A Healthcare Knowledge Management Helpdesk (HEKMANH) Framework to Enhance Healthcare IT Service Delivery

Hidayah Sulaiman¹, Bilal Ahmed², Nor’ashikin Ali³ and Zaihisma Che Cob⁴
Universiti Tenaga Nasional, Putrajaya Campus, Malaysia, ¹hidayah@uniten.edu.my, ²belal.1979@yahoo.com, ³shikin@uniten.edu.my, ⁴zaihisma@uniten.edu.my

ABSTRACT
The introduction of healthcare information systems (HIS) technologies into the healthcare environment has led to increased efficiency in providing better services and improved processes for healthcare practitioners. Hence, the information technology (IT) department has a significant role in providing technical support and maintenance to the HIS in order to ensure efficiency of the HIS use amongst medical personnel. With limited technological experience amongst the hospital staff, this has brought about issues with repetitive technical support calls on similar technical inquiries and problems. Hence, a proposed knowledge repository is deemed useful to assist the users in resolving these trivial and routine issues. This paper describes a research in progress which explores Healthcare Knowledge Management Helpdesk issues to improvise the technical support and IT service delivery process of easy and routine technical inquiries in relation to HIS service delivery.

Keywords: IT Service Delivery, knowledge management, helpdesk, healthcare.

I INTRODUCTION
Healthcare organizations have been investing heavily in developing Information Technology (IT) facilities, to resolve healthcare business processes, gain competitive advantage, and continuous organizational development. A healthcare information system (HIS) that integrates computer systems throughout the hospital which was developed to enhance the clinical and administrative function of a hospital is commonly being implemented in most healthcare facilities due to the global trend of utilizing IT in resolving various business process and operational issues (Kim, Lee & Kim 2002; Wager, Lee & Glaser 2013). The HIS was also aimed at providing easy access of data, data sharing while improving patient safety in the management of illness, provide better record management and security as well as improving workflow through the reengineering of work processes (Kumar, Krupinski & Abdullah 2008). Due to the complexity if the implementation and maintenance of the HIS, this has created multifarious technical problems being reported to the IT department of the healthcare facility (Sulaiman & Wickramasinghe, 2012). The main problem identified in this context is that HIS users face numerous difficulties when they require assistance from IT technical support especially in terms of waiting time and ultimately discovering that help is unavailable when it is crucially needed. This indicates service delivery malfunction in the helpdesk team, which promotes dissatisfaction amongst HIS users thus leads to HIS users abandoning the applications and reverting to manual processes. What worsen the situation is the numbers of incoming inquiries increasing dramatically especially during hospital peak hours of clinical patient appointments. The helpdesk has to cover numerous software, hardware, network and other HIS related issues. When help desk is expected to troubleshoot more technical inquiries with less staff, users have to wait a long time for a solution to their inquiries. This is especially unacceptable when dealing with life and death situation in a healthcare setting. Further, as a result of this delay, the amount of time taken by the HIS users to accomplish their day-to-day job is lengthier than assigned, thereby decreasing the productivity of the healthcare staff and could potentially lead to aggravation by both HIS users and patients.

Therefore, this study proposes to develop a Healthcare Knowledge Management Helpdesk framework to improve the support process for easy and routine technical inquiries for the benefit of both the technical helpdesk team and HIS users.

II LITERATURE REVIEW
Healthcare organizations have been investing heavily in developing Information System (IS) and Information Technology (IT) applications which enables them to resolve business problems, gain competitive advantage, and continuous organizational development (Bitton, et.al, 2012; Cresswell et. Al, 2013). However, the complexity of these software, hardware and network technologies have increased substantially over the years due to increase number of patients, upgraded facilities and technical compatibilities (Sulaiman & Wickramasinghe, 2012). This leads to heavier reliance on the IT helpdesk in providing technical assistance to HIS users.
A. Healthcare IT helpdesk

Continuous efforts have been carried out in order to improve the current technological scenario in the healthcare industry (Øvretveit et al. 2007). Initiatives such as E-Health, Electronic Health Record (EHR), Hospital Information System (HIS) and Telemedicine will generally bring about the usage of information systems as a means to provide better health services to the population and overcome challenges that has been perceived as cumbersome by people seeking medical treatment (Sulaiman & Wickramasinghe, 2012). Studies have shown that most HIS users are not technologically equipped with the technical knowledge to use the applications smoothly. Hence, there is a need for human interventions in providing technical support in order to assist with users’ technical difficulties and providing maintenance to the implemented systems. The helpdesk personnel has to play a major role in providing on-line telephone support, categorizing and allocating jobs to relevant areas and escalating larger issues to vendors or external contractors. Hence, this leads to the need of the helpdesk team to have a proper knowledge base which supports their daily activities namely in classifying trivial and routine incidents that could assist HIS users in resolving their technical issues.

B. The use of technology in knowledge management

Knowledge management (KM) is described as the tools, technologies and strategies to store, examine, manage, improve and share work expertise (Groff and Jones 2012). In order to achieve an effective management of infinite knowledge assets, organizations have to focus more on information, technologies and infrastructure facilities in order to deliver explicit and implicit information that can be transformed into valuable knowledge for the organization (Serna 2012; Turner et al. 2012). The theoretical KM model of Wiig (1997, 2002) organizes the KM processes into knowledge building, transforming, organizing, deploying and using, whereas Chait (1999) and Rowley (2001) further explains that the KM process is based on the measures of capturing, evaluating, cleansing, storing, providing and using the knowledge. Aggestam (2008) describes KM processes as gathering knowledge, documenting and making it available for those in need. As illustrated in Figure 1, KM is branched out into five stages: create, store, make knowledge available, use and evaluate knowledge.

In realizing the five stages to manage knowledge, organizations are in need of an appropriate mechanism to store and retrieve the knowledge smoothly and effectively. Hence, from this point of view the knowledge base is considered an appropriate technology. Knowledge bases are digital databases that are being utilized to determine and store any explicit information that are available in the organization. The knowledge base aims to provide a knowledge rich environment for problem solving, repository for best practices and strategic information for the organization. Furthermore, it may also contain processes, standard operating procedures (SOP) and operational workflow on the organization’s products, employees and other resources (Akhavan et al. 2013; Piorkowski et al. 2013).

C. Helpdesk Knowledge Management related issues

Help desk researchers and specialists have continued to develop new systems, support models and technologies for helpdesk. Nevertheless, these developments are may not always alleviate the helpdesk team from huge amount of incoming inquiries, particularly when there are progressive trend of insufficient workforce.

To effectively enhance the work of the helpdesk team, the solution must be based on call flow distribution, that is, to find a way to distribute the overwhelming easy and routine technical inquiries via a knowledge management system. Table 2.1 below highlights the use of KM technology in helpdesk.

<table>
<thead>
<tr>
<th>Author</th>
<th>Title</th>
<th>Issue</th>
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<tbody>
<tr>
<td>Carmel et al., 2000</td>
<td>eResponder: Electronic question responder.</td>
<td>The purpose of this paper is to develop help desk system called eResponder.</td>
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</table>
retrieves a list of request-response pairs and presents a ranked list of responses to the user.

Robertson, 2002

Knowledge management for call centers

This article reviews key issues when implementing KM for call centers. The author breaks it down into two parts, the first one being how to manage knowledge and the other being how to develop the KMS.

González et al., 2005

Knowledge management-centric help desk: specification and performance evaluation

The paper aims to show the benefits of using knowledge management-centric help desk over using the agent-centric help desk by using statistical data gathered from a simulation study.

Bryant, 2009


The purpose of this exploratory study was to demonstrate the importance of the use of a knowledge-based system to provide problem solutions typically found in an Information Technology (IT) help-desk environment.

Samarakoon et al, 2011

Automated Question Answering for Customer Helpdesk Applications

This paper describes a knowledge-based method to develop a closed domain question answering system which can be used as the first step in automating a customer helpdesk of a commercial organization.

Wang et al., 2011

iHelp: An Intelligent Online Helpdesk System.

The purpose of this paper is to develop iHelp, an intelligent online helpdesk system, to automatically find problem–solution patterns from the past interactions between customers and representatives.


A Helpdesk Support System Based on Relationship between Inquiries and Responses

Proposed a detection method of the FAQ matching inquiry e-mail based on Jaccard coefficient between inquiries and responses.

Helpdesk experts and researchers have continued to develop new innovations in assisting the tasks of the help desk team. However, these developments have yet to prove the significant assistance that the systems will assist the helpdesk team from tremendous amount of trivial incoming inquiries. Previous studies have also highlighted the need for a knowledge management system (KMS) which allows helpdesk personnel to manage their explicit and tacit knowledge in order to assist users to troubleshoot easy and routine problems that do not require specialized IT knowledge.

III RESEARCH METHODS

This study is exploratory in nature with the aim of exploring a specific population experiences and a new innovation in a particular context. Especially for this preliminary study, a qualitative approach is suitable in exploring the research problems through the point of view of participants describing their issues and problems explicitly. A semi-structured interview was conducted on 9 subject matter expert in the helpdesk environment where the participants express their opinions and share their in-depth experiences in a more holistic manner. The subject matter experts comprises of subject matter experts in the helpdesk environment from various IT and Telecommunications industry where the level of criticality of support calls were known to be at high level of severity and supporting mission critical systems. One subject matter expert from a hospital IT department was interviewed in order to gauge the suitability of this study in the healthcare setting. The interviews are then transcribed and analyzed according using thematic coding and analysis approach identify common themes.

IV ANALYSIS & FINDINGS

The results of the interviews indicates that the helpdesk staff are often placed on the most stressful position, especially those who serve at the frontline (first level) support due to the increased inquiries and the number of helpdesk workforce is insufficient to deal with the growing user demands. The results from the interview also expresses the need to reduce the workload of the helpdesk team through online information, online training and a knowledge base on
basic inquiries. The online documentations or knowledge base should at least include topics such as password reset, software/hardware installation, account maintenance, account login, account setup, account suspension, software performance and printer configuration issues. This will then eliminate trivial and routine support calls that can be easily resolved by the users through a self-service web based KM tool. Five basic components were found to be useful for the in the self-service web based KM architecture. The features suggested were user’s map, an interface agent that delivers dynamic user interface to facilitate user communication based on information stored in the knowledge base, search agent which will identify and return the most appropriate solution, and finally a resolution knowledge base which stores solutions for easy & routine technical questions. The self-service web based KM tool will ultimately be part of the Healthcare Knowledge Management Helpdesk framework implemented to the proposed healthcare setting.

V PROPOSED HEALTHCARE KNOWLEDGE MANAGEMENT HELPDESK (HEKMANH) CONCEPTUAL FRAMEWORK

As previously discussed, majority of incoming inquiries are easy and require no specialized knowledge to solve the problems (Knapp & Woch, 2002). Based on the analysis of the interview, a more proactive approach is recommended to reduce the frequency of HIS users to contact help desk for easy and routine technical questions. Instead of contacting helpdesk personnel, HIS users are empowered to solve easy and routine technical problems themselves when sufficient knowledge and guidelines are provided. A conceptual framework to redistribute easy and routine inquiries using the Knowledge Management approach is proposed in order to improve the support processes of HIS applications. The proposed framework not only manages knowledge within the helpdesk, it also has the capability to deal with overloaded work of the helpdesk personnel.

Based on the work of Wiig (1997, 2002), King (2009), Bhusry & Ranjan (2012) and analysis of the interview, the helpdesk inquiries can be subdivided into four types: IT administrative inquiries, hardware inquiries, software inquiries and miscellaneous inquiries. The IT administrative inquiries entail account setup, account termination, account maintenance, account login, account suspension, password retrieval, password reset, password syntax information, invalid password, software installation and purchasing, hardware installation and purchasing as well as service purchasing. The hardware and software inquiries include a number of performance and functional concerns that has to do with various kinds of hardware and software. The miscellaneous inquiries include queries on missing and corrupted files, inaccessible websites and servers as well as the servers’ performance. Such categorization not only provides a structured way to identify and elaborate easy and routine inquiries, but also assists in the form of associating and retrieving solutions for related inquiries.

One way for identifying easy and routine inquiries is to make use of the reports issued by the HIS users on the problem type, resolution method, call duration (time needed for the problem to be solved) and level of problem severity. By inspecting the reports regularly, the help desk manager is able to categorize the inquiries which is regarded as easy and routine. The proposed mechanism is to have the first level support to identify easy and routine inquiries as illustrated in figure 2. The classifications of the inquiries made by the help desk first level support should then be checked by the IT Helpdesk Manager or Team Leader to ensure that the classifications are accurate. The identification and categorization by the first level support is important and verification from the team leader/manager would lead to better learning mechanism to the KM system in order to train the system in identifying the easy and routine support calls.

![Figure 2. Proposed Mechanism to Identify Easy and Routine Technical Inquiries.](image)

To redistribute easy and routine technical inquiries in the most effective manner, the mechanism of categorizing the easy and routine inquiries will be integrated with the KM processes as depicted in figure 3. Based on the identified literature, KM theoretical models and interview analysis, the suggested KM processes will have the helpdesk knowledge divided into two categories: easy & routine as one category, and complex/technical as another category. The former will be stored in a proposed web based self-service KMS for the HIS users, and the latter is stored in a general knowledge base repository.
HIS users may first access the proposed web based self-service KMS and find out the most suitable or relevant solution to solve their current problems. Only if the solution is confirmed by the system to be unavailable in the proposed self-service KMS, then only the user is allowed to contact the helpdesk personnel. The helpdesk personnel uses the knowledge base repository where the complex HIS knowledge is stored and will be used to resolve complicated technical issues. Furthermore, knowledge evaluation will be conducted often to check if there are any invalid or outdated knowledge from the self-service KMS and the complex knowledge base repository to ensure that only valid knowledge is made available to the HIS users.

Figure 3. Proposed Healthcare Knowledge Management Helpdesk (HEKMANH) Conceptual Framework.

The HEKMANH conceptual framework aims to maintain the characteristics of the generic processes of knowledge management to store, make available, use and evaluate knowledge. It also aims to facilitate the minimization of large amount of incoming inquiries for the helpdesk team. In other words, HIS users can successfully resolve easy and routine inquiries by getting the most suitable solution from the proposed web based self-service KMS instead of resorting to the helpdesk staff on numerous trivial technical matters.

VI CONCLUSION

Due to the ever increasing healthcare costs and the growing use of IT as a solution to assist medical personnel’s work processes, it is critical to ensure that the support provided to maintain and troubleshoot HIS in the healthcare organization is done efficiently and in a systematic manner. A Knowledge Management approach is proposed to ease the workload of the healthcare IT helpdesk personnel by empowering HIS users to resolve trivial issues in order to ease helpdesk staff from enormous amount of easy and routine inquiries. The proposed HEKMANH conceptual framework aims to provide convenience in enabling HIS users to solve trivial problems by retrieving the most appropriate solutions from the self-service KMS without direct or indirect interventions from the helpdesk staff. This “self-service” practice provides a way to ease the workload of the help desk personnel hence providing them with more focus on resolving major HIS issues which in turns allow better efficiencies to the medical personnel in providing better services to patients seeking treatment.

Nevertheless, as the KM approach are made available and may be possible to resolve many potential HIS helpdesk support issues, the conceptual framework will be further improved by the following suggestions in future:

i. Empirical testing of the HEKMANH conceptual framework and study the impact in the healthcare helpdesk environment. The impact may include cultural, processes, resources and governance.

ii. Further investigation on effective approaches to the knowledge base which may include ontology in healthcare helpdesk environment.

The implementation of KM in the healthcare organizations’ IT helpdesk may be able to realize numerous benefits. The productivity of the medical personnel will be enhanced due to efficient support and excellent IT service delivery of the IT applications being used thus delivering better service to patients seeking treatment. It is important to underscore the importance and significance of this study in light of exponentially increasing healthcare costs globally, the importance of capturing tacit knowledge among highly skilled and knowledgeable workers as well as the growing trend of healthcare organizations to implement HIS as a solution to resolve such problems (Wager, Lee & Glaser 2013; Hung, Chen, & Wang 2014). With the huge reliance today on HIS by healthcare organizations, it is imperative that excellent IT service delivery is provided through KM initiatives that allows user independence as well as providing greater avenue for technical knowledge sharing.

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