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Critical Successful Factors Affecting Adoption of E-Health System in Developing Countries

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Abstract

Recently, cloud computing has gained popularity in healthcare systems with its ability to provide health services especially to people in remote areas. Despite its numerous advantages, there is still a significant number of healthcare users who do not fully approve the use of the technology especially in emerging nations were there are cases data privacy issues and lack of IT infrastructure. The study objects to proper identification on factors that influence users' opinions regarding their preference to adoptcloud based health awareness system. 366 respondents were questioned with questionnaires in four site of Jordan and there was an estimated 66.7% response. Data was analyzed using SPSS.toidentified to giveadmittance to healthcare services especially those in remote areas to reduce time required to access medical centers and associated costs.

Results: PE{B = 0.30 &T = 5.81}, EE{B = 0.18 &T = 3.91}, SI{B = 0.207&T = 3.96}, FC{B = 0.21 &T = 4.83}, privacy P {B = 0.150 &T = 3.08}, and information exchange IE{B = 0.110 &T = 2.52}have a grave effect to consumer's behaviorpurpose. But cloud based health awareness CBHA {β = 0.10& t = 1.50} identified as numerically insignificant. Based on the results policy makers need to consider the findings to ensure there is proper integration failure it will result to challenges created.

Keywords:*Qos, health, cloud,awareness, Jordan, remote access, Behavioral Intention.*

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I. INTRODUCTION

There is a remarkable increase in human population over the year, also global development pace has been maintained which has resulted to an increased advance in food production, better lighting and heating, better shelter and great healthcare services provided. However, in some countries there has been numerous healthcare challenges affecting them as a result of inadequate health institutions available and shortage of health professionals. Thus, solving the health care challenges has been a critical purpose(1)(2). The healthcare challenge is significant in the developing countries where most hospitals are available in the urban regions compared to the rural regions. The few healthcare facilities available in the rural regions express challenges in provision of healthcare to the village dwellers to be exhausting due to the long distance to be covered.Additionally, most rural people lack proper basic education, thus they prefer to take traditional medicines which do not offer specific dosages in place of visiting a proper healthcare facility and seeking the correct medical

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treatment(3)(4). As a result,there has been reported a rise in deaths in the rural areas in comparison to urban areas. Furthermore, since most of the best healthcare facilities are available in the urban areas, most rural patients have to travel for long distances; this is often referred to medical tourism. A definite way to solve the problem is by providing primary health center close to the rural places and ensuresthe remote communities have access to proper healthcare(5).

Utilization of ICT identified to offer a good solution to all health care services issues. In developing counties ICT is primarily used as a medium for social economic growth, thus its utilization on the healthcare services it will deliver the much needed transformation with ease. ICT technologies are designed to gather the immediate requirements of the patients(6)(4), all service supplier and different stakeholders. Recently, cloud computing in different healthcare has been witnessed as a major growth [6], this is due to the remote access capability of the system; the software is on high demand and has a huge storage capability among other advantages. A study conducted by explains, cloud technology provides access capabilities on all interconnected computers upon installation of software and all computers can be access from a central server. The identified increase in demand on healthcare facilities utilization of ICT technologies is likely to offset pressure on the accessible healthcare services and different healthcare experts(7)(8)(9). Nevertheless, it is crucial to confirm the receipt of proposed expertise by healthcare customers. Why is it essential to gauge on the receiving of the awareness by healthcare customer? The main reason is either the achievement of disappointment of the technology is determined by the recognition of the technology by the customers(10)(11)(12)

Across heath care systems, there has been a remarkable improvement on the utilization on modern technologies. Studies conducted by explore there has been remarkable advantages identified with the use of cloud based health awareness (CBHA) across the health care system(13)(14). Nevertheless, most users have not grasped the need to accept and use the technology especially those residing in Jordan. There are several factors determining acceptance of the technology by the users including: privacy guaranteed(15)(16) , usage of the available ICTs in the healthcare facilities(17), IT infrastructure available in the health care facility and attentiveness of the technology(18).

The purpose of the study is to identify elements affecting healthcare users' reception on cloud based health awareness (CBHA) in Jordan,recommend a system model which with offer isolatedentrée to healthcare amenities and ensure there is prevention on unnecessary delays in delivery of healthcare services(19). The proposed system is identified to offer solution to the identified challenges. The identified factors are investigated in a sequence to calculate on the healthcare of the users by using a questionnaire byunited theory of acceptance plus preference to use expertise extensive with integration of some innovative constructs: data privacy, cloud based health awareness plusinformation exchange which is critical to the current project. Below are research questions developed for the study.

a) What factors persuade reception of CBHA by healthcare customers?
b) Does an identified relationship between information exchange and data privacy? If any link between information exchange and privacy does it persuade the behavior purpose of health care clients regarding using CBHA?
c) Can healthcare services be provided distantly in Jordan?

A significant input is deciding significant elements driving from current results which can positively influence the ideals to the healthcare

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practitioners and policy makers stationed in the emerging countries. Additionally, the current study objects to initiate a suitable framework in relation to earlierstudy (Unified Theory of Acceptance and use of Technology 2 - UTAUT2) plus given an extension on these constructs to specific areas used in the present study. The education aims to positively add to the presented literature on attributes attributing to acceptance of CBHA. Moreover, given the current study is delivering a moderately new concept, it will disclose the existing extremities of healthcare cloud completion across Jordan healthcare system(20)(21). Through the study's findings, it will help management, governments, authorized institutions and service providers to adequately strategies on development of appropriate plans to ensure efficient delivery of healthcare services to the people. Moreover, CBHA identified to being real and timely healthcare services delivery, proper resource allocation and improve working competence of all healthcare professional and self-Medicare. The study findings have implication to potential healthcare services delivered across Jordan(22).

II. SUPPORT OF CLOUD BASED HEALTH AWARENESS

There are diversemodel that are identified for different study to ensure there is technology acceptance examples are Theory of Reason Action, TAM, UTAUT and Theory of Planned Behavior (TPB) .

TAM is a popular used model which is used to recognize different factors that positively influence acceptance of information system technology. Apparent ease of use (PEoU) and Perceived Usefulness (PU) are identified to be the main factors that are influential in recognition of information technology (IT). Additionally, there is social influence on usage of IT, facilitation condition on the use of IT and motivation to use the IT services has been included as indicators of approval in literature. However, a study conducted by explore classic TAM is not preferred to be adopted in healthcare IT as a result of its inconsistency in operation of TAM constructs and uniqueness in healthcare services. In TRA behavioral attitude and prejudiced norms are measured, effort expectancy, performance expectancy, social influence and facilitation conditions included in UTAUT studies to recognize different factors used for motivation of users by using information IT(23)(24). There are different research projects which have been conduct on submission of cloud based system across the healthcare sector. Various cloud based health awareness clinics have been urbanized ,& for proper recognition, management and monitor of non-communicable diseasein rural areas. A group of researchers in gave a proposal to use cloud based health awareness care system by means of verbal communication identification in Jordan language and the recognition was tested to be 97.3% accurate. To ensure privacy is guarantee there is preference to use enhanced cloud-based privacy scenario where users are authorized to protect their own solitudeparticulars before the data is uploaded to the cloud system(25).

A. PROJECTEDCLOUD BASED HEALTH AWARENESS SYSTEM MODEL IN JORDAN

The CBHA system identified in Figure 1 to be adequately be accessed distantly in real time hence solving medical tourism, patients wasting time in lines, undue pressure and reduced death rates. The proposed system has the ability to positively contribute to design and growth of health care Information technology (HIT)(26)(27).Considering social technical design approach is essential to design healthcare information system (HIS) based on four basic phases proper problem recognition and proposed results to be attained. Theory reviewed. Refining the theories identified. Test proposed theory(15).

CBHA is identified to work for client-server architecture. It makes use of MySQL database,

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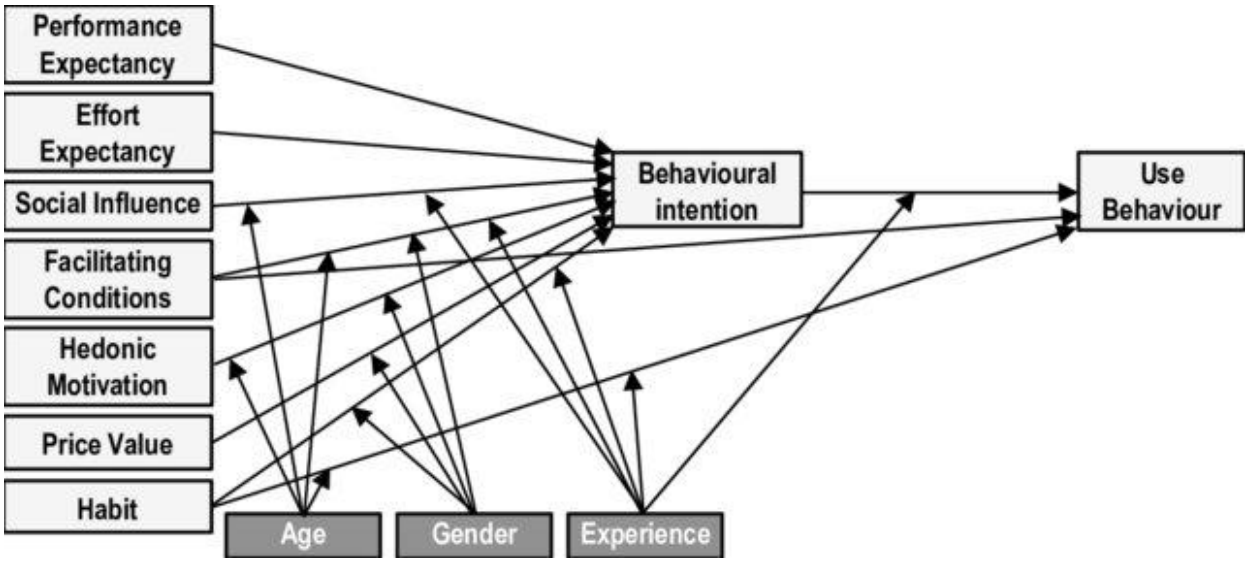
implemented PHP among other applications. Application attained via a single log in form by all users. Different users are referred to different interface once they have logged in according to their functionalities. The primary uses are patients and doctors and they can access the system through devices such as mobile phones and laptops. New patients can access the platform when needs and they get the user same and log in credentials.

The CBHAsystem has been developed to easily help the patient to self-diagnose and seek treatment of communicable diseases without help from a doctor. The patient can opt to seek doctors help is he or she is not content with results. The patient then schedules an engagement with the doctor for check-up. The submission uses all the symptoms that have been provide by the patient and displays possible condition and treatments. With reverence to symptoms provide by the patients the system matches the patient with a doctor who is considered to be an expert in the field for an appointment.

HYPOTHESIZED MODEL

UTAUT is identified to be a blend of approximately eight different models namely: Motivational Model (MM), Theory of Planned Behavior (TPB), PC Utilization Model (PCUM), Theory of Reason Action (TRA), Social Cognitive Theory (SCT), Innovation diffusion Theory (IDT), Theory of Planned Behavior, TAM, and Combined Acceptance of Technology Model. It is further figured with identified variables which are noted to be catalysts in behavioral intentions to use a specific technology. In the year 2012, UTAUT preferred to use extra constructs. The additional constructs used in UTAUT2 include: performance expectancy (this refers to the users settlement expected when they use the particular technology to undertake different activities), effort expectancy(refers to the ease use of the technology to undertake different functionalities), social influence (the level the users believes friends, relatives and colleagues can benefits from using the identified technology), facilitation conditions (the level the user believes availability of different resources and support needed to effectively use the technology), price value, (the cost value identified when using the particular technology), hedonic motivation, (The joy and pleasure the user experiences when using the technology) and habit (the level the user automatically performs with the technology). There are some moderators identified with UTAUT2 including experience, age and gender.

FIGURE 1: UTAUT 2



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the figure 1 showed the UTUAT model Referencing above discussions UTAUT2 model is proposed to be used in the current study accordance with similar studies. There are some factors current study does not consider price-value, hedonic motivation, moderating variables and habit. In place there has been introduction of new constructs to particular health care in sequence, research scope and technology acceptance. A study conducted by Venkatesh, it is essential to ensure UTAUT2 model has been added new constructs, moderators and relations in scenario where the proposed expertise is likely to be subjected to distinct factors. Proposed new constrains comprise:

a. Cloud based health awareness (CBHA): identified as motivation feature for constructs in effort expectation and considered as a basic requirement when using cloud based systems. Moreover, most developing countries are identified to having rates of poor awareness regarding cloud based application in health care Thus, proper awareness is essential for smooth operations with use of IT in health care facilities.
b. Data privacy: privacy of private data is essential; it is a grave concern in the event an authorized individual gain access to personal data it can result to significant damage. Hence it is paramount to ensure there are precautionary measures undertaken to guarantee privacy. Research explains there is a strong relation between privacy and users' intension using established cloud based systems
c. Information exchange:by using cloud based health awareness system, there is availability of sharing data. Thus it is essential to consider information sharing. Information in a healthcare can be shared both internally and externally. However, the unlimitedpour of information in a system translates to effectiveness

The identified model has superiorpreference to identify behavioral target of the userswith HITs. Referencing to results gained from UTAUT2 results in relation to health care contexts it illustrates its ability to check on initiators of CBHAreceipt by the healthcare customers on Jordan. Below are planned hypothesis and a hypothesized replica of study.

(H1): PE-Performance expectancyidentified to affect the healthcare customer behavior and their likelihood using proposed cloud based health awareness system.

(H2): EE-Effort expectancy has anaffirmative has an effect on users' behavioral meaning to make using the cloud based health awareness system.

(H3): SI-Social influence impacts positively the usersusing cloud based health awareness system.

(H4): FC-Facilitation circumstances are identified to have aoptimistic effect on users' intension on using the cloud based health awareness system.

(H5): CBHA-Cloud based health awareness directly impacts likelihood on usingcloud based health awareness system.

(H6): PD-Privacy determines the users' willingness using cloud based health awareness system.

(H7):IE-Information exchange plays pivotal role to determine the users' usage of cloud based health awareness system.

METHODOLOGY

DATA ANALYSIS

For the data analysis, SPSS used to undertake the factor analysis plus (SEM) advance. For evaluation and goodness of fit SME approach is preferred. At the same time there are structural and measurement components. Unlike Partial Least Square (PLS), the SME model can be used on large samples which favor the research large sample. The LISREL structural path modelneed three kinds of assessment models to get the

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unconditional fit model namely Chi-square, Goodness of Fit Index (GFI) and Root Mean Square Error

RESULTS

An identified measurement model testing was conducted on the study with proper estimation on the internal consistency reliability, convergence and discriminant validity on the items. All reliability measures were above 0.70 hence good internal consistency items not at this per were disregarded. A study conducted by , convergent validity is considered suitable when constructs are identified having Average Variance Extracted (AVE) of a minimum of 0.5 (> 0.5) plus planned construct identified to have a very fine convergent and discriminatory strength. Illustrated on Table 1

TABLE I. Psychometric properties of the constructs.

Construct	Item	Factor loading	CR	AVE
Performance Expectancy	PE1	0.865	0.9233	0.7505
	PE2	0.890		
	PE3	0.873		
	PE4	0.837		
Effort Expectancy	EE1	0.834	0.9001	0.6928
	EE2	0.864		
	EE3	0.830		
	EE4	0.800		
Social Influence	SI1	0.825	0.9110	0.7193
	SI2	0.885		
	SI3	0.855		
	SI4	0.826		
Facilitating conditions	FC1	0.757	0.8966	0.6344
	FC2	0.827		
	FC3	0.813		
	FC4	0.826		
	FC5	0.757		
Cloud Based Health Awareness	CBHA1	0.857	0.8611	0.7562
	CBHA2	0.882		
Data Privacy	DS1	0.820	0.8999	0.6922

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	DS2	0.833		
	DS3	0.838		
	DS4	0.837		
Information exchange	IS1	0.765	0.8775	0.6422
	IS2	0.855		
	IS3	0.819		
	IS4	0.763		
Behavioral Intention towards CBHA	BI1	0.900	0.9242	0.7530
	BI2	0.910		
	BI3	0.828		
	BI4	0.830		

Table 1 above illustrated discriminant validity of the constructs. The chart explains the relationship identified linking constructs in oblique provided with square roots identified in AVEs. Based on results from the results it is safe to note there are items with higher validity results in comparison to other items.

The above results illustrate there is discrimination and union validity of different used items. Before examining structural models, there was a multicollinearity test that was conducted via Variance Inflation Factors (VIFs) and all VIF values are between 1.01 and 1.23 identified to be underneath the optional maximum value of 10. Thus, on the delivered outcome there is need for the researcher to undertake multicollinearity..

As indicated on Table 3, it illustrates a tabular illustration of the replica fit indices, recommends ideals and shows outcome of the current investigate study.

Table 2: Summary of hypothesis results

Independent variables			Hypothesis	Path coefficient (β)/Sig.	t-values	Results
PE		BI	H1	0.30/***	5.81	Supported
EE	→	BI	H4	0.18/***	3.91	Supported
SI	→	BI	H3	0.207/***	3.96	Supported
FC	→	BI	H6	0.21/***	4.83	Supported
CBHK	→	BI	H2	0.10	1.50	Rejected
DS		BI	H5	0.15/***	3.07	Supported
IS		BI	H7	0.110/**	2.51	Supported

** P < .005, *** P < .001

DISCUSSIONS

There are registered great potentials with cloud based solutions having a positive impact on the quality of healthcare in emerging nations such as Jordan. The current study focuses on the factors identified to have a direct influence on cloud based health awareness system acceptance and utilization from the health care in Jordan. (UTAUT)2 has over time been used as the acceptable technology in reference to previous related studies when evaluating the consumer behavioral intention on the users regarding

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healthcare context. The referenced CBHA model may have a positive impact on the general healthcare system and ensure the quality of healthcare services is improved in Jordan. The research findings for the studies are categorized into two sections, theoretical findings and managerial and organizational implication findings.

Additional relatededucations conducted in reference to cloud based monitoring have illustrated factors such as effort expectancy; performance expectancy and social influence have a significant impact on the users' behavioral intention. Information sharing, facilitating conditions and privacy all have a positive impact on the BI hence supporting H4, H6 and H7.

Cloud based health awareness did not have a strong positive impact on BI in the current study, plus H5 is not supported. As a rejection on the H5 it illustrates most healthcare users do not consider availability of awareness as a key component for them to embrace cloud based health awareness system. Most users indicate they can learn through the process with ease. When there is availability of correct IT infrastructure. friendly application platforms provided the users are likely to embrace the use of technology.

The identified variables are noted to be important factors in the health cloud environment and the factors needs to be availed for successful adoption of the technology.

MANAGERIAL AND ORGANIZATIONAL IMPLICATIONS

The identified findings of the study can be used in planning, design and proper implementation for sustainable implementation of cloud based health awareness system adoption in Jordan. Decision makers and managers in Jordan are required to consider theoretical findings to before full implementation of CBHA. Thus there is need to develop a prototype to check if it delivers all proposed deliverables. Thereafter, a real system can be designed and based on trial results from prototypes it can be amended. In Jordan they are still peculiar of having an eHealth delivery system given the state is faced with slow delivery process and shortage of healthcare professionals.

There have been different studies done on cloud computing system implemented in different healthcare services and there are notable advantages especially in service delivery and the healthcare of the users with proper quality delivery of services and cost-effective solutions delivered.

Based on these collaborations there is efficient data exchange with better patient fast feedback by sharing the availed information regarding patient condition. Patients files can be accessed with ease from anywhere by a healthcare service professional when needed. These studies plus the current study findings indicate there is a positive influence on users' behavior with their intention to use CBHA system. Ease access to patient health provides management an opportunity to ensure better decision making. Patients quality of service is guaranteed with faster disease identification and correct treatment proposed. With healthcare cloud computing it is easy to ensure significant costs are saved and this is because it is accessed remotely based on "Pay –as – you – go" framework. Thus an individual only pays for services which have been offered.

Currently across Jordan there is grave issue on inadequate availability of healthcare professions to check on the high number of patients requiring medical attention, have cost effective care for the needy patients. Thus the proposed system is likely to have significant impact on healthcare delivery across Jordan.

Different factors were noted on their impact on successful adoption of e-health system cloud based health awareness system in Jordan. Full adoption of the system will reduce pressure

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currently on Jordan health care system with now remote access to healthcare services.

Based on the findings on the model it is clear approximately 25% explains the behavioral intention of the users. Thus, with proper training and awareness created on CBHA it will go a long way to increase adoption rating. Accepting the CBHA is not the only importance but also ensure there is proper planning, design and implementation to ensure great usage on the system once it is in operation. Moreover, based on the result governments in developing countries gets the opportunity to consider adoption of cloud health system or other related health cloud system.

Three questions were answered during the study:

a) *What are the influences that persuade the* approval *of CBHA by healthcare customers?*

A study conducted by,&indicated four factors performance expectancy- could the platform deliver to the users as expected especially in remote access. Effort expectancy- how easy was the platform to use. Facilitating conditions- how available were the required IT infrastructure and expertise support. Data privacy. Information exchange with value attributed to the service.

Is there any connection between information exchange and data privacy? If there is a relationship between *information exchange and data privacy, does the relationship influence the behavioral intention of health care users in the use of* the *CBHA?*

The results were gained from analysis of path model coefficient on figure 3. It indicates there is a positive correlation between the two and less impact on cloud based health awareness which agreed with previous studies.

b) *How can healthcare delivery be accessed remotely in Jordan?*

The results identified most health care service providers in Jordan are yet to fully role out cloud computing into the health care system. Thus there is need to motivate full implementation of cloud based health awareness system solutions on existing networks. According to there are also insufficient funds availed to the Jordan Healthcare sector.

CONCLUSIONS AND LIMITATIONS

The current study examined different factors influencing behavioral intention of Jordan health care users towards accepting UTAUT2 a cloud based health awareness system. The education developed seven hypotheses and out of seven six were identified to have a positive relation with their impact on behavioral intention of health care users to accept cloud based health awareness system. The only hypothesis identified to have no positive relation with the consumer behavior was cloud based health awareness. It has been identified with proper training and friendly user interface it is possible to overcome the missing CBHK of the users. Hence decision makers, health care providers and managers are identified to consider all critical factors which have a positive impact on the BI before there is design and implementation of the cloud based health awareness system. Additionally, it is paramount to ensure there is adequate maintenance on the facilitation conditions plus guarantee data privacy. Based on the findings, most users are identified to be ready to accept to learn once privacy is guaranteed and facilitating conditions taken care. The users are fully aware of the benefits CBHA will bring into Jordan health care systems. Thus, when all the influencers of CBHA are not well addressed, then the implementation of CHBS will bot be possible and it could deter the progress of the health care delivery which in extreme cases could result to increased deaths and hardships on patients.

The current study contributes significantly to existing literature with examination of some factors that facilitates acceptance of cloud health system which is a new concept. Moreover, the

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study indicated capabilities of UTAUT2 and hoe it directly influences the CBHA acceptance by healthcare users in Jordan. The developed system illustrates the proposed system can result to effective delivery of services to all patients.

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