PROPOSED MODEL OF HEALTH INFORMATION SYSTEMS IN PAKISTAN

IMRAN ANWAR UJAN [1], ASADULLAH SHAH[2], MOHD. ADAM BIN SUHAIMI[3]

[1]*Faculty of Engineering & Technology,University of Sindh, Jamshoro, Pakistan*
[23]*Kulliyyah of Information & Communication Technology, International Islamic University Malaysia, Kuala Lumpur,Malayisa*

*Corresponding author: iujaniium@gmail.com

***ABSTRACT**:* This research is conducted for acceptance of Health Information Systems by healthcare Professionals of Pakistan. For the last few decades, the introduction of Information Technology (IT) has been a source of excitement. TAM (Technology Acceptance Model) is a type of technology acceptance model that is used to predict user behaviour. Few research has been performed on the capability to predict community's acceptance of health information systems (HIS). The initial step is to assess the level of adoption, followed by stakeholders' commitment to upgrading the HIS for the improvement of healthcare facilities in Pakistan. As a result, this study employed a model to imply that five main dimensions influence HIS acceptance: behavioural intention, attitude, perceived utility, perceived ease of use, and technology self-efficacy.

KEY WORDS: *Health Information Systems, Information Technology, Technology Acceptance Model, Pakistan*

1. INTRODUCTION

Information Technology (IT) is defined as "the group of technologies that is revolutionizing the handling of information and embodying a convergence of interest between electronics, computing, and communication" (Abdekhoda M et.al,2014). IT has evolved steadily since the early twenty-first century, impacting information systems and their respective areas dramatically, and health information organization is no exception. The use of information technology in healthcare systems has improved healthcare excellence and access, resulting in a significant reduction in medical errors and expenditures. When deploying any Health Information System, however, careful consideration must be given to IT adoption (HIS). The Medical Records Institute says (2003), Most healthcare organisations' ultimate goals include online health applications such as electronic health records, electronic prescription, and mobile health. Many papers have suggested the use of the Internet to increase healthcare sector productivity and eliminate errors in care delivery operations. Despite these efforts, health care organisations are lagging in the deployment of health information systems (Abdekhoda; Ahmadi, Dehnad; Hosseini, 2014).

The HIS aims to enhance the existing healthcare system by streamlining workflow and reporting. The procedures are intended to make the healthcare situation under the HIS more manageable. However, some reports have shown that such roadblocks to the acceptance and performance of health information systems and technology remain. Shefter and Black identified some of the application's

strengths and limitations (Shefter, 2006, Black et al., 2011). The central emphasis of Information Technology applications in healthcare systems in 1970s was to organize a better management of services, specifically those activities that included the computation of the patients incurred charges subject to reimbursement. In the following decade, the 1980s, the central emphasis was on the progress of clinical systems for patients' healthcare such as the diagnosis and cure of diseases. This carried on until the late 1990s, and one notable aspect of this was that the IT applications were tailored for use; there were standalone software applications for certain situations. Such discrepancy proved to be one of the major challenges in healthcare IT applications nowadays (A. Dwivedi,Bali, James, Naguib, 2002).

In the late 90s there were major changes and modifications in system designs that purportedly supported the IT functions. Organizations and institutions had shifted to a more dispersed computing architecture, rather than focusing on one central system. The upsurge of client or server and object-oriented (OO) technologies was coupled with the aforementioned shift in the main focus of system architectures. Such a period for the combination of these two technologies paved way for the rise of the distributed computing architecture in the 90s (A. Dwivedi et.al, 2002).

The biomedicine field was greatly improved with the help of IT applications for healthcare systems. Consequently, the present-day healthcare industry can now see "the emergence and proliferation of entire new scientific disciplines - molecular biology, economics, bioinformatics and proteomics - which are revealing the secrets of genes, proteins and their functions", and this proved to have notable effects on the processes and procedures involving healthcare (Dwivedi et.al, 2002).

The Institute of Medicine (IOM) USA, discovered a noticeable difference with regards to the quality of health between the past health care system and the present health care system. In the past, numerous proposals were made to reduce the frequency of medical errors and enhance the methods of providing health care.

1. proper utilization of IS in evidence-based medicine by health and medical professional was one of the identified solutions that may address the gap between the two health care systems investigated.

2. Health Care Professionals use of information technology and online information systems can be complicated as it involves the changing behavioral pattern along with the familiarity of the information technology.

3. The combined effect of the Health Care Professionals behaviors to use the information systems in their routine clinical practices is difficult to foresee and therefore the research area involving the health care professionals use of the IS need to explore in detail.

4. Some researchers reported that health care professionals are reluctant to introduce the systems into their practices because of time constraints

5. Some important factors are knowledge and cognitive barriers as their level of information technology literacy is low to use applications of the IT. This low level of IT literacy and information literacy and skills are the reasons argued by the health professionals. Due to these reasons understanding the concepts and importance of health information systems and information technology are justified by medical professionals.

2. SIGNIFICANCE OF THE RESEARCH

Without health information systems and new information and communication technology, improvement and rehabilitation of the health-care system would be difficult. As a result, this research would be beneficial to Pakistani healthcare professionals. It will help hospital administration to know the importance of Health Information System in their organization. With the introduction of the HIS in developing countries' hospitals, patients will get timely and best healthcare treatments.

In terms of the analysis methods used, this thesis makes a contribution. It's also worth noting that the questionnaire acts as the framework's foundation. Similar procedures used in this study can be utilized by future studies to obtain results for their research. The questionnaire used in this study was developed based on previous study entitled "An investigation on Physicians' acceptance of hospital information systems: A case study" (Rai-Fu Chen and Ju-Ling Hsia, 2012).

This study provides a concise framework for addressing the determinants of health technology, acceptance, and a user's intention toward digital clinical and medical information resources, making a theoretical contribution to the field of health informatics in general.

Overall, this study demonstrates the importance of various factors that influence physician acceptance and use of HIS. Although technology acceptance and intentional behaviour were also included in the research design. While it is important to consider the user's adoption and intention to use technology, it is also important to investigate the acceptance and intention to use a health information system in the research design.

In the field of medicine, information is of utmost importance. Physicians are constantly processing information. Their practice involves the recording, collating, testing, and modifying information. The exact position of medical informatics is at the intersection of information technology, cognitive science, artificial intelligence, and medicine. So, this is not a simple field involving only one aspect such as medical computing, telecommunications, or information engineering, but rather it is a dialogue between physicians, patients, and medical informaticians in medical information systems and online information resources. It explores and develops new knowledge, builds new theories, and organizes principles and solutions. Health information technologies and information systems are to positively increase the outcome of clinical care. Computers, information systems and evidence based decision makings are vital pillars of health informatics. To take full advantage of all ICT applications in health, physicians have to learn the skills for framing, analyzing and integrating the healthcare information into clinical practices. Today's challenge is not to have access to hardware rather it is the ability to use the information system and other available information resources to improve the quality of health care delivery (Stahl, S.G.P.a.J.E, 1997).

To build a prosperous, stable economy, and society, healthcare sector is very important. Unfortunately, health sector in Pakistan is suffering from neglects. It is an underperforming sector. Due to the 46% reduction in the allocation of funds for health in 2010-2011, Pakistan has the lowest budget for the health sector in the region and the population of Pakistan, was observed to be rapidly increasing. In 2000, it was reported that the population of Pakistan was at 142 million. However,

in 2011, Pakistan's population was already 187 million with the ratio of one physician to 1,326 people. In addition to the lack of funding and growing population, other limitations prevalent in the health care of Pakistan are (a) tradition modes of practice, (b) rising frequency of medical errors, (c) delay in knowledge diffusion process, and (d) the interests of private individuals and institutions (Faisal Sultana, Muhammad Tahir Azizb, Idrees Khokharc, Hussain Qadrid, ManzarAbbasc, Amir Mukhtarc, Waqar Manzoorc, Muhammed Aasim Yusufaa, 2014). The use of ICT application in conjunction with evidence-based medical practice is the best way to address the significant challenges that Pakistan is experiencing in health care, namely, (a) compounding cost for health care, (b) rising rate of medical errors, and (c) delay in the knowledge diffusion process (Wears, and Ber, 2005).

Both public and private health care is provided in Pakistan. 80% of outpatient visits are entertained by the private sector. Welfare and community hospitals are also playing a great role in providing the health services at low cost. Current scenario can be improved by introducing information technology in the healthcare sector, and by training physicians to get the best benefits from these resources for evidence-based medicine (Babar T. Shaikh and Juanita Hatcher, 2004). In 2007, 133933 doctors were registered with Pakistan Medical and Dental Council (PMDC) and by 2010; the country had only 54 qualified health informatician. In an independent research report it was stated that "Pakistan does not have an institutional mechanism for healthcare service quality control, hospital accreditation or provider credentialing except for the PMDC, which plays the role of registration only" (Dr Haroon Khan, eHAP Pakistan).

3. PROPOSED RESEARCH FRAMEWORK

Adoption of technological innovation is a fundamental concept of economic growth and plays a significant role in achieving long-term competitiveness among emerging organisations (Barrett and Sexton,2006). The adoption of technology in organisations is increasing noticeably. In 1999, annual IT spending exceeded US$1 trillion, with annual compounded growth of about 10% expected (Seddon et al, 1999). Furthermore, since the 1980s, literature has shown that organisations' respective investments in IT account for roughly half of their total capital investments (Venkatesh et al, 2003). However, the impact of such investments cannot be determined or guaranteed until the systems are used by the intended operators (Venkatesh and Davis, 1996).

Literature of information system analysis, researchers continue to struggle with selecting an acceptable model from a myriad of models and determining whether or not to incorporate new technologies into operation (Karahanna, and Straub,1999, Rogers,2010, Moore, and Benbasat,1991). A variety of theoretical models from diverse fields of social psychology, information systems, sociology, and business management were combined, updated, and applied to forecast the valid determinants and provide a deeper understanding of technology adoption (Rogers,2010, Karahanna, and Straub,1999).

TAM is the most influential model in information system research for studying Acceptance or adoption of emerging technology or information systems by individuals. TAM's success derives from the fact that it is frugal and capable of forecasting and illustrating the adoption of a large number of different types of

information management and information technology at various levels of experience, as well as cultural diversity.

The advancement of novel technology and the adoption of technological innovations. The Technology Acceptance Model (TAM) was originally developed by Davis to investigate the connections between factors such as "perceived usefulness" (PU), "perceived ease of use" (PEOU), Attitude (ATT), Behavioral Intention (BI), and actual use (AU). The utilization of this paradigm has been extensively employed across several industries to address diverse challenges related to the adoption of technology. However, the utilization of Health Information services, has been insufficient. Therefore, it is imperative to do an empirical investigation within the Indian setting. Various scholars have conducted investigations into the effectiveness of mobile health (mHealth) in different countries worldwide. However, the degree of acceptance and implementation of mHealth has been observed to differ across nations (Manindra Rajak *, Krishnendu Shaw, 2021)

3.1. Behavioral Intention

"The extent to which an individual intends to adopt or purchase the technology, system, or product in the future" (Venkatesh et al., 2003). The Health Information System viewpoint is meant to measure or predict the activities of a potential healthcare practitioner. As a result, in this study, behavioral intention of use is used as an outcome variable in the proposed research model to understand how other independent variables such as attitude towards using, perceived usefulness, perceived ease of use, and technology self-efficacy affect the acceptance of Health Information Systems both directly and indirectly.

3.2. Technology Self-efficacy

The literature on the impact of self-efficacy on using information technology emphasizes its significance in elucidating a person's behavior toward IT as well as his or her capabilities in doing so (Compeau and Higgins, 1995a; 1995b; Gist et al., 1989). However, Marakas et al. (1998) highlighted the differences in behavior between a person's self-efficacy with regard to computers in general and self-efficacy with regard to a particular task on a computer.

3.3. Perceived Usefulness

Davis (1989) says that perceived usefulness (PU) is how much a person thinks that using a certain tool or service will improve his or her performance. The PU is one of the most important parts of Davis's (1989) Technology Acceptance Model (TAM). The PU is an important part of the health information system and has a good effect on the working environment of healthcare professionals.

3.4. Perceived Ease of Use

According to Davis (1989), "the degree to which a person believes that using a particular system would be free from effort" is the definition of social perceived ease-of-use. A causal precursor to perceived usefulness is perceived ease of use. Numerous empirical studies have confirmed the association between perceived usefulness and perceived ease of use (Gefen et al., 2003; Gefen and Straub, 2003; Teh and Ahmed, 2012). Additionally, multiple studies (Venkatesh, 2000; Teh and Ahmed, 2012) have supported the positive correlation between perceived usefulness and behavioral intention to use technology. For a better HIS to

participate in the health information system in our setting, a good association between technological antecedents (i.e., perceived usefulness and perceived ease of use) and behavioral intention is necessary.
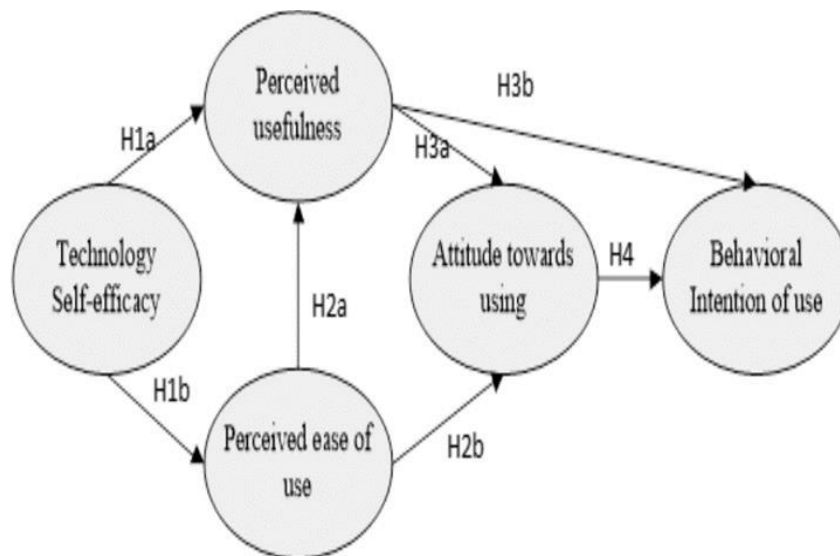

Fig. 1. Proposed model for Health Information Systems acceptance in Pakistan

The theoretical composition and hypothesis interactions among several constructs used in this study are depicted in Figure 1. TAM was used for three purposes. (1) TAM is a well-studied model with a solid theoretical foundation that has been supported by a set of psychometric measurement scales. (2) TAM is a basic IS parsimonious model that was created to provide adequate acceptance

of various IS and technologies in a variety of contexts. (3) TAM's core constructs, PEOU and PU, have good empirical support for predicting consumer adoption of technology. (Abbasi, 2011, Fida Chandio, 2011, Davis, 1989, Gefen, 2004).

According to the research's conceptual structure, perceived usefulness (PU), perceived ease of use (PEOU), attitude toward using (ATU), and technology self-efficacy ITSE) all influence behavioural intention to embrace HIS. TSE External variables were used as antecedents of PEOU and PU in the proposed model based on previous study. (Abbasi, 2011, Fida Chandio, 2011, Davis, 1989, Gefen, 2004). TSE is useful for describing people's attitudes about technology and evaluating how much they use it.

4. CONCLUSION

In the proposed model for Health Information Systems acceptance in Pakistan is discussed. There are 4 constructs Technology Self Efficacy (TSE), Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude towards using and all are independent variables. Whereas Behavioural Intention (BI) is dependent variable. A cross sectional survey approach will be used to gather data for this research study since it is quick, inexpensive, and may be used to obtain a high sample size.

REFERENCES

Abdekhoda M, Ahmadi M, Dehnad A, Hosseini AF. Information technology acceptance in health information management. Methods of information in medicine. 2014 Jan 1;53(1):14-20.

A. Dwivedi, R.K.Bali, A.E.James, R.N.G. Naguib, The efficacy of using object oriented technologies to build collaborative applications in healthcare and medical information systems, Proceedings of the 2002 IEEE Canadian Conference on Electrical & Computer Engineering.

Black, A. D., Car, J., Pagliari, C., Anandan, C., Cresswell, K., Bokun, T., McKinstry, B., Procter, R., Majeed, A., Sheikh, A. (2011) The Impact of eHealth on the Quality and Safety of Health Care: A Systematic Overview. PLoS Med, 18.

Compeau, D., Higgins, C.A. & Huff, S. (1999) "Social cognitive theory and individual reactions to computing technology: A longitudinal study", MIS Quarterly, vol. 23, no. 2, pp. 145-158.

Davis, F.D., Bagozzi, R.P., and Warshaw, P.R.: 'User acceptance of computer technology: a comparison of two theoretical models', Management science, 1989, 35, (8), pp. 982-1003.

Fida Chandio, STUDYING ACCEPTANCE OF ONLINE BANKING INFORMATION SYSTEM: A STRUCTURAL EQUATION MODEL, Brunel Business School, Brunel University London, June 2011.

Faisal Sultana, ∗, Muhammad Tahir Azizb, Idrees Khokharc, Hussain Qadrid, ManzarAbbasc, Amir Mukhtarc, Waqar Manzoorc, Muhammed Aasim Yusufaa, Development of an in-house hospital information system ina hospital in Pakistan, International Journal of medical informatics 8 3 (2 0 1 4) 180–188.

Gefen, D., & Straub, D. W. (2004). Consumer trust in B2C e-commerce and the importance of social presence: experiments in e-products and e-services. Omega, 32(6), 407e424.

Gefen, D., Karahanna, E., and Straub, D.W.: 'Trust and TAM in online shopping: an integrated model', MIS quarterly, 2003, 27, (1), pp. 51-90.

Gist, M.E., Schwoerer, C. & Rosen, B. (1989), "Effects of alternative training methods on self-efficacy and performance in computer software training", Journal of Applied Psychology, vol. 74, no. 6, pp. 884-891.

Karahanna, E., and Straub, D.W.: 'The psychological origins of perceived usefulness and ease-of-use', Information & Management, 1999, 35, (4), pp. 237-250.

Manindra Rajak ∗, Krishnendu Shaw, An extension of technology acceptance model for mHealth user adoption, Technology in Society 67 (2021) 101800

Moore, G.C., and Benbasat, I.: 'Development of an instrument to measure the perceptions of adopting an information technology innovation', Information systems research, 1991, 2, (3), pp. 192-222

Rai-Fu Chen, Ju-Ling Hsiab, An Investigation on Physicians' acceptance of hospital information

Systems: A case study, International Journal of Medical Informaticd 81 (2012) 810-820.

Rogers, E.M.: 'Diffusion of innovations' (Simon and Schuster, 2010.)

Shefter, S. M. (2006). Workflow Technology: The new frontier. How to overcome the barriers and join the future. Lippincott's Case Management, 11, 25–34.

Stahl, S.G.P.a.J.E.: 'Medical informatics: where the action is.', West J Med, 1997, 166, (2), p 82-88

Teh, P.-L., and Ahmed, P. K. 2012. "Understanding Social Commerce Adoption: An Extension of the Technology Acceptance Model," Proceedings of the International Conference on Management of Innovation and Technology (ICMIT): IEEE, pp. 359-364.

Viswanath Venkatesh and Fred D. Davis, A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies, Management Science Vol. 46, No. 2 (Feb., 2000), pp. 186-204

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS quarterly, 425-478.

Wears, R.L., and Berg, M.: 'Computer technology and clinical work', JAMA: the journal of the American Medical Association, 2005, 293, (10), pp. 1261-1263.