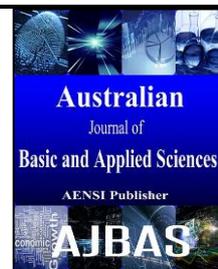




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Factors That Influence The Adoption Of EHR By Health Professions: The Case Of Dhi-Qar Hospital

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ABSTRACT

Iraq as a developing country tried to take advantage of advances in information and communications technology to provide safe and high-quality services to the citizens. Based on the advantage of the new communication technologies, Dhi-Qar local government sought to implement and adopt these technologies in the public sector. Regrettably, since 2003 most of the electronic services initiatives have been neglected or have not been used. In fact, pre-implementation (adoption) is essential for successful electronic health implementations. Serving patients in the hospitals through an integrated electronic Health system requires an understanding of the behavior of the Health workers (such as Nurse and Doctors) as well as the factors that influence their acceptance and usage of technology. Thus this study is intended to identify the main factors affecting on the adoption of the electronic health record in Iraq. The study will examine user acceptance and use of technology, in the Technology Acceptance Model (TAM). The quantitative method is the main approach of collecting the raw data from the respondents. This study concentrates on the staff who works in the main hospital in Dhi-Qar because this province is the first local province that implemented many electronic projects. A total of eight questionnaires were distributed but only 61 questionnaires were returned. As for the data analysis, the present study used second generation technique (Partial Least Squares) to analyze the self-administration questionnaire as well as use SmartPLS V.3 as an instrument. The results indicated that there is a significant relationship between Ease of Use -> Usefulness, Usefulness -> Attitude, and Attitude -> Adoption of EHR. The results also showed that influence demographic do not influence on the adoption of EHR among health workers in Dhi-Qar Hospital. These finding may help decision makers in Iraq government to improve future implementation of e-health services.

INTRODUCTION

Essentially, the former method which is the paper-based approach to clinical documentation has been overwhelmed by the demands in terms of the exchange of information among health care providers, the financial and legal complexities of the environment of modern health care, as well as the rate of biomedical knowledge and the growth of chronic care needs which are resulted from the aging population that are both increasing and last but not least, the errors in medical field that are interrelated to the handwritten notes (Hendrikx *et al*, 2013). According to Sanders *et al*, (2013) technological advances rapidly increased the pace of information exchange,

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and basically, the electronic health record (EHR) systems are among the strategy adapted in terms of addressing the limitations of paper-based methods. Moreover, Pradhan (2016) had stated that exploiting the modern technologies in the health context such as EHR will certainly be useful in providing an effective solution to the problems and complications faced in the process of health data management. Generally, healthcare issues can be dealt in better ways by using modern technologies (such as Internet and smartphones).

In fact, most of the data in a hospital and related to the patient are currently gathered using a form of charts as well as using paper basis (AL-Hadban, Hashim & Yusof, 2016). By utilizing the paper record, it will then maximize the use of papers and thus making it critical in managing and utilizing the records. EHR is a term that is used to refer to the patients' medical records which are seemingly gathered in an electronic format. Electronic records are easily portable and accessible at anytime and anywhere. Besides that, it is also easy to be used as it can easily transfer electronic records to different channels at one time. Specifically, EHR is a step taken in the healthcare world to another modernized level as all the processes included in the journey of the medical as well as the clinical data are all automatically generated and be well structured. Therefore, it is believed that this approach may help patients in getting better healthcare and at the same time, the physicians will also have the chance to get up-to-date information. This will then contribute towards the effectiveness of the overall medical system. This argument is considered one of the motivations to conduct this study in developing countries, such as Iraq.

Research Methodology:

Conceptual Model and hypothesis development:

TAM considers perceived usefulness (PU) and perceived ease of use (PEOU) as two major factors influencing a user's attitude toward using technology (ATT) in using hospital system (Chen & Hsiao, 2012). However, our conceptual model is shown in Figure 1. It is a simple TAM, without any external variables, testing perceived usefulness (PU) and perceived ease of use (PEOU). As the objective of this study is TAM's measurement equivalence, the focus of the model is shifted to demonstrate whether gender, age, and IT competency affect a response to TAM.

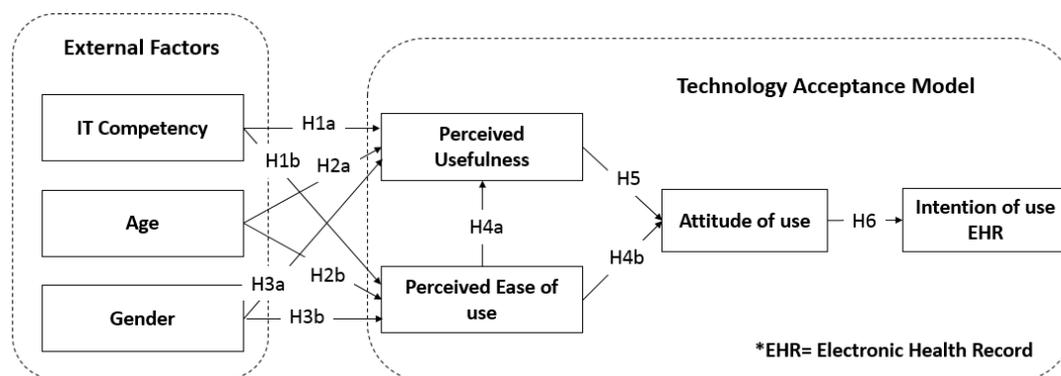


Fig. 1: Conceptual model

According to Lai and Li (2005), the demographic variables (such as gender and IT competency) were singled out because they may have significant effects on an individual's adoption decision. Moreover, critics argue that the widespread adoption of Internet-based systems pre-sents a new form of discrimination against older, female, less IT competence, poorer, less educated, and minority (ethnic) users (Yao, Okoli, Houston & Watson, 2006). Although some user profile variables, especially in gender (Gefen & Straub, 1997), age (Spacey, Goulding & Murray, 2004), and IT competence (Kleijnen, Wetzels & De Ruyter, 2004) have been examined in technology acceptance research, they did not examine these profiles with healthcare technology. Table 1 list of the hypothesis and the sources supported.

Table 1: List of hypothesis

No	Hypothesis	Sources
H1a	More IT competent users will perceive EHR to be more useful than will less IT competence users.	Lai & Li (2005)
H1b	The more IT competent users will perceive EHR to be easier to use than will the less IT competent users.	
H2a	Older users will perceive EHR to be more useful than will their younger counterparts.	
H2b	Younger users will perceive EHR to be easier to use than their older counterparts	
H3a	EHR will be perceived to be useful more by females than by their male counterparts.	
H3b	EHR will be perceived to be ease of use by females than by their male counterparts.	
H4a	Ease of use has a significance influence on usefulness to adopt of EHR services amongst health workers (Doctors and Nurses)	Pai & Huang (2011)

H4b	Ease of use has a significance influence on attitude to adopt of EHR services amongst health workers (Doctors and Nurses)	Moore, (2012) and Davis, Bagozzi & Warshaw (1989).
H5	Usefulness has a significance influence on attitude to adopt of EHR services amongst health workers (Doctors and Nurses)	Ketikidis, Dimitrovski, Lazu-ras & Bath (2012)
H6	Attitude has a significance influence on intention to adopt EHR services amongst health workers (Doctors and Nurses)	Ketikidis, Dimitrovski, Lazu-ras & Bath (2012)

Instrument and data collection:

For this study, the researchers adopted a quantitative research design, using a questionnaire survey as their primary means of data collection. In fact, the questionnaire of the present study was developed based on previous literature and was then distributed to a random sample where participation was completely voluntary. Moreover, the purpose of this study is to determine the factors that may influence electronic health record adoption in the public hospital.

Furthermore, Sekaran (2014) stresses the importance of choosing the questionnaire language that approximates the level of understanding of the respondents. Given that the majority of the employees in the public institutions of Iraq are communicating in the Arabic language, questionnaire items of the study have been translated into the Arabic language. However, the questionnaire was written in both the Arabic and English language. The researchers offered to answer any questions that the respondents might have and to provide a further explanation should it be needed. In general, most respondents took less than 15 minutes to complete the questionnaire. A total of 61 sets of questionnaire were returned by the respondents.

In general, the survey measures five ordinal variables, which are EOU, UF, ATT, INT and ITC, as well as demographic dimensions. All these variables were adapted from previous studies. Adaption of items related to each variable from the summary of the measurements adapted from previous studies is quite authentic and useful. Table 2 summarizes the instrument used for all constructs. Moreover, for every construct, the measurement scale is a five-point Likert Scale, which ranges from 1 to 5 ['1' strongly disagree to '5' strongly agree]. This study applied the five-point Likert Scale because it is more convenient for the respondents to make their choice (Muraina, Wan, & Azizah, 2013)(Dwivedi *et al.*, 2010).

Table 2: Construct's measurement

Factor	Items	Sources
Adoption	<ul style="list-style-type: none"> ▪ I intend to use the EHR in the future. ▪ I will always try to use the EHR in my daily life. ▪ I plan to use the EHR frequently. 	Venkatesh, Morris, Davis and Davis (2003).
Attitude	<ul style="list-style-type: none"> ▪ I think that using the EHR is a good idea. ▪ I think that using the EHR is beneficial to me. ▪ I have a positive perception of using the EHR. 	Fishbein and Ajzen (1977).
Ease to use	<ul style="list-style-type: none"> ▪ I find the EHR to be clear and understandable. ▪ I find that the EHR does not require a lot of mental effort. ▪ I find the EHR to be easy to use. 	Davis, Bagozzi and Warshaw (1989).
Usefulness	<ul style="list-style-type: none"> ▪ Using the EHR will improve my performance in track and manage the patient's condition. ▪ Using the EHR will increase my productivity in track and manage the patient's condition. ▪ Using the EHR will enhance my effectiveness in track and manage the patient's condition. ▪ I find the EHR to be useful in track and manage the patient's condition. 	Davis, Bagozzi and Warshaw (1989).
IT competence	<ul style="list-style-type: none"> ▪ Novice ▪ Expert 	Lai and Li (2005).

Data analysis and results:

SmartPLS version 2.0 was used to perform the PLS-SEM data analysis. The first step for analysis was to test the content, convergent, and discriminant validates of constructs using the measurement model, while the second step was to test the structural model and hypothesis.

Profile of respondents:

Eighty questionnaires were distributed, and sixty-one were returned. Of these returned questionnaires, six were partially completed and were excluded from the data analysis. This gave an effective response rate of 76 percent. The final 61 respondents all work in a hospital (Doctor and Nurses), they ranged in age from 18 to above 45, but a majority of them (67%) were aged between 25 and 40. Distribution of gender was 44 % (n= 27) of respondents were male and 55 % (n = 34) were female. With regard to IT experience, 61% of the respondents do not have more experience with electronic services; while 439 they have good experience with electronic services and modern technology. The details are shown in Table 3.

Table 3: Sample profile

		Frequency	Percentage
Age	18-25 years	20	32.8
	Over 26 years	41	67.2
Gender	Male	27	44.3
	Female	34	55.7
IT Competence	Novice	37	60.7
	Advance	24	39.3

Assessment of measurement model:

The measurement model evaluated the reliability and validity of the constructs. To assess this study, composite reliability, discriminate validity and convergent validity criteria were used. To evaluate the reliability of the reflective measurement model for PLS-SEM, indicator reliability and construct reliability must be assessed, as shown in Figure 2. To evaluate indicator reliability, the loading of each indicator on its associated latent construct was checked. A loading greater than 0.7 is considered acceptable in terms of indicator reliability (Hair *et al.*, 2011). All these results were achieved by using PLS Algorithm in SmartPLS.

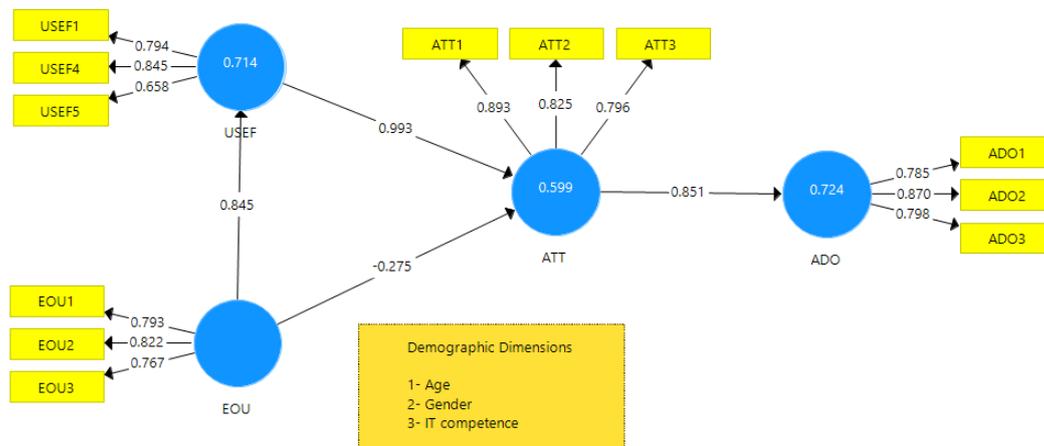


Fig. 2: Measurement model

Indicators with loadings between 0.4 and 0.7 should be taken out only if deleting the item would result in an increase in the CR or AVE above the indicated threshold value [21] A Composite Reliability (CR) and Average Variance Extracted (AVE) tests were carried out to measure convergent validity. These results are presented in Table 4.

Table 4: The results of assessment of the measurement model

Constructs	Items	Loading	CR	AVE
Adoption	ADO1	0.785	0.859	0.670
	ADO2	0.870		
	ADO3	0.798		
Attitude	ATT1	0.893	0.877	0.704
	ATT2	0.825		
	ATT3	0.796		
Ease to use	EOU1	0.793	0.837	0.631
	EOU2	0.822		
	EOU3	0.767		
Usefulness	USEF1	0.794	0.812	0.592
	USEF4	0.845		
	USEF5	0.658		

As for discriminant validate, it is actually established when the square root of the AVE from the construct is greater than the correlation shared between the construct and another construct in the model. Table 5 reports the results of the discriminant validate.

Table 5: Discriminant validity of the variable constructs

Latent Variables	1	2	3	4
Adoption	0.818			
Attitude	0.810	0.839		
Ease to use	0.667	0.564	0.845	
Usefulness	0.791	0.760	0.794	0.870

Assessment of the structural Model:

In addition to PLS Algorithm, the present study made use of bootstrapping procedure in the SmartPLS 3.0, where the T values of every path coefficient were produced and subsequently along with the P values for latent variables, as well as, Multi-Group Analysis (MGA), to determine whether males and females, older and younger people and people with high IT competency and low IT competency conceptualized the exogenous constructs in the same way, as depicted in Table 6.

Table 6: Hypotheses testing results

NO.	Hypothesis	t.value	p.value	Decision
H1a	More IT competent users will perceive EHR to be more useful than will less IT competence users.	Threshold <0.05 Or > 0.9	0.458	Not supported
H1b	The more IT competent users will perceive EHR to be easier to use than will the less IT competent users.		0.427	Not supported
H2a	Older users will perceive EHR to be more useful than will their younger counterparts.		0.679	Not supported
H2b	Younger users will perceive EHR to be easier to use than their older counterparts		0.210	Not supported
H3a	EHR will be perceived to be useful more by females than by their male counterparts.		0.714	Not supported
H3b	EHR will be perceived to be ease of use by females than by their male counterparts.		0.280	Not supported
H4a	Ease of use has a significance influence on usefulness to adopt of EHR services amongst health workers (Doctors and Nurses)	10.698	0.000	Supported
H4b	Ease of use has a significance influence on attitude to adopt of EHR services amongst health workers (Doctors and Nurses)	0.990	0.323	Not supported
H5	Usefulness has a significance influence on attitude to adopt of EHR services amongst health workers (Doctors and Nurses)	4.314	0.000	Supported
H6	Attitude has a significance influence on intention (adoption) to adopt of EHR services amongst health workers (Doctors and Nurses)	48.731	0.000	Supported

The structural model estimation and evaluation of the formulated hypotheses. Results indicated that out of four of the exogenous and endogenous latent variables, one of the variables was not supported, namely: Ease of use -> attitude, where t-value was 0.990. The results also indicated that Ease of use -> usefulness, usefulness -> attitude has significant influence, and attitude have a direct effect on electronic health record adoption. With regard to the demography different, there is not any effect of adopting the electronic health record between the gender, age and IT experience (or IT competence)

As for R^2 , as in Table 7, the R^2 value for endogenous latent construct (Usefulness, Attitude, and EHR Adoption) demonstrates an acceptable prediction level in empirical research. Where R^2 of key target construct of the present study (EHR Adoption) has a high value of 0.724. In the same context, the R^2 for each of Usefulness and Attitude were 0.714 and 0.599 respectively. The present study also supports the prior finding through the use of Q^2 predictive relevance measure.

Table 7: Results of R^2 , Q^2 , and f^2 .

Construct	R^2	Q^2	Effect Size		
			Correlation Between variables	f^2	Remarks
HER Adoption	0.724	0.436	ATT -> ADO	2.626	Large
Attitude	0.599	0.369	EOU -> ATT	0.054	Small
Usefulness	0.714	0.387	EOU -> USEF	2.500	Large
Ease of use	-	-	USEF -> ATT	0.702	Large

The obtained Q^2 value, after running the blindfolding procedure in SmartPLS 3.0, with an omission distance $D=7$, was (0.43, 0.369 and 0.387) for electronic health record adoption, Attitude, and Usefulness. The value of Q^2 is well above zero, indicating the predictive relevance of the path model. Lastly, this empirical study measured the f^2 value for supported variables (Attitude, Usefulness, and Ease of use). As shown in Table 6, the effect of ATT -> ADO, EOU -> USEF and USEF -> ATT is large, while the effect of EOU -> ATT is small.

Conclusion:

Understanding the attitudes and dispositions of technology users is of great significance to the field of health informatics. The successful implementation and adoption of health care information systems is contingent on the satisfaction and acceptance of the technology by users. Therefore, several countries are in the process of implementing an Electronic Health Record (EHR), but limited physicians' acceptance of this technology presents a serious threat to its successful implementation. The aim of this study was to identify factors influencing the intention of the physicians and the nurses to adopt the EHR in the Province of Dhi-Qar (Iraq) using Technology Acceptance Model (TAM).

Data was gathered in this study from physicians and nurses who work in the main local hospital in Dhi-Qar, Iraq. The results of the study demonstrate that ease of use has a significant relationship with usefulness. Meanwhile, usefulness has a significant relationship with attitude and attitudes also significantly affect users' intention to use EHR. Meanwhile perceived ease of use does not affect users' attitude to use EHR in Dhi-Qar hospital.

Despite its important contributions, this study has several limitations that could curb the interpretation of the results. First, the weak response rate and the small sample size prevented us to generalize the findings. Second, this study also did not consider all the theoretical constructs and focused only on the constructs of the TAM model. Third, the present study concentrates on the one local hospital in the province have good experience on the ICT. Therefore, in the future work need recruitment more physicians and the nurses within several hospitals. In addition, we need to expand TAM by merging several theoretical constructs from several Models such as TBP theory or IS success model. Thus, we would recommend exploring more empirical quantitative and qualitative research before implementation any electronic initiative in the public sector.

REFERENCES

- AL-Hadban, W.K.M., K.F. Hashim and S.A.M. Yusof, 2016. Investigating the Organizational and the Environmental Issues that Influence the Adoption of Healthcare Information Systems in Public Hospitals of Iraq. *Computer and Information Science*, 9(2): 126.
- Chen, R.-F. and J.-L. Hsiao, 2012. An empirical study of physicians' acceptance of hospital information systems in Taiwan. *Telemedicine and e-Health*, 18(2): 120-125.
- Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, pp: 319-340.
- Dwivedi, Y.K., A. Papazafeiropoulou, W.-P. Brinkman and B. Lal, 2010. Examining the influence of service quality and secondary influence on the behavioural intention to change internet service provider. *Information Systems Frontiers*, 12(2): 207-217.
- Davis, F.D., R.P. Bagozzi and P.R. Warshaw, 1989. User acceptance of computer technology: a comparison of two theoretical models. *Management science*, 35(8): 982-1003.
- Fishbein, M. and I. Ajzen, 1977. *Belief, attitude, intention, and behavior: An introduction to theory and research*.
- Gefen, D. and D.W. Straub, 1997. Gender differences in the perception and use of e-mail: An extension to the technology acceptance model. *MIS quarterly*, pp: 389-400.
- Hair Jr, J.F., G.T.M. Hult, C. Ringle and M.S. arstedt, 2013. *A primer on partial least squares structural equation modeling (PLS-SEM)*: Sage Publications.
- Hendriks, H., S. Poppel, R. Van de Wetering and R. Batenburg, 2013. Expectations and attitudes in eHealth: A survey among patients of Dutch private healthcare organizations. *International Journal of Healthcare Management*, 6(4): 263-268.
- Kleijnen, M., M. Wetzels and K. De Ruyter, 2004. Consumer acceptance of wireless finance. *Journal of financial services marketing*, 8(3): 206-217.
- Ketikidis, P., T. Dimitrovski, L. Lazuras and P.A. Bath, 2012. Acceptance of health information technology in health professionals: An application of the revised technology acceptance model. *Health informatics journal*, 18(2): 124-134.
- Lai, V.S. and H. Li, 2005. Technology acceptance model for internet banking: an invariance analysis. *Information & Management*, 42(2): 373-386.
- Moores, T.T., 2012. Towards an integrated model of IT acceptance in healthcare. *Decision support systems*, 53(3): 507-516.
- Pradhan, M., 2016. Analysis of Data Mining Techniques for Building Health Care Information System. *International Journal of Engineering Technology, Management and Applied Sciences*, 4(1): 49-56.
- Pai, F.-Y. and K.-I. Huang, 2011. Applying the technology acceptance model to the introduction of healthcare information systems. *Technological Forecasting and Social Change*, 78(4): 650-660.
- Sanders, D.S., D.J.L. attin, S. Read-Brown, D.C. Tu, D.J. Wilson, T.S. Hwang, *et al.*, 2013. Electronic health record systems in ophthalmology: impact on clinical documentation. *Ophthalmology*, 120(9): 1745-1755.
- Spacey, R., A. Goulding and I. Murray, 2004. The power of influence: what affects public library staff's attitudes to the Internet? *Library Management*, 25(6/7): 270-276.
- Sekaran and Bougie, 2011. *Research Methods for Business: A Skill Building Approach* (5th Edition ed.): TJ International Ltd, Padstow, Cornwall, Great.
- Uraina, I.D., R. Wan and A. Azizah, 2013. Efficacy of UTAUT model in continuation of usage of broadband in the rural areas of northern region of Malaysia. Paper presented at the Proceedings of International Con-

ference on Rural ICT Development, Jun.

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

Yao, Y., C. Okoli, A. Houston and E. Watson, 2006. Demographic differences in attitudes toward remote electronic voting systems. *Journal of Computer Information Systems*, 47(2): 34-45.