A SUMMARY LANDSCAPE IN EHEALTH ADOPTIONSTRATEGY

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Abstract - An attempt to obtain stated business goals of an organization, senior healthcare IT leaders make use of a collection of tactics that are organic in nature in the absence to a declared strategy in the adoption of an eHealth system. The collection of tactics used and goal objectives can be considered anunintentionalstrategy in of itself, called – a theory of goal direct trial and error, where senior healthcare IT leaders select a tactic to move the organization closer to a stated goal. This theory of goal directed trial and error is essentially a holistic approach of clearly identifying and stating the goals, assessing the achievability of the stated goals, and matching clearly defined milestones with aligned metrics which communicate the success of a tactic organically to move the organization closer to its overall stated goal. In thispaper,we provide a summary landscape of current literature in strategies used in adoption of interoperable eHealth systems. In concluding we will identify the need for further research on formal strategies and the viability of a theory of goal directed trial and error as meeting the needs of all stakeholders as a formal strategy in the adoption process of interoperable eHealth systems.

Keywords – eHealth; Health Information System; HIS; strategies; HIE; frameworks (key words)

I. INTRODUCTION

The HITECH Act of 2009 legally required the meaningful use of electronic healthcare records (EHR) and the exchange of the information contained in these records while incentivizing and penalizing those who do or do not adopt some form of eHealth system [1]. However, current eHealth systems are not standardized with competing proprietary architectural systems causing delays in adoptions of interoperable systems [2]. The adoption of an interoperable eHealth system, is complex with a multitude of difficulties and barriers requiring a systematic approach that addresses all potential mitigating aspects of a successful adoption process.

The non-standardization of EHRs leads to disparate unattainable electronic records at various medical providers that are either not co-located nor associated with a medical group with which an individual sees a medical provider for care and the unavailability of a specialist in a rural area causing a patient to seek treatment outside their home of record or due to limitations of insurance requirements and availability of approved providers [3]. Disparate records are one component of barriers to eHealth adoption. However, to address disarray in standards and enhance the exchange of EHRs, proverbial 'carrots and sticks' were established as incentives and penalties for the promotion of health information exchange (HIE) or the lack of exchange among various healthcare organizations [4]. According to Worthen [5] as cited in Hoque, Hossin, and Khan (2016, p. 307), 87% of business leaders identify information systems (IS) as critical for business needs and success of goals. Due to the critical need of accurate exchange of health information and lower costs in conducting business, health information systems (HIS) are a necessity in the healthcare field from the perspective of a business need at the least. To address the need for an IS, it is necessary to understand, then identify an appropriate strategy to use as a part of a framework in the adoption process of an HIS from a functional and interoperable standpoint.

This paper is a summary of current research exploring the need for strategies, and then identifying a potential strategy to include as part of a framework in the adoption process of an interoperable eHealth system implementation to be considered successful. A theoryis presented that an aspect of current formal and informal strategies used by senior healthcare IT leaders in the adoption process is missing as part of the framework and adoption process. A further summary landscape provides a brief overview on the lack of formal strategies and the concept that senior healthcare information technology (IT) leaders simply have generic goals identified rather than a strategic concept presenting a formalized theory of a strategy which may serve in assuring a successful eHealth system adoption.

II. PROBLEM STATEMENT

Interoperability of HIS could save the healthcare industry billions and possibly reduce errors in medical diagnostics thereby improving the treatment process [6]. However, many organizations fail to properly exchange information in EHRs efficiently due to the lack of interoperability amongst proprietary systems. Current review of literature identifies that there is the lack of formal strategies in implementing interoperable eHealth systems across disparate systems. The main problem is the lack of

formal eHealth adoption strategies to obtain stated goals by use of multiple tactics in an undeclared strategy in the adoption of an interoperable system. The use of random tactics versus the strategies eventually leads to setting of additional goals and further delays a successfully implemented interoperable eHealth system.

III. RESEARCH METHOD

A. Qualitative Case Study

As mentioned aqualitative case study is intended to summarize and understand current strategies and frameworks used by senior healthcare IT leaders in the adoption process which can be later identified as potential solutions as part of a holistic framework used in the adoption process of an interoperable eHealth system. Myers[7] describes information system (IS) qualitative research using interviews, observations and documents to understand a phenomenon. Dhillon, Syed, and Pedron [8] further claim that case study research is preferred in placing context of a study for future studies to refer to and further research. As part of identifying successful implementation of EHRs,it is necessary to identify and understand strategies as part of the adoption process. Therefore, exploring research that has identified successful implementation of an information system can assist in identifying formal strategies.

B. Frameworks

This study identifies the use of the following as frameworks used in IT adoption: Unified Theory of Acceptance and Use of Technology (UTAUT), Expectation Confirmation Model (ECM), Information Technology Post Adoption Model (ITPAM), and Technology adoption model (TAM and TAM2) initially. The original study doctoral study undertaken to evaluate the successful adoption of an eHealth system identifies these four frameworks as potential in evaluation process of HIS adoption. However, a fifth framework, using the D&M IS success model will be suggested as the primary means of evaluating the successful implementation of an HIS due to the flexibility of categories and the need to identify and understand strategies used by senior healthcare IT leaders in adopting an interoperable eHealth system.

C. DeLone and McLean IS Success Model (D&M IS success model)

The use of the D&M IS success model will provide a lens in which to evaluate the successful implementation of eHealth systems. The D&M IS success model provides for flexibility by allowing for context, identification of stakeholders, and the relationship of individual paradigms and multidimensional perspectives [9]. The flexibility allows for this research to identify specific categories that match the needs of the stakeholders in the adoption process.

Based upon the 2016 update, the original study undertaken will use the categories of: information quality, system quality, service quality, use, and net impacts; while omitting intent to use and user satisfaction as part of the evaluation. Omission of intent to use and user satisfaction is identified because it is assumed most organizations have exciting infrastructure to which individuals do not have an option of 'intent' thereby negating the need for satisfaction because users may already have a predetermined dissatisfaction of an existing system.

The D&M IS success model was initially proposed in 1992, with subsequent updates in 2003 (10-year update) and then with further updates in 2016. The 1992 model included two dimensions: system quality and information quality which relate and impact the use and user satisfaction, individual and the entire organization [10]. The model was updated in 2003 to include a third dimension: service quality, altered the categories of use to clearly define intent to use and use and how they it relates to or impacted by the use and intent to use [11]. In 2016, DeLone and McLean updated the model to change net benefits to net impacts to better clarify both a potential negative or positive result from the evaluation versus a perceived and solely positive net benefits impact [12].

IV. STUDY APPROACHES

This section of the paper will offer a few selections of current case studies which include the use of the D&M IS success model as its lens to understanding the paradigm of eHealth and information system adoption from a summative perspective. Each of the studies identified use an aspect of the D&M IS success model specialized to meet the needs of the study undertaken and the stakeholders needs. This is important for reasons of fit within the context of the study for the design and implementation and ultimate deployment of a functioning IS among healthcare organizations [13]. In addition, this study will summarize strategies and the importance in organizations as part of the implementation process.

The following cases studies were selected from the current ongoing study in understanding strategies in IS adoption to show context of the flexibility in use of the D&M IS success model:

A. Study 1

Mohd Salleh et al., [14] conducted a case study focused on system quality attributes excluding many other aspects outside system qualities not needed for the confirmation evaluation of system quality. Mohd Salleh et al. argued the existing gap in D&M IS success model review did not cover technical characteristics of eHealth systems. Mohd Salleh et al., central study theory was to determine how technical system quality predicted healthcare provider's performance rather identifying the individual impact.

The study conducted by Mohd Salleh et al., was focused on confirmation of system quality attributes. Therefore, all other categories were omitted from the evaluation. In addition, Mohd Salleh et al., specifically omitted the use of use and user satisfaction due to the mandatory use of a HIS and system quality and impact measures contained in the user satisfaction category [15].

Mohd Salleh et al., proposed and evaluated a modified model based on the D&M IS success model by evaluating the following external factor categories: adequate infrastructure, system interoperability, perceived security control, and system compatibility. These four exogenous constructs then impacted an internal factor: provider performance. Each category was identified with related indicators specific to the exogenous factor which aspects of the factors that impacted the endogenous factor provider performance. Mohd Salleh et al., further verified their proposed model by testing each hypothesis and the relationship between factors and the impact to the endogenous factor. The resulting conclusion were verified to support each hypothesizes. The strength of the model was tested and validated based on established Fornell and Larcker criterion in measuring discriminate validity [16].

B. Study 2

Chung, Lee, Lee, & Koo [17] conducted a study combining D&M IS success model with the expectation-confirmation model (ECM) for the purpose of measuring tourist decisions and relationships between quality of a vacation website and the predetermined beliefs the tourist had in the decision process. The focus of the study measures the quality of selected destination websites. Then based upon the web sites quality Chung et al., hypothesize the tourist have a predetermined expectation due to the initial system qualities, information quality, and service quality as contributing factors [18].

The use of the ECM model provided Chung et al., cognitive behavior exploration of expectation and initial acceptance behavior leads to confirmation of continued use based on positive performance [19]. In conclusion, based on the combined D&M IS success model and the ECM model Chung et al., confirmed in the context of their study the combination of the two theories is important in understanding tourism concepts as it relates to website usability and satisfaction [20].

V. STRATEGIES

Current frameworks are used in many adoption decision processes, there still appears to be lack of formal strategies as a part of the frameworks in the decision process to assure success of an interoperable HIS. Kivinen, and Lammintakanen (2013) [24] identify true success of an information system is as effective as the extent to which all stakeholders and decision-makers consider its strategies to obtaining its end goals. For example, it seems many organizations state goals and then identify ways and means of obtaining those stated goals only to identify that further changes are needed further down the adoption process due to changes from internal and external environmental factors. Senior healthcare IT leaders approach obtaining the goals using tactics that are a randomly selected and implemented to address a potential short-term constraint rather than identify a holistic strategy to address all known and potential unknown constraints. Kivinen et al., even further state that studies show the HIS implementation is hindered due to the lack of strategic thinking [25]. For instance, the adoption process for many nations as outlined has identified current constraints and issues in existing system structures and then only address the known constraint or constraints impacting or had impacted the system, disregarding the potential other constraints. These organizations have identified specific goals in which they need to obtain to provide business value of treating patients effectively and efficiently for the current business need.

HISs, which are also considered enterprise information system (EIS) are very complex by nature. According to Weichhart, Guédria, & Naudet [21] systems, such as EIS are comprised of people, cyber-physical systems, and the consumers of these systems. HISs today are very much EIS in the complexity of individuals that connect to these systems, review and edit records, collect data from internet of things (IoT) devices and are needed for support of the people that use the complex systems. As such, strategies are necessary to address the complexity in adopting an interoperable eHealth system. Any organization needs to identify the not only frameworks (scaffolding to build) but strategies before building any type of system to ensure success and the obtain the goals of the given organization. As an example, Hellberg and Johansson identified three strategies in which Sweden used in their National eHealth study on health equity [22]. The following three strategies were used: (1) future vision of IT as part of eHealth for providers and patients in the form of a web portal, (2) identify patient and organizational needs, elimination of barriers and enhancement to decision-making ability as part of policy establishment, and (3) that the eHealth sector is an area of innovation and job growth potential providing new business opportunities [23]. Therefore, cases like Hellberg et al., show how nations and political motivation are shaping the need for eHealth and the need for strategies as part of a framework are necessary for successful implementation of an interoperable eHealth system and obtaining stated goals. However, these strategies are broad and do not state goals specifically by senior healthcare IT leaders and involved stakeholders to obtain the overall goals of defining future vision of IT

as it relates to patient treatment and provider use, the needs of the organization and all stakeholders, and addressing innovation and growth potential in the eHealth sector [23].

An attempt to obtain stated business goals of an organization, senior healthcare IT leaders make use of a collection of tactics that are organic in nature in the absence to a declared strategy in the adoption of an eHealth system. The collection of tactics used and goal objectives can be considered an unintentional strategy in of itself, called – a theory of goal direct trial and error, where senior healthcare IT leaders select a tactic to move the organization closer to a stated goal. This theory of goal directed trial and error is essentially a holistic approach of clearly identifying and stating the goals, assessing the achievability of the stated goals, and matching clearly defined milestones with aligned metrics which communicate the success of a tactic organically to move the organization closer to its overall stated goal. This paper provides a summary landscape of current literature in strategies used in adoption of interoperable eHealth systems.

VI. SUMMARY FINDINGS

This summary paper provides an overview of the current need for EHR in organizations today, the need for a strategy and frameworks in the adoption process of an HIS for providing healthcare related treatment. In addition, it provides an initialtheory for senior healthcare IT leaders to use as formal strategy as part of the interoperable implementation process. Finally, it provides a current summary of various current literature in evaluating the successful implementation of an interoperable eHealth system.

The study currently under research is limited to identifying current strategies, if any, used in a healthcare organization. This paper provides a summary landscape of the research completed thus far and the potential trends in future adoption of interoperable eHealth systems. Future studies are needed in the area strategies to determine and identify successful formal strategies for senior IT healthcare leaders to use as part of an all-encompassing framework for the adoption of an interoperable eHealth system. In addition, further study needs to identify and evaluate the use of a theory of goal directed trial and error to provide its usefulness by senior healthcare IT leaders in successfully adopting and interoperable eHealth system to meet the needs of all stakeholders.

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