to the creation of the technology enactment framework (Fountain, 2001). As Cordella and Iannacci (2010) describe, this socio-technical framework draws on ideas from institutional, organizational, and social theory to understand the interaction of material technology within organizations. This framework is used to study how organizations enact technology in relation to their institutional features (Yildiz, 2007). "Objective technology", such as the physical hardware, software, and infrastructure that these technologies depend on is distinct from "enacted technology", which can be considered "the use and perception of technology in a particular setting" and according to the institution's formal (structural and legal) and informal (social and cultural) norms (Cordella & Iannacci 2010).

Fountain (2001) outlines technological enactment's role as the "filler" of "microstructural details required to understand the connection between individual action and structure." She discusses that position within a hierarchy (e.g., manager, director, subordinate) or a network (e.g., government agency, private corporation) affects the view that one has on a particular situation as well as the interests that an actor holds (Fountain, 2001). The role of history is also an important concept. As Selzinck (1992) writes, "Institutionalization constrains conduct…by making it hostage to its own history." This idea stresses the influence of history on sensemaking and, ultimately, enacted technology (Fountain, 2001). More generally, system designers can construct a technology in the hope of some outcome. This outcome could be parallel or completely divergent to the resulting enacted technology, depending on the individual actors involved.

Case Study: The Indiana Health Information Exchange (IHIE)

History

The U.S. state of Indiana has a long history of innovation in health IT. In 1994, pre-dating any national HIE initiatives, the state launched its Indiana Network for Patient Care data exchange, the precursor to the present Indiana Health Information Exchange, also known as IHIE (West & Friedman, 2012). Established in 2004, IHIE is one of the country's largest, connecting over 10 million patients; 18,000 doctors; and 80 hospitals, community health centres, long-term care and rehabilitation facilities; and other providers in a secure, robust, statewide health IT network (Finn, 2011). By the end of 2010, IHIE covered 43% of the state's population (Penno n.d., cited in West & Friedman 2012). From its inception through 2010, it had delivered a total of more than 77 million clinical results (Indiana Health Information Exchange, 2011). It has partnerships with HIEs and health systems within Indiana and in neighbouring states. In the following sections, I will describe the factors involved in the strategy and initial implementation of IHIE.

Stakeholders

IHIE operates through a variety of governance structures for most efficient consultation with its diverse user groups. The main stakeholders consist of a board of directors from various hospital networks, government agency representatives, medical societies, individual doctors, scientists, consumer representatives, and a public outreach forum (West & Friedman, 2012).

The IHIE system caters to this variety of stakeholders' needs. For the purpose of this paper, using Donald Norman's definition, affordances are "the perceived and actual properties of the thing, primarily those fundamental properties that determine just how the thing could possibly be used" (Norman, 1988). IHIE provides a number of affordances to its stakeholders and other users. These include the creation of patient-specific quality reports for clinicians using real-time information through Indiana's Quality Health First (QHF) Program; doctor performance assessment; the clinical messaging service "DOCS4DOCS"; web-based training; and the provision of standardized and integrated clinical, claims, and cost information across all providers within the network (West & Friedman, 2012). Overall, according to Grossman et al. (2008), IHIE served "multiple roles as data provider, data aggregator and manager of QHF's other activities, including negotiating with stakeholders and overseeing quality measure development." More recently, IHIE added long-term care to its portfolio of offered services through the National Coordinator for Health IT (ONC) Challenge Grant Program and commenced a project to merge clinical and health plan claims data to evaluate performance of providers within the overarching goal of improving community-wide quality assurance and instituting "pay-for-performance" models (Grossman et al., 2008; West & Friedman, 2012).

In addition to affordances, funding is another critical aspect of sustainability. As such, we will now look at IHIE's financial business model.

Business Model

IHIE was launched with the financial support of hospitals and other stakeholders. It has chosen to sustain itself through a private-public hybrid model in which hospitals, laboratories, and other users are charged fees to deliver results to other hospitals (Finn, 2011). Although the state attempts to avoid over-dependence on subsidies or grants, IHIE also

continues to rely on external funding. For example, in 2010, it received its largest amount - $50 million - from ONC's HITECH Act fund.

However, in IHIE's long term strategic plan, it views revenue-generating services as crucial to building long-lasting sustainability (Grossman et al., 2008). The clinical messaging service is seen as the most obvious selling point for existing and potential users, as it is easiest to demonstrate the reduction in operating costs by distributing clinical results to and from hospitals electronically. Consequently, hospitals and other participants are more willing to pay fees for this service.

Environment

The context in which an HIE is implemented can also be a pervasive, less evident, yet still critical factor for sustainability. West & Friedman (2012) outline the historical and organizational environment in which IHIE is situated in terms of eight categories: external environment, organizational environment, consensus about goals, consensus about means, unique local aspects about the state, consensus about roles, willingness to contribute financial or organizational resources, and consensus about behavioral expectations - all of which were positively aligned in IHIE's favor.

Plan for Sustainability

In assessment of sustainability, IHIE's explicit plan for sustainability should be taken into account. According to the THSA (2013), its strategy is focused on offering an ever-growing portfolio of "value-added services" to different stakeholders throughout the healthcare network. (For a summary of IHIE's near-term sustainability strategy, see THSA 2013.)

In short, IHIE's main priorities are not purely financially-focused, but instead aimed at expanding reach of the system's core products of clinical messaging and QHF patient report generation services in both current and new markets of healthcare providers, health plans, and employers. Securing payment from participants is in-line with visions of future self-sustainability, but it is just one component.

Analysis

IHIE is widely considered one of unfortunately few HIE successes in the U.S. (Finn, 2011; West & Friedman, 2012; Terry, 2014). The exchange's main focus is on supporting more focused, transaction-based information exchange, namely through its clinical messaging service, as designers identified this as the activity which most hospital systems would support in terms of providing data, use, and potential funding (Grossman et al., 2008). These users are not enticed merely by operational cost savings, but by the productivity-enhancing potential of the system as well as its role as outsourcer of related services, namely digitizing public health reporting and medical records, thereby lightening the work burden of the participating institutions (Grossman et al., 2008).

Successful health IS design is not driven by one unique value or business model beside that of sustainability. Relating this idea to alignment theory, to achieve sustainability, it is necessary to create system architectures which distribute value to all actors involved, from doctors and other hospital staff to healthcare administration, financial sponsors, and even patients. In essence, the business model becomes more about stakeholder-valued affordances than funding. According to the Deloitte Center for Health Solutions 2006 report, while "financing and ROI issues often receive a disproportionate share of stakeholder attention, successful HIEs keep their purpose and mission at the forefront," such as IHIE (Deloitte CHS 2006). IHIE's mission to facilitate a simple business need - i.e., the generation and access of shared patient data in the aim of increasing quality, efficiency, and safety throughout the state healthcare system - is relatively uncomplicated, clear, and meticulously executed (Deloitte CHS, 2006).

According to Grossman et al. (2008), a major stakeholder concern for potential participants was how participating would affect what previously proprietary data could be shared, explicitly affecting data privacy and security issues. Grossman et al. (2008) note that the potential loss of competitive advantage by liberating control of "their" data was, perhaps, the biggest concern of potential participants. Proprietary clinical data was considered an important strategic asset binding patients to their services, as physicians would find it less complicated to send patients to a hospital that already has their data on file. Hospitals also feared that competing providers would use their client information for marketing reasons and to direct patients to other hospitals. Additionally, healthcare providers were cautious of intended data use for hospital performance measurements, as they could, potentially, be found non-compliant with some federal operational or privacy laws. As a direct response, IHIE actively worked through all of these varied concerns with stakeholders to increase participation (Grossman et al., 2008). With regard to the data ownership and privacy issue, Grossman et al. (2008) outline how IHIE differentiated itself from other exchanges by allowing only designated physicians to access patient data. Moreover, to view this data, the patient would have had to previously consent for the specific provider to have control over his or her records, and there would have to be a "triggering event" for the designated physician to even be able to view the records (i.e., the physician would need a reason, such as a patient visit). Additionally, clinical

information could not be used for quality reporting or similar purposes without explicit approval.

By accommodating the high privacy and data concerns of physicians and encouraging collaboration as a neutral party, IHIE convinced hospitals that working together with their competitors was the best way forward. The neutrality and trust that IHIE built up among stakeholders through earlier information exchange projects was also key to convincing hospital CEOs to collaborate (Grossman et al., 2008).

IHIE achieved alignment, specifically Reich & Benbasat's notion of "social alignment", through understanding healthcare providers' desired outcomes and by shaping the system and its incentives from their points of view. IHIE staff effectively "black-boxed" this alignment through the crucial aspect of communication (between stakeholders, both from the IT and business domains) throughout the project. Alignment was further secured through specific, strategic decisions made by IHIE management, such as the connection with the Regenstrief Institute whose experts thoroughly understood the value and complexities of the technology. Additionally, the state's "mothership approach" to data, which favours data integration and sharing over other states' (such as Utah's) "post office approach", which tends to treat medical data as the private passing of information from sender to recipient, contributes to increased participation levels (West & Friedman, 2012). Another differentiator for IHIE's success is the system's adaptation of existing technological infrastructures to deliver additional features, such as the integration of automatic public health reporting for government agencies (Grossman et al., 2008).

West & Friedman (2012) summarize the key business-IT alignment factors in IHIE's so far successful path to sustainability:

> Indiana has made excellent progress in building consensus on goals, means, and roles for various stakeholders. Its inclusive governance structures with different committees and advisory boards has worked well. The state coordinates effectively with various local and regional networks… [and] has pioneered a business model based on providing important services to stakeholders, and therefore is well-positioned for future sustainability.

However, alignment theory can superficially neglect the way technology is socially-constructed in institutional and cultural environments, and how this can affect the end results of a technological intervention. This is where enactment frameworks can complement the analysis of IHIE to provide a more nuanced picture of the factors that contribute to its sustainability.

Analysing West & Friedman's outline of IHIE's historical and organizational environment (Figure 1), the state's history as a pioneer of stable, effective health IT systems worked to IHIE's advantage, as it had a strong, historical knowledge base off which to build the HIE. This included prior experience with the related regulatory, policy, and clinical issues of such systems. The organizational environment is also conducive to shared visions of success, as the group consists of a wide-range of both public and private actors, each which is given a seat at the governance table. This participatory environment allows IHIE designers to understand all players' main requirements - for example, privacy concerns for physicians or secure, open data sharing and reporting for public health officials. Furthermore, the combination of the historical and organizational environment, facilitated by IHIE's leadership, contributes to the widespread consensus about goals, means, roles, and behavioural expectations (West & Friedman, 2012).

Because of these historical, organizational, and contextual factors, IHIE stakeholders are motivated to use and support the system, from both operational and financial perspectives. Through this lens, we are better able to understand the details of the connection between individual users' actions and overarching institutional structure (Fountain, 2001). In terms of IHIE's initial successful implementation, these actors received the unenacted technology and, through the "sensemaking" process - namely with regard to their implicit and explicit views on its role concerning their individual needs; technical and clinical usage; operational effectiveness; and long-term sustainability - they enacted the technology. This enacted technology manifested through IHIE appears to be congruent with the intended design of the system.

Conclusion

As the THSA (2013) notes, the benefits of having a wide-spread network of effective HIEs are nationally recognized. Other authors have discussed HIE success factors in relation to financial business models; government policy and regulation; privacy and confidentiality; technical issues; and governance models (Truscott et al., 2010). The focus of this paper was instead on sustainability from a combined IT alignment and enactment perspective. Whether entirely self-sufficient or falling somewhere on the spectrum of private or public investment, HIEs become sustainable when they reach a critical mass of health institutions participating, contributing, and benefiting from their services. This paper sought to

demonstrate the factors of IHIE's widely-acclaimed success through alignment and enactment theories which serve as effective lenses to highlight the degree to which stakeholder values and system design must be aligned in the creation of HIEs, and the effect that the historical, environmental, organizational, and cultural contexts they are embedded within has on future sustainability. In conclusion, what is most critical to sustainability within HIEs appears not to be the economic business model chosen, but the degree to which system designers are able to generate value for the main actors involved. Time will tell how IHIE will ultimately fare but, so far, signs are pointing towards a continuously improving and growing exchange, and one that should be looked at as a model to newer or struggling HIEs.

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