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Innovation Diffusion among Healthcare Workforce: Analysis of Adoption and Use of Medical ICT in Ghanaian Tertiary Hospitals

Henry Asante Antwi[1] Ethel Yiranbon[1], Zhou Lulin[1], Barffour Adusei Maxwell[2], Awuni Joseph Agebase [1,3] Naminse Eric Yaw[1], Tevita Tangaroa Vakalalabure[1],

[1]School of Management, Jiangsu University, 301 Xuefu Road, Zhenjiang, Jiangsu, P.R. China
[2]School of Public Health, Department of International Health, John Hopkins University Bloomberg, Baltimore, USA
[3]Faculty of Agribusiness & Communication Science, University for Development Studies, Tamale, Ghana

Corresponding Author: Zhou Lulin (ZLL62@126.com)

Abstract

One of the many notable interventions in the healthcare delivery service in Ghana is the adoption and use of medical technology to different aspects of hospital management especially the integrated Hospital Information Systems. These are comprehensive information support systems (medical sensors, scanners, expert systems, patent record management) implemented in most hospitals to integrate and provide rapid information in respect of patients, clinical, ancillary, legal, financial, service processing and other administrative issues.

This research integrates each of the major elements from existing models to predict user acceptance, adoption and use of medical ICT in government hospitals in China and Ghana. Data is collected from a tertiary hospital in Ghana and analysed to evaluate a hierarchy of constraints and stimulants to the adoption and use of Medical ICT in government hospitals in Ghana, determines the extent to which cultural values or others can explain differences in the rate of adoption and use of Medical ICT in government hospitals in developing countries and make policy proposals towards amelioration of the problem of medical ICT adoption and use in government hospitals based on research outcome.

INTRODUCTION

Modern hospitals are complex institutions with different units and professionals coordinating healthcare for patients by assisting in diagnosis and management for better and improved services and practices. No matter the time of day, hospital staff and physicians must be prepared for anything including the treatment of common colds to life-threatening diseases through to providing aid when emergency occurs such as disaster relief (Wall, 2011). With its various departments and units, effective hospital management requires high level collaboration of different professionals to provide life-saving care, operate complex equipment and handle business issues such as policy development and compliance for the same common goods. This can only be effective if there are efficiently running top-notch management tools and techniques (Scheutz et al, 2009).

For this reason the way a hospital secures, deploys and utilizes resources will determine the extent to which it can successfully pursue its performance objectives. This is why hospitals must develop a **bias** for action, build autonomy and entrepreneurship to foster innovation and instil a management philosophy that guides everyday practices of its staff (Peters and Waterman, 1982).

According to Wall (2011) hospitals in general have five main operational performance objectives which include cost management (ability to deliver services at low cost), quality control (the ability to deliver services in accordance with specification and without error) and speed (ability to respond quickly to patient demands by reducing service request and delivery lead time). The others include being dependable (ability to deliver services in accordance with promises made to patients) and flexible (ability to change the volume of services, the time taken to provide, the service mix and innovative services) (Payne, Greaves, and Kipps, 2003).

Over the years government hospitals in Ghana have responded to changes within their internal and external operating environment through continuous innovation after decades of persistent neglect due to poor funding from the state (Rao, Wang, Hu, 2005: Badu Akosah, 2011, Ghana Health Service, 2012).

Some of the initiatives of government hospitals in Ghana as far as achieving the above objectives include programs to identify, reduce or possibly eliminate non-value added activities popularly known as the "TIMWOOD" wastages (Transport, Inventory, Motion, Waiting, Overproduction, Over processing and Defects) (Rao, Wang, Hu, 2005: Badu Akosah, 2011, Ghana Health Service, 2012).

One of the many notable interventions in the healthcare delivery service in Ghana is the adoption and use of medical technology to different aspects of hospital management especially the integrated Hospital Information Systems. These are comprehensive information support systems (medical sensors, scanners, expert systems, patent record management) implemented in most hospitals to integrate and provide rapid information in respect of patients, clinical, ancillary, legal, financial, service processing and other administrative issues (Gunter and Terry, 2005, Habib, 2010). According to the WHO, efficient use of the hospital information system can enhance service delivery and management, ease of access to sorted, classified and analysed patient information by doctors, improved access to remote data to guide development of comprehensive health care policies, efficient and accurate administration of finance, management of patients diets, monitoring drug usage, reduced transcription errors and also

64

provide administrators with a broad picture of hospital growth trends and direction (WHO, 2012).Despite the benefits which hospital information system can bring to the efficiency in health services delivery, its adoption and use has not been without challenges in developing countries where similar Health ICT Policy Strategies have been implemented. Ghana adopted a similar module of Health ICT Policy Strategies as China and many other developing countries. However, the attainment of the desired levels of basic ICT adoption and utilisation (general electronic health records, radiology information system (RIS), picture archiving and communication system (PAC), laboratory information management system) by government hospitals in Ghana is far from being achieved compared to China (Ghana Health Service, 2012).

The Ministry of Health's own evaluation report suggests that in regional and tertiary hospitals, less than 20% of hospital services (clinical and administrative) are actually integrated into existing hospital management information systems while majority of the district hospitals have less than 10% of their healthcare services integrated. Compared to China which has more than 69% of its basic healthcare information adequately integrated into existing system of healthcare delivery at all levels (Ministry of Health, 2012)

The desired expectation that modern technology will replace traditional management information approaches that encompasses paper-based information processing as well as resident work position and mobile data acquisition and presentation is far from being met in government hospitals in Ghana hence provoking academic concern.

In existing studies about the challenges of medical ICT adoption in developing countries, it is argued that most of the time hospitals lack the requisite technology, facilities and resources to integrate operations. However, recent studies by the Coalition of Health Related NGO in Ghana (2013) suggest that in the case of Ghana even tertiary and high profile institutional hospitals such as university and military hospitals (where computers, internet services and other management information technology is readily available) still have problems with effective adoption and use of medical ICT and this needs extended academic investigation.

In the existing literature, the concept of diffusion, adoption and use of technology in any area has come with different constraints. These have been conceptualised into theories and hypotheses some of which have been tested, validated or rejected in different socio-cultural context. For example, while some researchers consider personality factors as influencing the interest, and rate of technology adoption, others think that immediate environmental factors has bigger influence while others also look at distant external factors as the key to technology adoption and use (Kierkegaard, 2011). The common factors that influences technology adoption and use are conceptualised in theories such as Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Technology Acceptance Model 2 (TAM2), Motivational Model (MM), Theory of Planned Behavior (TPB), Combined TAM and TPB (C-TAM-TPB), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), Social Cognitive Theory (SCT), Unified Theory of Acceptance and Use of Technology Model (UTAUT) etc and these have given different constructs of technology adoption and use (Venkatesh, Morris, Davis, Davis, 2003).

This research integrates each of the major elements proposed to affect user acceptance from the models above to predict user acceptance, adoption and use of medical ICT in government hospitals in Ghana. The objectives of the research are to evaluate a hierarchy of constraints and stimulants to the adoption and use of Medical ICT in government hospitals in Ghana and to

65

determine the extent to which cultural values or other factors can explain differences in the rate of adoption and use of Medical ICT in government hospitals in Ghana. Finally the study seeks to make policy proposals towards amelioration of the problem of medical ICT adoption and use in government hospitals based on research outcome

Technology Adoption

The origins of the diffusion of innovations theory (including medical technologies) are varied and span multiple disciplines but most of the current attempts at conceptualizing innovation diffusion and technology adoption have built on Rogers's Diffusion of Innovation Theory (Rogers, 1962). Everett Rogers; a professor of rural sociology defined innovation diffusion as a continuous process of communicating innovative ideas like technology get people within a defined social system to understand it using a recognisable channel of communication. In the view of Rogers (1962), four main elements influence diffusion and adoption of innovation such as technology. These factors include the channels for communicating innovation, the time, the innovation and the social system and this relies on the impact of human capital. Rogers believe that the extent to which an innovation or technology can be adopted and used by individuals depends on the innovation itself, the way the innovation is communicated, the length of time that orientation about the innovation takes place and the nature or characteristics of the social system or culture and how it encourages or discourages adoption of innovation.

In this regard, Rogers (1962) affirms the importance of external factors such as socio-cultural context and individual or personality level factors such as playing significant roles in determining whether an innovation can be used or cannot be used by the people within the society. The weakness in Rogers theory which this research will seek to examine is the fact that Rogers does not explain the degree of strength of external factors in relation to other factors in innovation adoption.

The importance of external factors in innovation diffusion as explained by Rogers (1962) is confirmed by Bandura's (1977) social learning theory. Bandura (1976) argues that the learning behaviour of an individual including how he accepts and use technology is influenced by socio-cultural and psychological or personality factors (as cited by Wang and Wang, 2010). Bandura (1977) even posits that these psychological (personality) factors are themselves affected by the social system of the individual hence suggesting that the social system (including cultural factors) is a primary level impact factor whiles the personality factor remains a secondary level impact factor in learning behaviour

The Technology Acceptance Model also known as the TAM model was developed by Bass, (1986) and has been used to explain the propensity for diffusion and adoption of new technology based on understanding of social and psychological realities of man (Bass, 1986). As an information systems theory, the TAM model explains how users of technology accept and use a particular technology when it is first introduced to them. Unlike Rogers who identifies five main influencing factors, the TAM model identifies two main factors as stimulating technology adoption and use.

These are "Perceived usefulness (PU)" (the degree to which a person believes that using a particular system would enhance his or her job performance, Davis, 1986) and "Perceived ease-of-use" (the degree to which a person believes that using a particular system would be free

from effort, Davis, 1986) and these how the users perceive the technology as useful and then also the perception they hold about how easy or difficult it is to use that new technology.

In terms of the perceived usefulness of technology, Davies explains that the people do not have the same degree of believing that the use of a particular technology will be beneficial or enhance the way an activity used to be done. In that context, the degree to which the individual thinks the use of the technology can make him or her perform better such as save cost, save resources, increase speed, reduce effort etc is a major factor in determining the extent to which the individual will adopt and use that particular technology.

Secondly, the rate of adoption and diffusion of technology as per the TAM model also suggests that individuals will accept and use technology based on what they perceive as the reduction in the effort which must be committed to that particular technology. When the required effort to operate the technology is high, it may lead to resistance to accept and use while limited effort will also lead to a higher rate of acceptance and use of that particular technology (Bagozzi, 2007).

Since the proposal of this TAM model for understanding the possible behaviour or users of technology when a new technology is introduced, several other researchers have replicated the work of Davies (1986) to find out if these conclusions drawn are valid or not. Subramanian (1994) and Szajna (1994) for example have sought empirical relationship between perceived usefulness of a technology or the ease of its use and adoption and use or even the rate of use of technology and came out with robust and valid relationship by administering the TAM mode questionnaire instrument (Adams, Nelson, Todd, 1994).

Furthermore, Van Raaij and Schepers (2008) have extended the two factor theory of Davies (1992) by applying it within different countries. The conclusions supported the claims made by Davies (1992) that even though some cultural variations affect differences in technology acceptance and use, its impact is largely without statistical significance. Further extension of the TAM model has been developed by Venkatesh and Davis (2000) who explain that usage intentions and perceived usefulness are influenced by social and cognitive factors and processes.

The need to integrate competing models of technology acceptance models has led Venkatesh, Morris, Davis, Davis (2003), to develop the Unified Theory of Acceptance and Use of Technology (UTAUT) by integrating eight main theories (personal computer use model reasoned action theory, motivational model technology acceptance model, planned behaviour theory and combination of planned behaviour/technology acceptance model, innovation diffusion of theory and Bandura's (1977) social learning and cognitive theory). The unified theory of acceptance and use of technology (UTAUT) explains that the user's intention in using a particular information system and subsequent adoption of that technology as a way of life is dependent on four main factors. These include the expected performance level of the technology and the expected effort that must be put into that particular technology compared with what pertains in the past.

The third influencing factor of the rate of interest in technology adoption is the socio-cultural influences that persists within the environment of the individual and then finally the presence of other factors or conditions which generally facilitate or inhibit technology adoption.

The use of UTAUT has been validated in different forms of research including a longitudinal study by Sykes, Venkatesh and Gosain (2009) that found out that the four factors that have been explained above account for 70% of the adoption of an information system. Further empirical research has been conducted by Koivimäki, Ristola, and Kesti (2008) where the UTAUT model was applied in studying the way 243 people in the northern part of Finland perceived and used mobile services technology. The study concluded that the time spent by the users in experimenting with the device hardly affected the perception of the consumer. However, being familiar with the device and skills of the user impacted on the rate of use of technology. In the research conducted by Eckhardt, Laumer and Weitzel (2009) the UTAUT model was applied to how social influencers play some role in determining whether a person can use or not technology and the rate of use of the technology. The results suggested that among all the 152 German companies that were examined, there was a significant relationship between the social context and the possibility and rate of adopting new technology.

In healthcare management, the importance of this research regarding its social context and adoption of medical technology has also been rigorously examined with different outcomes. For example, Marques (2013) studied medical records system adoption in European hospitals and found out that culture was very much important in dictating the pace at which hospitals in different countries were adopting electronic medical records system. Another important study on medical care and technology adoption is by Khan and Findlay (2009) who analysed the factors behind the lag in electronic medical record (EMR) adoption in the United States. It was widely reported at that time that economic factors, particularly, lack of economic incentives were the primary cause of the delay in EMR adoption.

This prompted the Health Information Technology on Economic and Clinical Health Act in 2009 that allowed financial incentives through the Centers of Medicare and Medicaid Services for many health care organizations planning to adopt EMR. However, several four years after the promotion of these Act financial incentives alone have not solved the problem and many new innovations do not diffuse even when offered for free. They rather found out that sociocultural factors were the largest impediments of EMR adoption in the hospitals.

MATERIALS AND METHODS

For this research, the UTAUT model was adopted as the key measurement of medical ICT adoption in response to a proposal for further study by Payne, Greaves, and Kipps, (2003) who employed the TAM model in their research in a healthcare facility. This, notwithstanding, UTAUT model was adopted on its own merit as the most comprehensive technology adoption model because it incorporates all the major user acceptance determinants from eight models as stated in earlier sections. These have been summarised in Table 1.0

Models and Theories	Constructs
Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975) derives from psychology to measure behavioral intention and performance.	Attitude Subjective norm
Technology Acceptance Model (TAM) by Davis (1989) develops new scale with two specific variables to determine user acceptance of technology. Technology Acceptance Model 2 (TAM2) by Venkatesh and Davis (2000) is adapted from TAM and includes more variables.	Perceived Usefulness Perceived Ease of Use Subjective Norm* Experience* Voluntariness* Image* Job Relevance* Output Quality* Result Demonstrability* * indicates TAM2 only
Motivational Model (MM) also stems from psychology to explain behavior. Davis et al. (1992) applies this model to the technology adoption and use.	Extrinsic Motivation Intrinsic Motivation
Theory of Planned Behavior (TPB) by Ajzen (1991) extends TRA by including one more variable to determine intention and behavior.	Attitude Subjective norm Perceived Behavioral Control
Combined TAM and TPB (C-TAM-TPB) by Taylor and Todd (1995).	Perceived Usefulness Perceived Ease of Use Attitude Subjective norm Perceived Behavioral Control
Model of PC Utilization (MPCU) by Thompson et al. (1991) is adjusted from	Social Factors

the theory of attitudes and behavior by Triandis (1980) to predict PC usage behavior.	Affect Perceived Consequences (Complexity, Job-Fit, Long-Term Consequences of Use) Facilitating Conditions Habits
Innovation Diffusion Theory (IDT) by Rogers (1962) is adapted to information systems innovations by Moore and Benbasat (1991). Five attributes from Rogers' model and two additional constructs are identified.	Relative Advantage* Compatibility* Complexity* Observability* Trialability* Image Voluntariness of Use * indicates Roger's constructs.
Social Cognitive Theory (SCT) by Bandura (1986) is applied to information systems by Compeau and Higgins (1995) to determine the usage.	Encouragement by Others Others' Use Support Self-Efficacy Performance Outcome Expectations Personal Outcome Expectations Affect Anxiety
Unified Theory of Acceptance and Use of Technology Model (UTAUT) by Venkatesh et al. (2003) integrates above theories and models to measure user intention and usage on technology	Performance Expectancy Effort Expectancy Attitude toward Using Technology Social Influence Facilitating Conditions

	Self-Efficacy
	Anxiety

Table 1.0: Models and Theories of Individual Acceptance (Sundaravej, 2010)

A conceptual model was designed to investigated how reliable and valid each construct from the 8 models that forms the UTAUT models and reduced them to seven constructs based on their significance. This is consistent with earlier studies by Sundaravej (2010). However, this construct was modified by including attributes of uncertainty avoidance of culture using "cultural practices" (GLOBE team, 1995) instead of "cultural value" (Hofstede, 1984) in response to a recommendation by Cardon and Marshall (2008) but the questions were rephrased to suit the research objectives. The final conceptual model is shown in figure 1.0 below
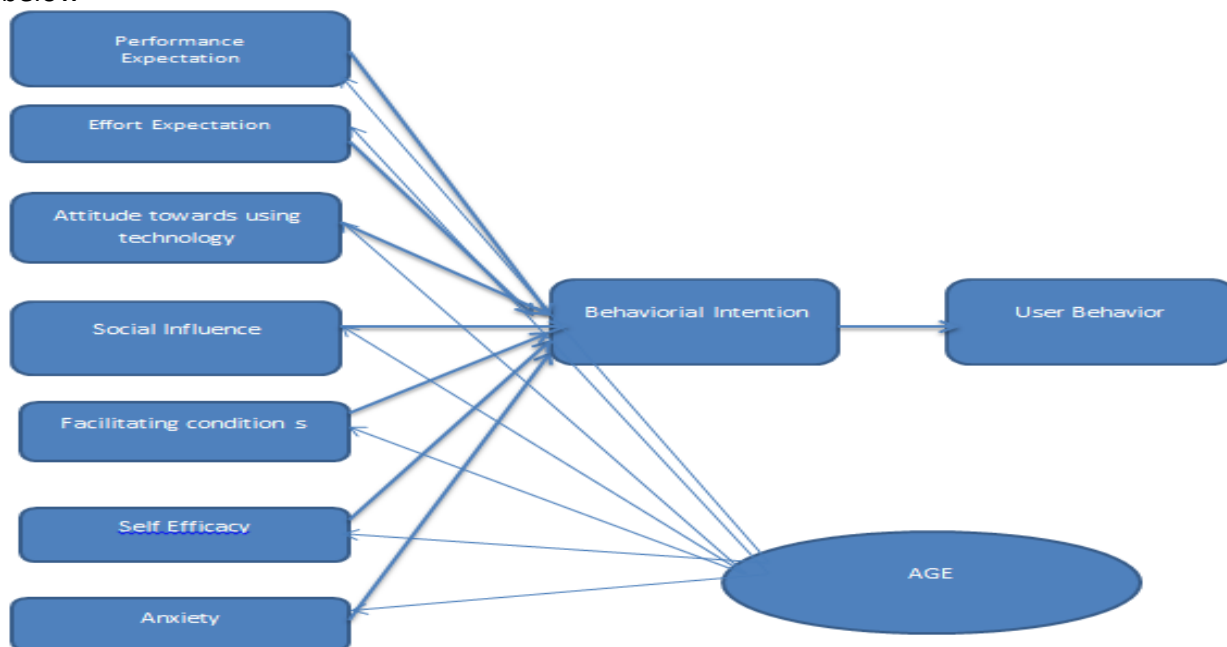

Figure 1: Conceptual framework for analysing the Medical ICT adoption and use

- **Performance Expectancy (PE)**: influence of personal conviction of improvement in job performance by a system
- **Effort expectancy (EF):** influence of perceived simplicity of use of a system.
- **Attitude toward using technology (AT):** influence of personal conviction of the necessity in using a particular system
- **Social influence (SI):** influence of other persons in the work place.
- **Facilitating conditions (FC):** measuring the impact of an individual's conviction of the availability of infrastructure and technical support to assist in the usage of a particular system.

71

- **Self-efficacy (SE)**: measuring the impact of individual's conviction of his or her ability to effectively and efficiently make use of a particular system to accomplish a particular job or task.
- **Anxiety (AX):** measuring the impact of individual's apprehensiveness or emotional reactions associated with the usage of a particular system.
- **Uncertainty avoidance (UA):**measuring the degree to which certain values are implemented in society (The GLOBE study of 62 societies, as stated by House et al, 2004)

Design of Instrument

We adapted the standard UTAUT questionnaire from Venkatesh, Morris, Davis, Davis (2003). Apart from rephrasing to align with the objectives of assessing medical ICT adoption in hospitals, no major changes (including data) were made to the user acceptance scale.

Thus, we measured all the construct items on a seven point likert scale, where 1 = completely disagree, 2 = moderately disagree, 3 = somewhat disagree, 4 = neutral (neither disagree nor agree), 5 = somewhat agree, 6 = moderately agree, and 7 = completely agree. The reliability of the instrument was rigorously tested through a pre-test in both Ghana after which wordings were refined according to the feedbacks. The final questionnaires were distributed to enable extensive assessment of all the four aspects of healthcare information system implemented as part of the basic Hospital ICT Policy Strategies in tertiary hospitals in Ghana (general electronic health records, radiology information system (RIS), picture archiving and communication system (pacs), laboratory information management system as follows:

79 General nurses

19 Hospital administrative staff

14 Radiology technicians

10 Laboratory technicians

In all, 122 healthcare workers were reached (a possible limitation acknowledged in this research). All of the respondents were selected from the Komfo Anokye Teaching Hospital which is a 1000 bed capacity teaching hospital with a daily outpatient services of 1000 located in Kumasi in the Ashanti region. Student volunteers from the Kumasi Polytechnic helped to collect the data. We strictly supervised each of these groups.

ANALYSIS OF DATA

Descriptive Statistics

We conducted three levels of analysis which entailed the analysis descriptive statistics, assessment of reliability and the assessment of correlation. We first determined the appropriateness of the data for factor analysis using the Bartlett's Test of Sphericity and Kaiser–Meyer-Olkin measure of sampling adequacy (KMO-MSA). The Bartlett's Test of Sphericity value recorded was significant while a KMO value of more than 0.60 was recorded. In separate processes, we examined the correlation among the constructs of uncertainty avoidance and also in the UTAUT model to check the factor loading scale using the VARIMAX rotation. With respect to the UTAUT model, the highest total variance of the item loading represented 75.55% without four of the items recorded in the construct hence were dropped from the analysis

leaving 31items with good discriminant and convergent properties. Additionally, all the subcomponent items of the same construct were found to have significant and high correlation and that showed consistency with the original construct by Venkatesh, Morris, Davis, Davis (2003) albeit their different context and sample size. This important observation confirms the general applicability of the UTAUT in different research settings as is being perused in the current research. A similar results of consistency was obtained with the items on uncertainty avoidance.

Reliability Test

Next we created a composited score by summing up all the scores for the set of questions under the UTAUT dimensions for each respondent and tested for reliability of the constructs (how well the items in the construct were measuring the same construct). The Cronbach's Alpha method and Inter-Item Correlation Matrix were used to and we obtained a high reliability coefficient or internal consistency over and above the 0.70 benchmark proposed by Venkatesh, Morris, Davis, Davis (2003). Appendix 1 shows the Cronbach's Alpha numbers for the composite values. A test of correlation revealed the self-determining relationship between variables. All the off-diagonal elements were close to zero signifying a strong independence of each construct. The inter-item correlation matrix is provided in table 1.1gives evidence to validate the fact that the constructs were reliable in relation to the UTAUT scales used

	SI& AT	PE	EE	SE	AX	BI
SI &AT	1.000	.272	.578	.130	.272	.413
PE	.272	1.000	.478	-.272	.508	.247
EE	.578	.478	1.000	-.059	.506	.331
SE	.130	-.272	-.059	1.000	-.280	.128
AX	.272	.508	.506	-.280	1.000	.290
BI	.413	.247	.331	.128	.290	1.000

Table 1.1 The inter-item correlation matrix

Correlation and Regression

We designed a univariate and multivariate linear regression model, examining the adjusted and unadjusted association between behavioural intention and each of adoption, use and culture. Composite scores for each of the seven factors (including uncertainty avoidance) were computed and used as independent variables while ease of adoption and use (behavioural intention) was used as the dependent variable in separate linear regression models. Our regression model also designated the dummy value "1" if the respondent was a female and "2" if he was a male respondent to examine any possible differences. Additionally we designated

"1" for respondents whose ages were below 36years and "2" for respondents whose ages were more than 35 years.

Results

Table 1.2 is a summary of the results of the univariate regression models that shows association between each of the dimensions of technology adoption and use and behavioural intention of actual use for both countries

Predictor Variables	Ghanaian Respondents			
	R^2	Beta	P	Significance Level
Performance Expectancy	0.429	0.151	0.0	P<0.001
Attitude toward using technology	0.542	0.135	0.0	P<0.001
Effort expectancy	0.612	0.112	0.0	P<0.001
Social influence	0.593	0.433	0.0	P<0.001
Facilitating conditions	0.482	0.472	0.0	P<0.001
Self-efficacy	0.518	0.151	0.0	P<0.001
Anxiety	0.672	0.212	0.0	P<0.001
Uncertainty avoidance	0481	0.096	0.6	P>0.001

Table 1.2 Summary of results of the univariate regression models

Each of the indicators showed significant relationship with adoption and use of medical ICT indicating that they are all important factors in determining technology adoption. The data shows that p-value of performance expectancy is 0.043, effort expectancy (0.035), self-efficacy (0.039), and anxiety (0.042), attitude toward using technology (0.04), social influence (0.01), facilitating conditions (0.00) and uncertainty avoidance (0.05). On the other hand the coefficients of linear equation, suggest that the strongest impact factor in medical ICT adoption among the Ghanaian sample is, facilitating conditions (β = .47), social influence (β = .43), Anxiety (β = .21), Performance Expectancy (β = .15), Self-efficacy (β = .15), Effort expectancy (β = .13), Attitude toward using technology (β = .11) and Uncertainty avoidance (1.09)

Impact of Gender and Age

Following the observed analysis we examined the possible impact of the gender and age on the each of the variables and found no correlation with gender however in terms of age we observed the following a significant relation as presented in table 1.3

	Age	
Predictor Variables	**Coefficients (SE)**	P-value
Performance Expectancy	-.060049	0.003
Effort expectancy	-.0366966	0.042
Attitude towards using technology	-.017051	0.037
Social influence	.034102	0.049
Facilitating conditions	.032093	0.030
Self-efficacy	-.092366	0.014
Anxiety	-.021714	0.053
Uncertainty avoidance	-.0041402	0.063

Table 1.3 results of the regression models on gender and attributes of technology adoption

The data shows that a change (increase) in age by one unit based on our earlier classification of ages of the respondents in table 1.0 reflects a negative and significant change in performance Expectancy (-.060049), Effort expectancy (-.036696), attitude towards using technology (-.017051) and self-efficacy (-.092366) however the negative impact change in age on anxiety and uncertainty avoidance were insignificant (high P Values at a significance level of 5%). However another significant finding is the fact that increase in age has a positive and significant change on facilitating conditions and social influence attributes.

Discussion and Implications

The findings of the research provides very important information that can help understand the differences in the medical ICT adoption among health professionals in Ghana despite Ghana's high uncertainty avoidance culture which is suitable for the adoption and use of technology. Our first research objective was to compare and contrast a hierarchy of constraints and stimulants to the adoption and use of Medical ICT in government hospitals in Ghana. The analysis suggest that the source of motivation for adoption and use of medical technology among Ghanaian healthcare workers in government hospitals were found to be firstly by facilitating conditions (individual's conviction of the availability of infrastructure and technical

support to assist in the usage of a particular system), social influence (influence of other persons in the work place), anxiety, performance expectancy, self-efficacy, effort expectancy and attitude toward using technology.   This view is consistent with existing work of Czaja, Hammond, Blascovich, Swede (1986) who argues on importance of cognitive orientation in information technology adoption.   The contrary is the case among Ghanaian healthcare workers analysed in this research. They derive their interest to adopt and use technology from external sources i.e. the presence of others and social condition which are in most cases non-existent. In the absence of such external pressure and support, there is a greater tendency to have delayed adoption. This problem may explain the reason why some hospitals will only switch on the computer information system when pressure is put on the user by the superior or when an important visitor is expected at the hospital.

In response to the second research objective as to whether cultural factors mediate these differences, the study found out that in both countries the role of culture played very little role in medical ICT adoption as opposed to the other factors which have been identified. On the contrary it was observed that intrinsic motivational factors (Performance Expectancy, Effort expectancy, Attitude towards using technology etc) are associated   strongly with younger healthcare workers (below 36 years) while extrinsic motivational factors are associated with higher age (more than 35). In other words, most of those who indicated that they are inspired by intrinsic factors were below the age of 36 while those above were those which were largely influenced by extrinsic motivation factors. 73% of the samples were more than 36 years and from that it could be argued that age has some effect on motivation to adopt and use technology significantly. The differences in the age profile in their responses reflect the trend or age range of category of health workers studied in the two hospitals. Ghana has an ageing healthcare workforce in terms of nurses, laboratory technicians etc. In the Komfo Anokye Teaching Hospital 62% of healthcare workers are nearing their 40s, this suggest possible challenges with effective adoption and use of medical technology As a measure to promote adoption and use of medical technology in Ghanaian hospitals, we propose the following:

a. There is an urgent need for the hospital to recruit more young people to support the healthcare delivery in an environment where technology contributes strongly to cost reduction, service quality (speed, reduced errors, free hospital space) and patient satisfaction

b. That hospitals in Ghana must build working teams or groups that entails young and old workers to stimulate adoption and use

c. Supervisions and morale support are not only essential but are functional imperatives in the attempt to promote the use of innovation in hospitals In Ghana

Limitations of Research

This research has limitations. Firstly, data was collected from only one teaching hospitals in Ghana hence generalisation may be limited. Secondly even though the UTAUT model is by far the most comprehensive measure of the innovation adoption, its weakness is discussed severally in the existing literature. There is still the need to look for more rigorous models to better understand how people adopt and use technology. Future research may increase the sample size to cover as many hospitals as possible. In the same regard large scale studies on the

factors which determine how and why hospitals as a whole adopt technology from the top management level of the organisation will be equally useful.

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77

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