E-HEALTH, ELECTRONIC MEDICAL RECORD SYSTEM, PATIENTS, AND HEALTHCARE INDUSTRY

[1]ALARQAM SAEED BATARFI ALKENDI, [2]HABIB ULLAH KHAN, [3]STELLAMARIS UWEMI

[1]Department of Computer Science / Magrabi Hospitals University of Liverpool, UK / Kingdom of Saudi Arabia.
[2]College of Business & Economics, Qatar University, Doha, Qatar/Walden University, USA
[3]Department of Computer Science, University of Liverpool, UK
E-mail: [1]arqam@hotmail.com, [2]habib.khan@qu.edu.qa, [3]stellauwemi@gmail.com

Abstract - The Electronic health (e-health) is different forms of electronic services forms trans-ported through information technology networks, and it consists direct facilities delivered by the health care specialist for the educational and commercial usage. The scope of conducting this case study is to analyze the quality of the healthcare service provided to the patients and number of the adverse events reported due to incorrect medical procedures, lake of system control, inappropriate method of transfer the patient information, no medical decision support system for the physician prescriptions, save and retrieve the patient information, whether or not a newly implemented EMR artifact and cloud computing systems are effective I aligning records keeping systems if healthcare organization, the severity of the medical mistakes due to the flow the patient information in an inadequate manner; the assistant provided by the implemented EMR system in making the decisions related to the diagnosis, medical procedures, treatment plan for the patients; the effect if the efficacy of EMR system; the physicians respond along with the patients' health outcomes.The outcomes from this research are anticipated to align multi-branch healthcare organization with the international standards and consider the expansion of the computing network in the future, residing and have the best practice of implement the EMR sys-tem in the Saudi Arabia.

Keywords - E-health, Electronic Medical Record System, Healthcare industry

I. INTRODUCTION

Electronic health (e-health) is different forms of electronic services forms trans-ported through information technology networks, and it consists direct facilities delivered by the health care specialist for the educational and commercial usage. In fact, using the electronic medical records facilitate and redesign the medical service to make your life easier and simpler for the physicians and patients and gave them the medical information in ways that were impractical beforehand e-health also referred to as health informatics and each electronic process gone under this term (Alasmary et al., 2014).

The e-health service gives the auxiliary information utilization of the research which increases the quality of services, confidentiality, and productivity and helps to gain the health organization recognizes internationally (Alsmary et al., 2014).

Saudi Arabia is one of the developing countries and still have a lack of e-health and electronic medical records services in the right way and that due to the lack of understanding and did not learn their staff the idea of the EMR and they do not have any idea about that (Shaker et al., 2015).

The EMR is a modern advancement enable both of the physicians and patients to get some answers about the medical care for the patients and save the patient history in the international and understandable format and make it simple (El-Sofany, 2012). Moreover, it helps to have the proper analysis after the board re-search. Few of the hospitals in Saudi Arabia adopt the EMR and information technology to boost the quality of the medical services to the patients. In addition, few of the hospitals paying attention to create a database to able to save their patient information and retrieve them quickly in the local hospital and from another hospital locally and internationally. On the other side, most of the hospitals demanding to have e-health reports from the developing countries in 2010 as they are not able to access their information directly and Saudi Arabia is one of those coun-tries. That causes the desertification due to the scarcity of EMR system in Saudi Arabia and not able to access the status of the patients in Saudi Arabia.

Currently, five fundamental health authorities are serving the hospitals in Saudi Arabia. Ministry of Health manages the 60% hospitals, while, the other four authorities oversees about 20% of the Saudi hospitals. The private sector leads the rest of the 20% of hospitals (Al-Khalifa et al., 2012). Moreover, Non-citizen not able to get a medical insurance from the Ministry of Health that makes Saudi Arabia hospitals not able to connect their information to shape a legitimate e-health system is still under development by the ministry of health (El-Mahalli, 2015).

In addition, most of the Saudi Arabia hospitals (Private and Public sector) still did not have a proper computerized system, and some of them provide the information system application through vendors with a different level of application quality and without integration with the medical machines. EMR is a centralized information system help to facilitate storing the patient medical information and retrieve it to handle the patient's records.

According to (Alsultan et al., 2013), the EMR system is a data collection system in the hospital can be a complex system with numerous data collection forms help to gather the accurate data and built the statistics about the patients cases and have a lot of the

advantage and contribute to reduce the medical errors compared to the manual work and paperwork and contribute to have a paperless environment without efforts.

This case study aims to analyze the effectiveness and accuracy of the EMR systems in multi-branch hospital in Saudi Arabia. Most of the hospitals in Saudi Arabia now working on to have EMR within their organizations to eliminate the medical errors due to wrong delivery to the patient information, especially in the routine practice. The research will evaluate EMR system and compare the service quality to the patients and have a system control to make the proper investigations to the patient before taking the medical decisions. Moreover, evaluate the quality service before and after implementing EMR system. Research hypothesis will assess whether or not previous methods in multi-branched healthcare organization was effective to provide quality care to patients. Moreover, the research hypothesis will analyze the current EMR system efficiency and focus on the accessibility of the patient information within the branch and from the other hospital's departments.

The aims and objectives of this research as the following:

1. Evaluate the effectiveness of the manual and papers medical records on the pro-vision the quality of the patient's services
2. Analyze the impact of the utilization of EMR business model on the quality of the medical services along and well-being patients
3. Evaluate and investigate the efficiency of the current EMR model from the medical staff perspective associated with the healthcare sector of Saudi Arabia.
4. Sort out the ambiguities related to the newly implemented EMR system and inte-grate it with the medical machines according to the international standards.

Due to the increase of the diseases ravaging humanity and the rate of visiting the patients to the hospitals. Patients spend a lot of money to find the medications and that including the transportation costs in a bid to meet the physicians. Lack of funds may lead to canceling the doctor visiting and may result in death to critically ill patients. Moreover, the hospitals spend a lot of paperwork to the keeping of their clients.

Medical staff usually face a difficulty to search for the patient's paper medical files due to lack of the proper database link to the health providers and giving the facility to the physicians to get the patient information from various geographical boundaries across the world. Most of the healthcare organizations looking to have innovated approach to eliminate the paperwork methods of saving the medical records and find a proper way to retrieve the patient information and history quickly. Moreover, eliminating the malpractices such as the improper medical records management.

The research made on Magrabi Hospitals and Centers in Saudi Arabia and focus on the show the advantage of having EMR system and technology to whose adoption and implementation is a must in every health facility.

To achieve the research objective, the study will utilize the qualitative method ap-proach among with the secondary data available in the literature. A questionnaire and interview to evaluate the current EMR system through a medical and admin-istrative team and find out the system weakness and the system control required to control the patient workflow between the medical departments. The interview will help to validate the survey responses and include that in the conclusion and recommendations. Also, that will contribute to building a recommended business process and workflow for the patients by using a flowchart software and include it in conclusion.

The research will focus on the following hypothesis and will be tested during the study.

H0: Flow of patient-related information through manual documentation does not assist in the provision of quality care to patients.

H1: The proposed EMR artifact will help to foster patient-centric communication and ultimately assist in the provision of better-coordinated care to patients.

H2: Proposed EMR model will assist in the establishment of plans for care for patients along with the analysis related to the appropriateness of quality of care delivered to patients.

H3: Proposed EMR system assists in quickly accessing patient related information from other branches of a particular healthcare organization.

The research will depend on the interview and have a face-to-face meeting with the medical staff. Also, test the current system workflow and process then record that result and any other observations

The IT artifact which will be proposed in this research is best practice and business model of EMR system which will completely transform the quality of care services delivered to patients. Unlike other EMR systems, which are designed with the intention of accessing patient's related data, this artifact will also provide recommendations related to patient's care on the basis of clinical guidelines. This business model is effective enough to be utilized within the premises of healthcare organizations. The business model will also provide access to the patient related information from diversified destinations and ensure the accuracy of that information.

This IT artifact allows accessing patient's data through cloud computing systems. As this IT artifact is anticipated to improve the quality of care services delivered from the platform of healthcare organizations; therefore, this IT artifact will assist in improving the business of healthcare organizations. The outcome and recommendation will be based on collecting information through interviews and using

Google online survey tool to gather the data from the medical and non-medical staff who implement and did not implement EMR system to know the effect of EMR system and enhance it to meet the international standards and Saudi Arabia government regulations.

The research findings focus on having valuable suggestions to improve the EMR system in the healthcare organizations in Saudi Arabia by introducing EMR business model to help in accessing the patient information across the group. Also, provide the medical recommendation for the patients and ensure the current sys-tem have the user-friendly interface to able to understand the medical treatment plans and guideline for the clinics for the proper investigations and the patient workflow between the medical departments.

The improved business model will help to get the correct action for the patient and make it available and accessible to the physicians within the branch and from the other branches through cloud computing system.

REFERENCES

[1] Agha, L. (2014). The effects of health information technology on the costs and quality of medical care. Journal of Health Economics, 34, pp. 19-30.

[2] Al-Khalifa et al., (2012). Factors Influencing Patients' Attitudes to Ex-change Electronic Health Information in Saudi Arabia. International Journal of Advanced Computer Science and Applications, Volume 7, Issue 8

[3] Alasmary et al., (2014). The association between computer literacy and training on clinical productivity and user satisfaction in using the electronic medical record in Saudi Arabia. Journal of medical sys-tems, Volume 38, Issue 8

[4] Alharthiet et al., (2014). Physician satisfaction with electronic medical records in a major Saudi Government hospital. Journal of Taibah University Medical Sciences, Volume 9, Issue 3

[5] Khan, H.U. and Alshare, K. (2019) 'Violators versus non-violators of information security measures in organizations—A study of distinguishing factors', Journal of Organizational Computing and Electronic Commerce, Vol. 29, No.1, P.4-23.

[6] Khan, H.U. and Saied, D.E.E.L., (2019) 'Pre and Post Implementation Of Integrated Health System: A Case Study Of Leading Gulf Country', International Journal of Services and Operations Management, Vol. 33. No. 1., pp. 113-133.

[7] Awan, M. A., Khan H.U. and Zhang, W. (2012) 'A comparative study on Online Service Quality Perception of two Major Regional Economies', International Journal of e-Education, e-Business, e-Management and e-Learning(IJEEEE), Vol. 2, No.6, P.529-551.

[8] Najmi, E., Hashmi, K., Malik, Z., Rezgui, A., Khan, H.U. (2015), "CAPRA: a comprehensive approach to product ranking using customer reviews", Computing, Vol. 97, No. 8, pp: 843-867.

[9] Heang, J.F., and Khan, H.U. (2015), "The Role of Internet Marketing in the Development of Agricultural Industry: A Case Study of China", Journal of Internet Commerce,Vol. 14, Issue.1 , pp. 1-49.

[10] Halabi A. E., Hachem A., Al-Akhrass L., Artail H., Khan H.U. (2014), "Identifying the linkability between Web servers for Enhanced Internet Computing", 17th IEEE Mediterranean Electrotechnical Conference MELECON 2014, 13-16 April, Beirut, Lebanon. (Conference Proceeding).

[11] Hassan, I. M., Khan, H. U. and Lalitha, M. (2016) 'Pedagogical Potentials of IEEE 802.11 WLAN to Nigerian Universities: A Case Study of the University of Uyo',

International Journal of Information and Education Technology, Vol. 6, No. 4, pp. 256-261.

[12] Khan, H.U. (2013a) 'Use of e-learning tools to solve group work problems in higher education: A Case study of gulf countries', The Advances in Computer Science: an International Journal, Vol. 2, No. 3, pp.90-96.

[13] Khan, H.U. (2016), "Possible effect of video lecture capture technology on the cognitive Empowerment of higher education students: a case study of gulf-based university", International Journal of Innovation and Learning, Vol.20, No. 1, pp. 68: 84.

[14] Khan, H.U. (2013b) 'Role of Computer Mediated Communication in Affect Empowerment and Performance Improvement', IFRSA's International Journal of Computing, Vol.3, No.3, P.165-171.

[15] Khan, H.U. (2012) 'Computer Mediated Communication, Quality of Learning, and Performance', Journal of GSTF Business Review, Vol. 1, No. 3, pp. 81-88.

[16] Khan, H.U., Artail, H., Malik, Z., Niazi, M.(2014a) 'Information Technology Adoption, possible challenges, and Framework of Supply Chain Management: A Case Study of a Leading Gulf Economy', 4th International Conference on International Conference on International Conference on Engineering Technology and Technopreneurship, Kuala Lumpur, Malaysia.

[17] Khan, H.U., Ahmed, S., Abdollahian, M. (2013) 'Supply chain technology acceptance, adoption, and possible challenges: A case study of service organizations of Saudi Arabia', 10th International Conference on Information Technology: New Generations (ITNG 2013), Las Vegas, Nevada, USA.

[18] Askoul, R., Khan, H.U. and Madhavi Lalitha, V.V. (2016) 'Cross-functional integration of marketing and information services in banking: a cross-industry comparison', International. Journal of Process Management and Benchmarking, Vol. 6. No. 1. pp. 57-78.

[19] Khan, H.U., Awan, M.A., Ho. H.C. (2014b), "How do Chinese and Saudi Customers Perceive Online Service Quality? A Comparative Study", The Journal of Business Inquiry, Vol. 13, No. 2.pp.142-157.

[20] Musa A., Khan, H.U., Alshare, K. (2015), "Factors influence consumers' adoption of mobile payment devices in Qatar", International Journal of Mobile Communications, Vol. 13, No. 6. pp. 670-689.

[21] Khan, H.U., Omonaiye, J.F., and Madhavi Lalitha, V.V. (2017a) "Employees' perception as internal customers about online services: A case study of banking sector in Nigeria', International Journal of Business Innovation and Research, Vol.13, No.2, pp.181:202.

[22] Brock, V. F. and Khan H.U. (2017b), "Are Enterprises Ready For Big Data Analytics? A Survey Based Approach", Int. J. of Business Information Systems, Vol.25, No.2, pp.256:277.

[23] Das, A. and Khan, H.U. (2016) "Security behaviors of smartphone users", Information and Computer Security, Information and Computer Security, Vol. 24, No.1, pp. 116-134.

[24] Awan, M.A., and Khan, H.U. (2016), "Status of Internet Addiction among College Students: A Case of South Korea", First American Academic Research Conference on Global Business, Economics, Finance and Social Sciences (AAR16 New York Conference), New York, USA, May 25- May 28, 2016. (Conference Proceeding).

[25] Khan, H.U. and Fournier-Bonilla, S. D. (2016), "Technological Infrastructure Effects on Export Diversification: A Case Study of Qatar", Northeast Decision Sciences Institute Conference, Alexandria, Virginia, USA, March 31st – April 2nd, 2016. (Conference Proceeding).

[26] Khan, H.U., Fournier-Bonilla, S. D., Jinugu, A., Madhavi Lalitha, V.V. (2016), "Possible Challenges of the Successful Implementation of CRM in the Service Sector: A Case Study of Saudi Arabia", Northeast Decision Sciences Institute Conference, Alexandria, Virginia, USA, March 31st – April 2nd, 2016. (Conference Proceeding).

[27] Khan, H.U. and Alhusseini, A. (2015), "Optimized Web Design in the Saudi Culture", IEEE Science and Information

Conference 2015, London, UK, July 28 - 30, 2015. pp.906-915 [Co-sponsored by Springer].

[28] Khan, H.U., Uwemi, S. (2018a) "Possible Impact Of E-Commerce Strategies On The Utilization Of E-Commerce In Nigeria', International Journal of Business Innovation and Research, vol. 15, No. 2., Pp. 231-246.

[29] Khan, H.U., Uwemi, S. (2018b) "What are e-commerce possible challenges in developing countries: a case study of Nigeria", International Journal of Business and Systems Research, Vol. 12, No. 4, pp: 454-486.

[30] Uwemi, S., Khan, H.U. (2016), "E-commerce, Challenges, and Developing Countries", 2016 DSI Annual Meeting in Austin, TX, USA. November 19th – November 22nd, 2016. (Conference Proceeding).

[31] Bashir, G. M., Khan, H.U (2016b), "Factors Affecting Learning Capacity Of Information Technology Concepts In A Classroom Environment Of Adult Learner", 15th International Conference on Information Technology Based Higher Education and Training (IEEE Conference), Istanbul, Turkey, September 8th – September 10, 2016. (Conference Proceeding).

[32] Bashir, G. M., Khan, H.U., Fournier-Bonilla, S. D. (2016), "Applying Andragogy Theory to an Adult Multicultural Audience: How Cultural Factors Influence the Capacity for Adults to Learn Information Technology Concepts in a Classroom Environment", Northeast Decision Sciences Institute Conference, Alexandria, Virginia, USA, March 31st – April 2nd, 2016. (Conference Proceeding).

[33] Hassan, I. M., Khan, H. U., Zaitun, R., Mardini, G. (2015), "Pedagogical Potentials of IEEE 802.11 WLAN to Higher Educational Institutions: A Case Study of Nigerian based University", IEEE 9th International Conference on Semantic Computing (IEEE ICSC 2015), Anhaim, CA, USA, Feb.7 - 9, 2015. (Conference Proceeding).

[34] Omonaiye, J.F., Madhavi Lalitha., Khan, H.U., Signh, R., Fournier-Bonilla, S. D. (2015), "Ability and hurdle to provide Banking online services: A case study of banking employees in Nigeria", 2015 IEEE 2nd International Conference on Cyber Security and Cloud Computing, New York,USA, November 03 - 05, 2015. (Conference Proceeding).

[35] Ejike, A. C. , Khan, H.U., Fournier-Bonilla, S. D. (2016), "Possible Impact of Mobile Banking on Traditional Banking: A Case Study of Nigeria", Northeast Decision Sciences Institute Conference, Alexandria, Virginia, USA, March 31st – April 2nd, 2016. (Conference Proceeding).

[36] Uwemi, S., Khan, H.U., Fournier-Bonilla, S. D. (2016), "Challenges of E-Commerce in Developing Countries: Nigeria As Case Study", Northeast Decision Sciences Institute Conference, Alexandria, Virginia, USA, March 31st – April 2nd, 2016. (Conference Proceeding).

[37] Ho, H. C., Awan, M. A., & Khan, H. U. (2016), "Luxury brands and corporate responsibility: A perspective on consumers' preferences", Journal of International Management Studies, 16(1), 77-81.

[38] Smuts, R.G., Lalitha, M., Khan, H.U. (2017), "Change Management Guidelines That Address Barriers To Technology Adoption In An HEI Context", 7th IEEE International Advance Computing Conference, Hyderabad, India, January 5 – 7, 2017. (Conference Proceeding).

[39] Bankole, O. A., Lalitha, M., Khan, H.U., Jinugu, A. (2017), "Information Technology In The Maritime Industry Past, Present And Future: Focus On Lng Carriers", 7th IEEE International Advance Computing Conference, Hyderabad, India, January 5 – 7, 2017. (Conference Proceeding).

[40] Khan, H.U. and Ejike, A.C. (2017) "An assessment of the impact of mobile banking on traditional banking in Nigeria", Int. J. Business Excellence, Vol.11, No.4, pp.446:463.

[41] Awan, M. A., Khan, H. U. & Ho, H. C. (2016), "Online Banking: A Comparative Study Of Chinese And Saudi Customers Perceptions Of Service Quality", Journal of Internet Banking and Commerce, vol. 21, no. S5, pp. 1-31.

[42] Khan, H.U. and Adediji, O.A. (2017) 'Need for RADAR system utilisation for maritime traffic management: a case of Congo River Basin', Int. J. Computational Systems Engineering, Vol.3, No. 3., pp163:174

[43] Khan, H.U., Bankole, O.A. and Alomari, M.K. (2017b) 'Possible effect of IT introduction into the election process: a case study of Nigeria', Int. J. Business Forecasting and Marketing Intelligence, Vol. 3, No. 2, pp.109-129.

[44] Saied, D.E.E.L., Khan, H.U. (2017) 'Implementation of Health Information System-A case study of Magrabi hospitals, KSA', Journal of Computer Science, Vol. 13. No. 5., pp. 91-104.

[45] Najmi E., Hashmi K., Malik Z., Rezgui, A., Khan H.U.(2014), "ConceptOnto: An upper ontology based on Conceptnet", 11th ACS/IEEE International Conference on Computer Systems and Applications (AICCSA' 2014), November 10-13, 2014, Doha, Qatar ,PP.366-372 (Conference Proceeding).

[46] Brock, V. F. and Khan H.U. (2017a), "Big data analytics: does organizational factor matters impact technology acceptance?", Journal of Big Data, Vol.4, No.1, pp.1:28.

[47] Khan H.U., Awan M.A.(2017), "Possible Factors Affecting Internet Addiction: A Case Study of Higher Education Students of Qatar", Int. J. of Business Information Systems (IJBIS), Vol.26, No.2 pp.261:276.

[48] Khan H.U., Awan M.A.(2019), "Can IT Industry Merger and Acquisition Effect on Brand Equity of their product/services? A case study from Qatar", Journal of Engineering and Applied Sciences, Vol 14, No. 3., pp:1001-1013.

[49] Khan H.U., Gadhoum, Y.(2018), "Measuring Internet Addiction In Arab Based Knowledge Societies: A Case Study Of Saudi Arabia", Journal of Theoretical and Applied Information Technology, Vol. 96.Samad,H.S.I.A.,and Khan, H.U., (2017), "Adoption Of Cloud In Enterprises Environment", 2017 DSI Annual Meeting in Washington, D.C., USA. November 18th – November 20th , 2017. (Conference Proceeding).

[50] Johannes,F.,and Khan, H.U., (2017), "IT-Business Strategies Alignment In Strategic Planning", 2017 DSI Annual Meeting in Washington, D.C., USA. November 18th – November 20th , 2017. (Conference Proceeding).

[51] Samad,H.S.I.A., and Khan, H.U. (2018), "Adoption Of Cloud In Enterprises Environment", International Conference on Innovations in Engineering, Technology and Sciences (IEEE Conference). September 20th – September 21st, 2018. (Conference Proceeding).

★★★