A Framework for Electronic Health Record (EHR) Implementation Impact on System Service Quality and Individual Performance among Healthcare Practitioners

NOR SHAHRIZA ABDUL KARIM
International Business School
Universiti Teknologi Malaysia
Kuala Lumpur
MALAYSIA
nshahriza@ic.utm.my

MAZNAH AHMAD
International Islamic University Malaysia
Kuala Lumpur
MALAYSIA
amaznah@iium.edu.my

NORSHIDAH MOHAMED
International Business School
Universiti Teknologi Malaysia
Kuala Lumpur
MALAYSIA
norshidah@ic.utm.my

Abstract: - Driven by the needs to facilitate the administrative process and reduce medical errors, healthcare institutions in many countries including Malaysia have decided to use the electronic health records (EHR) in managing its various health care services and functions. In spite of all the benefits EHR can offer conceptually, the use and implementation of EHR in hospitals usually face difficulties and obstacles. This paper discusses a framework proposed for research to investigate the implementation process of EHR in the selected Malaysian healthcare institutions and its influence on the service quality and the healthcare practitioners’ performance. Using a case study approach, this paper discusses the use of multi-method research in order to achieve the objectives. Ultimately, the discussion is anticipated to contribute to the research model as well a research design in the study of EHR implementation success and impact.

Key-Words: - Electronic Health Record, Health information System, Health informatics, Health care practitioners, Work Performance, System service quality

1 Introduction

The applications of the Internet technology have contributed a great deal in the advancement of many fields such as education, business, health and entertainment. In the field of medicine, new concepts like telemedicine, e-medicine and health informatics have been introduced to optimize healthcare services. Driven by the needs to facilitate the administrative process and reduce medical errors, healthcare institutions in many countries have decided to use the electronic health records (EHR) in managing its various health care services and functions. With the use of EHR, healthcare providers can benefit significantly from the technology to improve patient care quality by making more accurate decisions and solving more clinical problems at a faster rate based on highly reliable and up to date electronic health record system [5][12].
According to Hameed et al. [6] the use of EHR offers significant amount of benefits in healthcare such as improved efficiency, reliability and system security. The system improves efficiency through easy access to patient records, results of patient investigation, lab tests, and imaging works from a single point of care. This capability eliminates the time required for the medical attendants to dispatch and retrieve physical records located at various distant physical locations. It also improves reliability in patient records by ensuring integrity and security of patient data through authentication and various level of access authority. Loss and misplacement of patient records and x-ray films, which commonly happen with physical paper folders, can be drastically alleviated. 

Evidence in the literature also indicates the system’s capability to improve safety in healthcare by supporting for better decision-making in patient treatments [5]. The ability to countercheck interaction between drugs, allergies, as well as abnormal result of investigation can alert the doctors to alleviate life-threatening situations. In addition, the use of EHR applications, like Clinical Decision Support Systems (CDSS), can facilitate clinical decision-making and minimise the potential for mistakes due to the inaccuracy and incompleteness of paper records [8].

According to Waegerman [15], EHR is the generic term for all electronic patient care systems in digital format which co-ordinate the storage and retrieval of individual records with the aid of computers via a network that enables storage and availability of information to authorized healthcare personnel. It usually comprises of electronic medical records (EMRs) from many locations and/or sources. A variety of types of healthcare-related information, such as demographic information, medical history, allergies, lab results, radiology images such as X-Ray, MRI and CT scans, appointment records, referrals and authorization documents, billing and insurance records may be stored and accessed via telecommunication and computer networks. In other words, with the use of EHR, the healthcare practitioners could get their laboratory results and reports from radiology clinics or issue discharge summaries from hospitals electronically.

In the event of emergencies, such as when a patient is unconscious or unable to speak, the pertinent information could be accessed from the host computer from the hospital where the patient was treated earlier [9]. Ultimately, an ideal system would allow for sharing of records over the telecommunication networks between healthcare organizations. This enables patients to get treatment across healthcare facilities more conveniently during emergencies.

With these benefits of EHR, it is not surprising that its implementation in the healthcare industry is becoming prominent worldwide. This is indicated by the global move towards increased implementation of Electronic Health Records (EHR) in hospitals in the US, Europe, Middle East, and Asia Pacific regions, including Malaysia [12]. Several countries such as Canada, Denmark, England and New Zealand have been rated with high rank in the level of EHR maturity. Other countries such as United States, Australia, Germany, Netherlands, France, Malaysia and Singapore are ranked medium [1]. Even though the trends of EHR adoption and implementation have been slow and difficult in many countries, it is also prevalent to note that the coming decade will see that it is going to be easier [1][10][9].

Accordingly, the Malaysian Government has embarked on the EHR system through Electronic Health Flagship Application as part of the e-Government flagship launched through the Multimedia Super Corridor (MSC) in the year 2000. Through the Malaysian Health Flagship, the Ministry of Health has introduced the Total Hospital Information System (T.H.I.S.) concept, which was adopted to run and manage several new government hospitals around the country. The T.H.I.S. concept was anticipated to provide a fully integrated functions in a hospital ranging from the clinical, lab and imaging, to administration such as human resource and finance. Indeed, many hospitals in Malaysia have undergone transformation with the use of technology in its operations. The models used are found different between private, university and government hospitals and not much is known in terms of how the hospitals experience the benefits and the challenges of such implementation, and the impact to the quality of service and healthcare practitioners’ performance.

In this regard a research framework is discussed and proposed in understanding the implementation process of EHR from different point of view and perspective as adopted by two different hospital environments in Malaysia. Such processes identified are also discussed in relation to system service quality and individual healthcare practitioners’ performance of the different hospitals.
providing the services.

2 Research Problem

According to Eason [4] and Carayon et al. [2], the most common reason for failure of technology implementation is that the implementation process is treated as a technological problem while the human and organizational issues are not fully addressed. Therefore, there is an urgent need to establish an understanding of EHR implementation best practice from technological, implementation, and behavioral perspectives. While there may be abundant researches conducted in looking at the existing scenario of EHR applications such as Ghahramani et al. [5] and O’Connor [11], not many can be found making an attempt to understand the differences of EHR implementation in various health care institutions and its impact on the quality of EHR services and health care practitioners’ performance.

Based on the above premises, the pertinent research questions are of concern. These are: How do the selected healthcare institutions (a government hospital under e-Government flagship and a university hospital) implement EHR? What are the implementation frameworks in terms of planning, system architecture and functional model being used? What are the differences in EHR implementation model between the two types of institutions? Do the differences in EHR implementation model influence system success in terms of system service quality among healthcare practitioners? Does EHR system success influence their individual performance in terms of their performance, professional autonomy, and occupational wellbeing?

Accordingly, a research is proposed in an attempt to address these questions. Following Karim and Ahmad [7], who conducted a comparative case study on two health care institutions, an extension of research is proposed to further enhance the knowledge on EHR adoption and implementation in Malaysia. This research can be expected to contribute significantly to the knowledge and understanding of EHR development and best practices in the country. The research output in the form of relevant model and theory of EHR is highly possible through the use of the mixed method approach. This can be achieved through the understanding of current implementation practices and exploring their impact on the system service quality and individual performance of the healthcare practitioners. Subsequently, this knowledge can assist in the development of successful EHR systems and future implementation strategy and policy. As the Ministry of Health has invested significantly on the systems, the findings from this research should allow for better strategies which are more efficient and cost effective for future developments in other hospitals. The ability to identify and relate the impacts of EHR implementation on healthcare practitioners’s performance can help to eliminate or at least optimize the impact of the EHR implementation. Through the study of the success and failure stories of implementation of EHR in the healthcare systems in the affected hospitals, we can also gauge the readiness of Malaysian hospitals to exploit the technology to achieve the Malaysian health goal of a nation of healthy individuals, families and communities.

3 Proposed Framework

Fig.1 below illustrates the proposed framework in studying the impact of EHR implementation process. The framework of this study is modeled based on the IS success model and system service quality framework developed and conceptualize by Yang et al. [14]. The work was built from the original IS success model pioneered by Delone and McLean [3]. Instead of investigating all the four dimension of IS success (information quality, system quality, use and satisfaction), Yang et al. [14] use only two dimensions of success. These are system quality (usability, accessibility and interaction) and information quality (usefulness of content and adequacy of information). In this proposed research framework, different implementation models (Model A and Model B) from two different hospitals are identified and described. The difference is then analyzed for any impact or differences according to Yang et al. [14] system and information quality dimensions. If we can make an assumption that a successful implementation process can produce quality of services, this model predicts a positive outcome in terms of system service quality, which in turn promotes further use of the system. The IS Success Model, as posited by DeLone and McLean [3], will also lead to the assumption that a good quality service can give more positive impact on performance at the individual and eventually to the organizational level. Following the work of Carayon
et al. [2], impact on individual performance has been conceptualized to comprise of professional autonomy, job performance, and occupational well-being.

![Diagram of EHR implementation process](image)

**Fig. 1 Framework for investigating the impact of EHR implementation process**

Based on the framework illustrated above, two dimensions of impacts can be measured based on the case of two hospitals. The first dimension of impact is the quality of services provided by the system through system and information quality. Evidences from research in information system success in the past have indicated the validity of the measures in assessing the system implementation impact [14]. Indeed it is also perceived that a successful system can also gives positive impact on the performance of doctors and other health practitioners using the system. Therefore, three research questions have been derived in the framework as R1 – what is the nature of EHR implementation model adopted by hospital A and B?; R2 – what is the influence of the differences in the model on system service quality?; R3 – Does system service quality in the health care institution investigated have any impact of individual performance of healthcare practitioners, whom we can categorized as doctors, nurses, and pharmacist?.

### 4 Conclusion

The importance of information technology in the healthcare industry has triggered the interest and adoption of the EHR system in many hospitals worldwide. The adoption of the technology in a number of Malaysian hospitals has also been around for a while. Therefore, it is important that such implementation can be further benefitted by learning its best practices and lessons learned through a series of evaluation studies and investigation on its impact. In this regards, this paper has discussed the need for a research to investigate the EHR implementation in Malaysia following a mixed method case study design. A research framework has been proposed and discussed for future research attempts.

**References:**


