Knowledge Management Framework Linkage for Cardiothoracic Healthcare

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ABSTRACT
Cardiovascular diseases (CVDs), the number one cause of death globally, are of disorders related to the heart and blood vessels. In 2011, the World Health Organization reported that 80% of CVD deaths occur in low- and middle-income countries. Cardiothoracic patients in hospitals need to be monitored at different point-of-care, throughout their treatment procedures which generate vast amounts of clinical data that is highly complex, multi-dimensional, unstructured and multi-modal. These clinical data are represented in different formats and stored in heterogeneous digital platforms, while some others are still recorded on paper. Thus, medical practitioners cannot effectively integrate, apply and manipulate these data into knowledge for strategic clinical decision. Although there are some frameworks focuses on how health organizations manage their knowledge, they are still different in some aspects. In order to accelerate the research progress in knowledge management, it is time to review these models in detail and integrate them into a comprehensive framework to serve as a foundation for the research. The main objective of this research is to have a holistic view of these clinical information, in a streamline processes by proposing a generic work process framework for cardiothoracic clinical research at point-of-care settings.

Keywords: knowledge management, healthcare knowledge management, knowledge management models and frameworks

I. INTRODUCTION
In recent years, organizations have increasingly realized that one of their most valuable assets is the knowledge that is developed internally and possessed by individuals within the organization (McCall et al., 2008). This view is increasingly prevalent in the case of the health care sector because knowledge management in healthcare is considered as a method and technique that help healthcare organizations reduce costs, enhance healthcare quality, lessen medical errors, cope with information overload, bring current research into practice, support decision-making, and boost cooperation and innovation amongst other things (Abbasi et al., 2012). Healthcare enterprises can be regarded as data rich as they generate massive amount of data, such as electronic medical records, clinical trial data, hospital records, administrative reports, benchmarking and findings, (Abidi , 2001; Wickramasinghe, 2010). Knowledge richness makes healthcare the most receptive domain for knowledge management-based improvements (Baskaran et al., 2004). As a result, new healthcare knowledge is being generated at a rapid pace and its utilization can profoundly impact patient care and health outcomes. But, this growth of knowledge is not congruent with our ability to effectively disseminate, translate and apply current healthcare knowledge in clinical practice. A clear and systematic framework to motivate transfer of healthcare knowledge among different distributed systems remains a challenge (Nasir & Dominic, 2010). This paper describes a conceptual knowledge management translation framework that comprises a set of knowledge management concepts, methods, and tools for the national cardiothoracic health setting.

II. CONCEPTUAL FOUNDATION OF KNOWLEDGE AND KNOWLEDGE MANAGEMENT
A. Data, Information, and Knowledge
To verify and understand what knowledge management is, it is essential to differentiate among three related concept namely, data, information, knowledge. Data at first is the most basic component of information technology. It is lowest level of known facts, with little value and has to be interpreted, analyzed and organized, in order to be of value then it becomes information. Accordingly, information is the data that has been processed in meaningful ways. While knowledge is higher level and it is result of processed information (Anand & Singh, 2011). Knowledge therefore is an insight derived from information that can be acted upon in a wide variety of situations. Knowledge makes information valuable beyond the specific context it was created in.

B. Knowledge Types
Earlier studies suggest the existence of various types of knowledge. Organizational knowledge can be classified into two categories: Explicit and Tacit knowledge. Explicit knowledge: is part of everyday professional life, presented through books, articles and manuals, this type of knowledge is captures in shape of diagrams, text, tables and so on. Thus, this kind of knowledge is easy captured and shared with other individuals through different ways and accessible easily by other individuals to solve similar problems (Adhikari, 2010; Lau, 2004)
III. KNOWLEDGE MANAGEMENT

Knowledge management is an emerging management technique that is aimed at solving the current business challenges to increase efficiency and efficacy of core business processes while simultaneously incorporating continuous innovation (Wickramasinghe, 2010). The premise for the need for knowledge management is based on a paradigm shift in the business environment where knowledge is central to organizational performance (Sassman, Lehaney, and Marshall, 2008). The main objective of knowledge management is to improve the systematic management of knowledge within the organization (Heisig, 2009), and to integrate crucial elements of data from various sources, such as groupware, databases, applications, and people’s minds, and make them readily available to users in an organized, logical form that represents knowledge (Lehaney, 2004).

IV. HEALTHCARE KNOWLEDGE MANAGEMENT

A. Healthcare Knowledge

Knowledge management in healthcare field is aligning people, processes, data and technologies to optimize information, collaboration, expertise, and experience in order to drive organizational performance and growth (Acharyulu, 2011). Knowledge management can assist healthcare organizations to become viable by giving healthcare information context, so that other healthcare providers can extract knowledge and not information (A. Dwivedi, et al 2001). The aim of healthcare knowledge management is to provide best, timely, effective and pragmatic healthcare knowledge to healthcare professionals where and when they need it to help them make high quality, well informed and cost effective patient care decisions (S. Abidi, 2008). Healthcare organizations are big source of knowledge creation. Acquiring knowledge, storing and transferring it to others in affective way has its own importance for healthcare organizations (Mirza, 2009). Knowledge management also involves converting knowledge from the healthcare enterprise’s sources and connecting healthcare participants like healthcare professionals, management and patients with that knowledge. However, the healthcare industry has not paid a great deal of attention to formal knowledge management (Jalali, et al 2009). In our view, the notions of knowledge management are not well established in the health setting (Lau, 2004). As knowledge management is becoming an established discipline with many applications and techniques, its adoption in healthcare has been challenging, some challenges are proper to knowledge management and other are particular to the healthcare field (El Morr and Subercase, 2010).

B. Knowledge Types and Modalities in Healthcare

Healthcare knowledge is primarily employed to support clinical decision-making that in it is a complex activity because it involves an active interplay between different types of healthcare knowledge. S. Abidi (2008) has identified a variety of healthcare knowledge types that directly contribute to clinical decision-making and care planning: Patient knowledge, practitioners knowledge, medical knowledge, resources knowledge, process knowledge, organizational knowledge, relationship knowledge, and measurement knowledge. Dwivedi, et al (2003) presented an organization current framework of knowledge management for healthcare institutions, it is a holistic and generic knowledge management framework for creation and dissemination knowledge that could help the healthcare organizations to navigate the difficult change process and assist them in the development of knowledge management strategy. Lau (2004) proposed a theoretical organizing design for managing knowledge management inside the healthcare environment, it includes different building categories each include a number of practices to successfully implement knowledge management. The core components are: social context, knowledge refinement, knowledge production, and knowledge use. Orzano, et al (2008) proposed a theoretical and practical knowledge management framework to assist healthcare clinicians in managing the practices and quality care to patients. Bordoloi and Islam (2012) had develop and evaluate a framework to understand the impact of knowledge management practices in healthcare deliver, especially in the area of evidence based medicine and interpersonal care. The focus of the framework is limited to the effect of knowledge management activities on measuring effectiveness and quality in clinical patient care. Buranarach, et al (2009) produced a semantic framework for healthcare knowledge management to handle the chronic disease care management. The semantic web framework is planned to sustain two chronic care components: clinical information system and decision support. Ontology has been used in the framework as a way for knowledge modelling and acquisition based of professionals opinion in form of clinical practice guidelines. Mirza (2009) proposed web based knowledge management system framework with the to provide healthcare knowledge facility and updated knowledge information for clinical staff. Nugent et al (2005) presented the outline of a proposed cardiovascular disease knowledge management system, a system based on web based multimedia patient administration system in conjunction with information and communication technologies. Hussain and Abidi (2005) Presented a knowledge management framework that allows the automatic linking and mapping of contextually and functionally similar medical knowledge that may originates from different sources and be represented in diverse modalities to recognize a holistic knowledge resources for a specific medical problem. Yamazaki & Umemoto (2010) presented a theoretical model of systematic knowledge creation in the healthcare process according to professionals’ collaboration using clinical pathways. The theoretical model which can create knowledge continuously was built from the case studies of two hospitals. The core components of the model are production process, implementation process, improvement process, share, creation and utilization. Baskaran, et al (2004) presented a knowledge management model for healthcare towards the key issue of sharing knowledge in a tacit-to-tacit mode. The models
provide a benchmark in addressing knowledge gaps and leverage all available resources. Pawlowski and Bick (2012) proposed a global knowledge management framework to support knowledge management in globally distributed settings.

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<thead>
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<th>Outcome</th>
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<tbody>
<tr>
<td>Delen</td>
<td>ICT</td>
<td>Creation &amp; Utilization</td>
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<tr>
<td>Lau</td>
<td>Social context</td>
<td>Production, Use &amp; Refinement</td>
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<tr>
<td>Orzano</td>
<td>ICT &amp; Social context</td>
<td>Finding, Sharing &amp; Developing</td>
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<td>Bordoloi</td>
<td>IT &amp; Social characteristics</td>
<td>Acquisition, Sharing, Assimilation &amp; Application</td>
</tr>
<tr>
<td>Yamazaki</td>
<td></td>
<td>Share, Creation &amp; Utilization</td>
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<td>Baskaran</td>
<td>Human &amp; engineering aspects</td>
<td>Initiative, Sharing, Establish &amp; Exploit</td>
</tr>
<tr>
<td>Pawlowski</td>
<td>Organization &amp; personal K capabilities</td>
<td>Creation, Sharing, Use, Identification, &amp; Storing</td>
</tr>
<tr>
<td>Buranarch</td>
<td>Semantic Web technologies</td>
<td>Modelling &amp; Acquisition</td>
</tr>
<tr>
<td>Mirza</td>
<td>IT tools</td>
<td>Acquisition, Storage, Transfer, &amp; Application</td>
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<tr>
<td>Hussain &amp; Abdi</td>
<td>ICT</td>
<td>Creation</td>
</tr>
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<td>Nugent</td>
<td>ICT</td>
<td>Acquisition &amp; Transmission</td>
</tr>
<tr>
<td>Dwivedi</td>
<td>ICT &amp; Social factors</td>
<td>Creation and Dissemination</td>
</tr>
<tr>
<td>Karadsheh</td>
<td>ICT</td>
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Table 1. Generic KM Framework Components

A. Key Features of Knowledge Management Frameworks in Healthcare

Knowledge management process is the sequential steps for conducting knowledge management in organization. A number of knowledge management frameworks have been proposed and some have been modified by various authors in as far as knowledge management processes are concerned such as knowledge acquisition, knowledge storage, knowledge use, knowledge application etc. Knowledge management enablers provide the foundation necessary for the organization to increase its effectiveness in knowledge management. Some frameworks have acknowledged the influences on knowledge management. Holsapple and Joshi (1999) summarized some of the important influences on knowledge management. This included leadership, culture, technology, organizational adjustment, governing/administrating knowledge manipulation activities and resources of knowledge, evaluation the activities of knowledge management and knowledge resources, external factors and employee motivation. Bordoloi & Islam (2012) identified four main or enablers which may manipulate the impact knowledge management activities on health care delivery services, these are ailment characteristics, physician characteristics, organizational characteristics and organizational IT infrastructure. Orzano, et al (2008) proposed several knowledge management enablers that give the groundwork required for the organization to enhance its efficiency in knowledge management such as robust infrastructure, trusting climate, effective communication, supportive leadership, accessible technology, active networks, reflective practice, and helpful relationships. (Lau, 2004) provide a social context factors that cover the knowledge management process which include organizational structure, personal values and preferences. (Davenport and Prusak, 2000) proposed some knowledge management influences that are able to enhance all knowledge management activities. These influences include leadership, culture, reward systems, technology, culture, values and norms and measurement. Knowledge management outcome, assists individual and organizational decision making and learning in order to accomplish the organization mission and enhance organization performance.

VI CRITICAL REVIEW AND COMMON FACTORS SUMMARY

Based on the literature, the major components of knowledge management framework are: KM enablers, KM process and KM outcome as shown in Table 1. Knowledge enablers influence the implementation of knowledge management (Theriou, et al, 2010). These factors should be clear in an healthcare organization, because they not only stimulate knowledge creation, protect knowledge but they also prompts people to share their knowledge and experiences with others (Yeh, Lai, and Ho, 2006). Knowledge management processes is the major component of knowledge management, can be thought of as a structured coordination for the purpose of managing knowledge effectively. Typically, these processes include activities such as acquisition, creation, refinement, storage, transfer, sharing and utilization (King, 2009). Organizational performance is evaluated based on organizational learning, decision making, productivity and workplace satisfaction (Orzano, et al., 2008). There exist a few guidelines on what should be included in an implementation framework. There is no single definition of what constitutes a knowledge management framework; and there are many concepts that are common to multiple frameworks, but the...
ordering or structure of the frameworks varies. The frameworks and models differ by their philosophical underpinning, the literature used to develop them, and their suggested uses. Based on the analysis, four elements can be inferred from the frameworks. They are: 1. The framework structure, 2. Knowledge types or knowledge resources, 3. Knowledge management processes or activities and 4. Knowledge management influences or factors. These four elements have been identified because they appeared to be the more relevant ones found in the framework. Some frameworks had a clear structure, others are not, a good building structure presents plan on how to apply knowledge management in an organizations and not only focuses on what knowledge an organization has. Knowledge management processes or activities are considered as one of the components that are available in most of the reviewed frameworks. One more element which is covered by some of the knowledge management frameworks is knowledge management influences or enablers. Beside these main elements, an important aspect of knowledge management framework that was rarely integrated in the reviewed frameworks is reliance on a balanced view of the role of human being and the role of information technology in knowledge management. The basic main element to start with while constructing a knowledge management framework is to consider a clear building structure. Also, a knowledge management framework ought to consider the various kinds of knowledge resources inside the organizations so as to deal with them correctly. However, most knowledge resources are categorized based on tacit or explicit knowledge. Having measured different kinds of knowledge resources to be managed, the other thing to be included in knowledge management framework is the different processes that are needed to manage the knowledge resources. Knowledge management processes considered as primary functions that an organization performs in manipulating its knowledge resources (Holsapple & Joshi, 2002). These processes should be clear in the framework as they underline the main actions that could be undertaken to operate with different resources of knowledge. Some Examples of knowledge management processes consist of acquisition, storing, sharing, using, distributing, creating, organizing, accessing and applying. Knowledge management framework should give a clear representation of the necessary process, because these processes lie at the heart of knowledge management. A knowledge management framework should consider the influences the affect the accomplishment of the framework and shape the performance of knowledge management. Practitioners should be fully aware of the inhibitors and enablers that affect the progress of achieving knowledge based organization. Acknowledging these enablers is vital because it assists an organization to formulate measures to take advantage of and capitalize on the enablers that will help them, while at the same time mitigating and diminishing the inhibitors that will hinder their efforts. Different enablers and influences have been introduces in the literature combining both technological and social influences. Another important consideration for a knowledge management framework is to provide a balanced view between a technological and a social approach to knowledge management. If this issue is not adequately addressed, there may be an inherent tendency for practitioners to take an overly narrow approach towards implementing knowledge management. An exclusive inclination towards either a pure technological or social view may lead to an incomplete picture of what is needed for a successful knowledge management effort. An overly narrow approach to knowledge management can be problematic and most technologically driven approaches have failed, largely because they ignored the people issues in knowledge management (Carter and Scarbrough, 2001). Information technology is a good repository for storing knowledge and an effective channel for transferring knowledge that goes beyond the boundaries of space and time, but in itself is not knowledge management. In contrast, humans alone are inadequate to promote good Knowledge management practices because they are slow in converting, manipulating and transferring knowledge. Therefore, knowledge management should always be viewed as a system that comprises a technological subsystem as well as a social one, which is in line with the socio-technical perspective. It is clear that some of the frameworks and models reviewed earlier in the literature still experience some few shortcomings and drawbacks that aren’t in accordance with the guiding principle presented earlier. Basically, none of the proposed frameworks reviewed has taken each and every guideline into consideration. The coming stage of this research is to develop more pragmatic and comprehensive knowledge management framework that consider all the above mentioned godliness. The aim is to integrate the previous knowledge management frameworks into a comprehensive theoretical framework.

VII AN INTEGRATED FRAMEWORK OF KNOWLEDGE MANAGEMENT

Wong and Aspinwall (2004) proposed certain guiding principle to be followed while building and proposing an implementation knowledge management framework. They have suggested that implementation knowledge management framework must be constructed based on a structure which presents plan on how to apply KM. It should describe different types of essential knowledge resources that are required. It should also highlight the influences of knowledge management enablers that will affect the performance of knowledge management implementation, while giving a balanced view between the function of technology and the role of human beings. Form this understanding we propose the framework to includes four main building blocks known as the knowledge resources, knowledge management activities, knowledge outcome and knowledge influences as described in Figure 1. As according to Banarach et al (2009) three main sources of knowledge in chronic care

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http://www.kmice.cms.net.my/
services are ontology, patient registries, and evidence based healthcare resource repository. Bose (2003) has highlighted several knowledge sources in healthcare setting such as: documents from patient admission, health administration, medical research literature, knowledge warehouse of patient records, medical procedures, hospital operations, applications, best practices, disease diagnosis, test, and care management. Acquisition or finding knowledge involves a process that permit organization to take advantage of data, information and knowledge that might be present but not evaluated, analyzed, codified or available to the users. Orzano, et al (2008) has mentioned several knowledge management tools that might support this knowledge management process such as databases sort, add, categorize, decision support, indexing/retrieval systems, repositories includes best practices, reports, manuals, meeting minutes and documents. In order to maintain the explicit knowledge and facilitate further sharing, it is important to have a repository database for maintaining all critical knowledge. What knowledge and how it should be placed into the repository are major issues. We need to have ontology specifically for the registry which will describe the schema of cardiothoracic in healthcare, which is currently not available. A study of the existing ontology from Serdang Hospital Information System, STS, Thailand, and other best practices from various hospitals will form our theoretical foundations to develop our own cardiothoracic ontology. Knowledge sharing is essential for creating new organization knowledge (Von Krogh, 2003). Sharing knowledge includes social and technical management tools such as communities of practices, intranet or groupware. Once the registry is in place and populated, knowledge management is able to provide additional value in terms of knowledge sharing and dissemination. Managing and sharing information to enhance the useful knowledge of consumers, patients, clinical, staff, managers and board members is pertinent to future competitiveness and survival of healthcare organization (Van Beveren, 2003). The value of knowledge can only be realized when it is applied to solving problems. This stage is concerned with how to utilize knowledge in order to produce commercial value. It can be improved through measurement, symbolic action, the right institutional context, and performance evaluations (Lai and Chu, 2000). We believe that knowledge translation starts from the transactional process in healthcare progressing into managerial and executive level across functional units in healthcare. The literature has introduced several knowledge management influences, these influences have been classified into three main groups as a) environmental influences, that represent environmental, economic, political, social, and educational factors. b) Information technology influences and c) organizational influences include corporate culture, leadership, corporate infrastructure, knowledge structure, vision, continuous learning, knowledge worker, measurement, reward and incentives, among others.

VIII. CONCLUSION

In this study, inspiration and motivation from previous literature help us to identify the factors, features, and characteristics in proposing a knowledge management framework. From the result of the summarized factors, we conclude that the importance of factors involved in proposing the knowledge management framework are significant. Finally, this study will be carried on in future to produce a conceptual framework and validate it in selected case studies.

REFERENCES


