The Development and Diffusion of IS Standards in the Canadian Healthcare Industry: An Industry Level Analysis

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Abstract

*There are major steps being taken at national, provincial, regional, and organizational levels to increase the implementation of information systems (IS) in the healthcare system. Developing and implementing nationally accessible electronic health records in the form of panCanadian electronic health records is the ultimate goal for the Canadian government. The solution called for by the healthcare industry involves the continuous development and diffusion of healthcare industry vertical standards to enable seamless electronic integration. Our proposed research project is an exploratory case study which will address the following research question: **What are the processes taking place as the Canadian healthcare industry develops and diffuses vertical industry standards to achieve interoperability and integration?** By taking a socio-technical perspective to answering this question, we will further research on standards development and diffusion enabling us to assist in the development of relevant guidelines to serve the practitioner community in developing and diffusing vertical industry standards.*

Keywords: Information systems standards, interorganizational electronic integration, development**,** diffusion

1. Introduction

"Electronic health records are one of the keys to modernizing the health system and improving access and outcomes for Canadians" [28]. The objective of our study is to understand the relevant processes taking place as the healthcare industry - including hospitals, clinics, government agencies, vendors, and professional associations - implements interoperable information systems. Vertical industry standards are at the core of interorganizational electronic integration and have recently been the focus of a few studies at the industrial level of analysis [22, 23, 25, 32, 34]. However, none of these studies considered the healthcare industry.

Furthermore, interorganizational systems have been studied, usually using an economic perspective, such as transaction cost theory in a competitive environment [5, 8, 17, 35]. The dynamics of the Canadian healthcare industry, which is government regulated and financed, entail a different perspective since the forces differ substantially from those found in more profit driven environments. An exploratory case study of the Canadian healthcare industry on how their IS standards are developed and diffused to support the implementation of panCanadian electronic health records will be conducted to increase our understanding of the necessary steps related to industry standards development and diffusion.

2. Conceptual Foundation

Löwer [21] defines interorganizational standards as "broadly adopted specifications that formally define or support business-related semantics and processes, which are made accessible to other organizations' information systems" (p. 237). This is a definition which includes several types of standards. Standards that support semantics are not necessarily the same as those which support processes. There are also some data transmission standards which have been referred to as "rules for transmitting data from one system to another" [14].

In the context of healthcare information systems there are several relevant types of standards This paper narrows its focus on to a single standard (HL7) which is used to communicate health information.

Research on vertical industry standards is starting to appear in the IS research literature. For example, a study of the development and diffusion of industry standards in the US home mortgage industry was recently conducted [22, 23, 31, 32]. Through these in depth case studies it became clear that the types of standards influenced their development and diffusion process [23]. Specifically, vertical standards differ from horizontal standards in their development and diffusion process.

Vertical standards involve not only IT vendors—as happens in horizontal standards—but also regulatory bodies and other industry members who contribute to the integration of the vertical standard with business processes and the conformance to industry specific regulations. Although the above studies provide us with significant insights, they are limited to one industry. Further studies are needed on the topic of vertical industry standards.

In the past, an economic perspective was used to theorize about the diffusion of innovations (e.g. industry standards). Currently, complementary perspectives such as social, socio-technical, socio-

cultural, and institutional are gaining favour [10, 26, 27].

There are several theoretical frameworks that emerge from these perspectives. Some like the stakeholder theory focuses on the human or corporate actors who are involved in or affected by the development and diffusion of a vertical standard [3] but it does not equally involve the technology in the analysis.

Similarly, the institutional perspective may be used to uncover the salient social structures and changes that the organizations' structures go through as industry standards are diffused. These changes may consist of processes to establish the validity and legitimacy of rules, norms and routines [2]. Although this is also an interesting framework, it suffers from the same weakness of the stakeholder perspective: it does not equally consider the role of technology in the analysis.

A theoretical framework that would include the technology equally well in the analysis is needed for this study. We therefore turn to a socio-technical theoretical framework because it specifically and equally includes the technology in the focus of research. One theory that comes from such a socio-technical perspective and could be useful in studying the industry standards is the actor network theory (ANT). This theory integrates technological, political and institutional factors [15 c.f., 34], and thus is an excellent fit for this study. This perspective is also referred to as the social shaping of technology approach [16]. ANT suggests that the work of science is not fundamentally different from other social activities [9].

The primary tenet of ANT is the concept of the heterogeneous network, where a network is built upon the various social and non-social elements that are channeled in such a way that they can work together [19]. A successful actor network is achieved when innovators succeed in building a network that is capable of resisting external threats from human as well as non-human actors (both referred to as actants).

The actor network theory (ANT) was previously used to study the role of vertical standards in aligning the interests of different actors (e.g. government, service providers, and users) and coordinating actions among them to mobilize the resources that are necessary for the successful innovation and diffusion of South Korea's broadband mobile services [34].

During that research, the focus was on tracking and investigating specific configurations of actor networks at specific stages. It was found that: 1) Standards enabled different actors to align their interests; 2) Standards defined a set of obligatory passage points (OPP) that were all successfully passed when the 2nd generation mobile technology transition period was closed. Note that for an actor to successfully translate an innovation, it must win the support of others and make itself indispensable to them by translating their interests and enrolling them. A successful translation of an OPP is a condition of network stabilization [16].

Thus results indicated that the success or failure of a standard is not determined simply based on technical merit, but by the configuration of the actor networks and how the status of obligatory passage points are achieved.

3. Research Framework

After making some minor modification to Yoo et al.'s [34] framework to fit the panCanadian EHR context, our research framework is illustrated in figure 1. It lists four groups of actants: Standards, innovation systems, market place and regulatory regime.
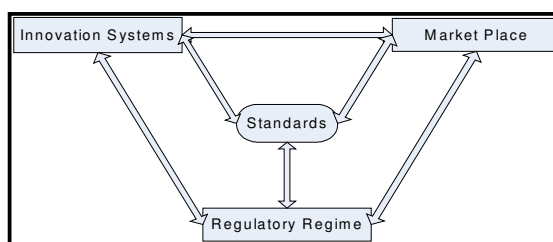

Fig 1. Research Model

In our study, as adopted from Yoo et al. [34] **standards** are any written artefact that enables effective coordination of activities between independent developers, manufacturers or users of technologies. **Innovation systems**, based on research, experimentation and development activity, are actor networks that consist of the interconnected sites, competencies, ideas and resources which are able to develop new solutions and capabilities over time for panCan EHR. The **market place** includes the constitution of actor networks that produce healthcare IS services or their underlying technologies by exploiting technological capabilities defined within the healthcare IS standards. The **regulatory regime** is any type of authority (industrial, provincial, national or international), that can influence, direct, limit or prohibit any activity in the innovation and diffusion realm and thus imposes a set of constraints and associated inscriptions on how actor networks can be organized.

Standards are seen to be at the heart of the interactions between the innovation systems, market

place and regulatory regime. It links to each of these logical actants and is an actant itself. Additionally, each of these actants may interact with the other actants directly. This framework will serve to focus the data collection for this study on how the actor networks configure themselves to achieve successful development and diffusion of healthcare industry standards.

4. Case Study Design

The uniqueness of the panCanadian EHR development and diffusion process calls for the use of a single case study design [12, 33]. A conceptual framework, based on the ANT model elaborated by Yoo [34] will be used to bound the collection of data as recommended by Miles and Huberman [24]. Eisenhardt [13] agrees that a priori specification of constructs can help to shape the initial design although this does not guarantee that these constructs will remain in the resulting theory developed during the study. These same notions are echoed by Strauss and Corbin [30]. This approach seems accurate because our focus is on studying the evolving role of standards in shaping actor networks as the technology evolves in the development of the panCan EHR. Thus, the aim of this exploratory case study is to generalize from case to theory (or theory extension) rather than from a sample to a population [33]. Yoo et al. [34] used the same case study design.

5. Data Collection and Analysis

One of the authors has already attended healthcare IS industry events in an effort to prospect the research project. These early efforts revealed several sources of primary and secondary data. Primary data include semi-structured interviews with industry informants and field observations at key industry events. This is a technique that was used by Currie [11] in a study of the application services providers industry. Secondary data (e.g. industry reports, government publications, white papers, notes from industry presentations), will also be used. Multiple data collection methods and data triangulation will be important attributes in developing a trustworthy case study [4, 13, 20, 33].

Quota selection sampling (c.f. [24]) involves identifying the major subgroups and then taking an arbitrary number from each. For interviews, based on the research framework, a few organizations falling into each of the actor networks identified in the framework will be sampled. The sample may be further developed during early data collection as a result of opportunistic and snowball sampling techniques [24]. This will involve approaching industry informants from several key organizations including governmental organizations, industrial organizations, professional associations and industrial standards development organizations and

vendors of the technologies involved. However, to bound the data collection process, interviews will be limited to informants involved with standards, integration and interoperability issues.

Potential interviewees will receive an introductory letter to explain the need for the interview, explain the relevant ethical guidelines, and request from them to accept or not the interview format and a phone call to set up the interview. The interview questions will be grouped into six main categories. The first is basic individual questions related to the informant's role and involvement with the standards project (with a demographics question at the end of the interview). Organization related questions will also be asked. These will include a history of the organization, its involvement with the standards effort, the roles it plays and other relevant details. The next group of questions focuses on identifying the actor networks involved. Strategy, technology, and national diffusion questions will be asked as well.

Generalizing from case to theory is done through hermeneutic iterations between data and emerging theoretical constructs until a theoretical saturation is reached [29]. Miles and Huberman [24] suggest many data analysis procedures and techniques such as the transcription of interviews, the creation of contact summary sheets, and collecting all case data in a database.

Thus the advice of Miles and Huberman [24] will be followed in the data analysis phase of the study. Generally, the data will be surveyed for relevant information and will be coded according to a pre-set coding scheme which may be evolved and extended as necessary. Through analysis, patterns in the data will probably emerge and some theoretical implications should be derived from these patterns. The guidelines provided by Langley [18] will be used to complete the theory building from the process oriented data that the data collection efforts produce. The temporal bracketing technique will be followed to show the developments in the processes over time as recommended by Langley [18].

6. Conclusion

This paper describes a research plan in the early phases of development. The focus is on the phenomena taking place in the context of health care information systems standards. We propose a study which should focus on the industry level of analysis using qualitative research methods.

The proposed study will allow us to elaborate theoretical propositions in the context of the Canadian healthcare IS industry. The findings will allow practitioners, including managers and policy makers, to explain what is needed to achieve certain

objectives and to predict process outcomes (c.f. [30] p.22).

Only a few academic studies have addressed the industry level of analysis. This gap has been commented on in IS research in general [1, 7] and particularly in health IS research [6]. Our study aims to fill this gap in knowledge, specifically with respect to the healthcare industry. By generalizing from case to theoretical propositions [33], this study will assist in starting to develop guidelines for practitioners wanting to bring about significant changes, using IS, in their respective industry. Thus, this proposed study aims to satisfy the above mentioned gaps in research and in practitioner knowledge bases.

7. References

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