Index Terms ICT, E-Health, UTAUT, Health Communication, Health Management, Medical Doctors

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Technology Acceptance By Medical Doctors In India: An Analysis With UTAUT Model

R. Jayaseelan, Prasanth Koothoor, C. Pichandy

Abstract: The present investigation attempts to unearth the adoption of Information and Communication Technology applying UTAUT model among medical doctors. In this endeavor, the researcher applied an appropriate technique and developed an instrument for the study with 41 statements structured in positive and negative aspects and data was collected from 590 respondents and 427 samples, which were complete in all respects alone, were included for the study. This study concludes that there is a significant relationship between the key variables (EE), (SI), (FC), moderating variables age, experience and the behavioral intention. Facilitating condition and voluntariness of use have a direct relationship between use behavior and performance expectancy and gender does not show any relationship between behavioral intention (bi) and use behavior (ub). Thus this investigation concludes that UTAUT model has relevance and applicability in understanding the adoption of information and communication technology in health sector.

Index Terms ICT, E-Health, UTAUT, Health Communication, Health Management, Medical Doctors, Medical Database.

1. INTRODUCTION

Information and Communication Technology is denoted as a 'key instrument' in health care delivery and public health internationally [1]; the health sector has always depended on technologies. According to the [2], technologies are the vertebrae of the medical sector in treating illnesses. Innovations in and the use of information technology has hastily amplified in all development contexts in healthcare. Constant improvement in information and communication technologies (ICT) - including the Internet, technical devices and powerful computer systems - have made a greater impact in increasing the use of these technologies in the practice of medicine and in the provision of medical care. This has led to new dimension towards technological implementation towards the field of medicine and has a great impact in society. Keeping pace with the developed countries, developing countries are also fast improving their e-health management. [3] Observed that information and communication technologies (ICT) are being widely used in healthcare management systems in Pakistan. Rapid progression in ICT in the last decade or so provides solutions to the problems in healthcare management systems. The medical doctors in the developing countries use the information and communication technology with a great potential to meet their professional needs [4]. Health care sector in India has witnessed a massive growth in the past few years both quality wise and as well as capability wise. Relatively the cost of health care is very low while compared to developed countries and the quality of treatment is at par with international standards and has placed India as a major place for medical treatment [5]. Corporate healthcare in India is growing fast and they are adopting the latest technology to provide best quality treatment to face the competition [6]. In support of such measures, agencies like the development gateway foundation provides web-based information sharing platforms for developing countries. It holds an on-line community for professionals working on e-governance initiatives. This study adopts the Unified Theory of Acceptance and Use of Technology (UTAUT) to the observable fact of medical doctors' adoption of information and communication technology. UTAUT incorporates eight theories of individual acceptance into one ample model intended to assist in understanding what factors either enable or hinder technology adoption and use. As such, it provides a useful lens through which to view what is presently happening in the healthcare industry regarding information and communication technology adoption. In this task, the present investigation explores the adoption of information and communication technology by medical doctors in their profession. It is precisely on this premise that the present study assumes importance and is being set to arrive at meaningful inferences and a conclusion.

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2 OBJECTIVE OF THE STUDY

The main objective of this study to identify the relationship on the adoption of information and communication technology based on UTAUT model core determinants (performance expectancy, effort expectancy, social influence and facilitating condition), moderators (age, gender, experience and voluntariness of use) and outcome variables (behavioral intention and use behavior) among Indian medical doctors in their profession.

3 REVIEW OF LITERATURE

UTAUT model draws upon and integrates eight previously developed models and/or theories that relate to technology acceptance and use [7]. Theoretical underpinnings include the Theory of Reasoned Action [8], Technology Acceptance Model [9], Motivational Model [10], Theory of Planned Behavior [11], and a combination of Technology Acceptance and Theory of Planned Behavior models [12], Model of PC Utilization [13], Innovation Diffusion Theory [14], and Social Cognitive Theory [15]. The core constructs asserted to impact behavioral intention to use technology are performance expectancy, effort expectancy, and social influence. Facilitating conditions are asserted to impact directly on use behavior.

3.1 Performance Expectancy

As enumerated [7] performance expectancy is construed as one's belief that adopting ICT in one's own profession may help in attaining enhanced job performance. Further explained,

performance expectancy has its roots from the perceived usefulness, extensive motivation, job fit, relative advantage and outcome expectation. This has been amplified by various studies [9][7][12] where it was found that performance expectancy is a chief factor in predicting the intention of adopting ICT in once own profession.

3.2 Effort Expectancy

The term effort expectancy can be elucidated as the "degree of ease associated with the use of the system" observed [7]. With perceived ease of use [9] [10], complexity and ease of use being its important components. Information and communication technology considered as a professional tool has become imperative to people from all walks of life. It makes the tasks of medical professionals simple and smooth. The degree to which a person considers it easy to use a specific system becomes the yardstick of its success. In the case of physicians, operation of computers, internet, mobile phones including the structures of computer software and hardware and their application to healthcare [16] is important. Medical professionals should acquaint themselves with healthcare information systems [17] including enormous event reporting systems [18], which are likely to make their tasks effortless.

3.3 Social Influence

Social influence, in the words of venkatesh [7] is "the degree to which an individual perceives how important it is that others feel or believe he or she should use the new system"; the influence which a person has over the others, whom he considers important, concerning the use of a particular system, is also inclusive. The notion that ICT can be used only for the purpose of trade is deceitful in the contemporary world. As indicated [12] [19], Information and communication technology can be and is used for healthcare by medical experts, pharmacists, nurses, medical doctors, hospital administration and also by patients.

3.4 Facilitating Conditions

Technology and healthcare are inseparable. Development of healthcare is based on the technological development. Facilitating conditions are the variables supposed to have a direct impact on system usage. They are defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system" [7] [31].

3.5 Behavioural Intention and Use Behavior

Behavioural intention is asserted to have a direct impact upon individuals' actual use of a given technology. Behaviour intention (BI) is a major determinant of usage behavior; behavior can be predicted by measuring BI. Behavioural Intention was proposed by Venkatesh [7] in their development of the UTAUT model. Use behavior is adopted from TRA (Theory of Reasoned Action). In developing TAM, [9] surmised the generality of TRA to explain a wide array of human behaviors. They suggest that use behavior "should therefore be appropriate for studying the determinants of computer usage behavior as a special case". Use behavior is adopted from TRA (Theory of Reasoned Action). In developing TAM [9] surmised the generality of TRA to explain a wide array of human behaviors. They suggest that use behavior "should therefore be appropriate for studying the determinants of computer usage behavior as a special case". Drawing on the UTAUT model, this research composes a new hybrid theoretical framework to identify the factors on the adoption of information and communication technology in the context of medical doctors. UTAUT is formulated with four core determinants of intentions and usage: performance expectancy, effort expectancy, social influence and facilitating conditions, together with four moderators of key relationships: gender, age, experience and voluntariness of use as in the model which are experimented in the study. RQ: Is there any relationship between adoption of information and communication technology based on UTAUT core determinant (performance expectancy, effort expectancy, social influence and facilitating conditions), moderators (gender, age, experience, voluntariness of usage) and outcome variables like behavioral intention and use behavior.

4 METHODOLOGY

The researcher applied an appropriate technique with the help of past literature reviews and expert opinions and developed an instrument for the study with 41 statements structured in positive and negative aspects. The researcher obtained responses from 100 respondents whose scores were subjected to a reliability cronbach's alpha test. The correlations obtained were corrected using the reliability cronbach's alpha prophecy formula. The high reliability value for the scale r=0.885 has been an indication of the care taken in formulating the items of the scale and the rapport established by the researcher with the respondents as well as the reliability of the instrument used for the study. At the next stage, the questionnaire was distributed in all the chosen cities having around 590 sample respondents from the chosen sectors (Government Hospitals, Private Hospitals and Own Clinic). The researcher administrated the questionnaire and data was collected from the respondents and 427 samples, which were complete in all respects alone, were included for the study.

5 RESULTS OF THE STUDY

Table 1 *: Standardized Beta weights for UTAUT key variables Performance expectancy (PE), Effort expectancy (EE), Social Influence (SI), Facilitating condition (FC) and moderating variables (gender, age, experience, voluntariness of use) towards Behavioral intention and Use behavior*

UTAUT Key variables	Behavioral intention	Use behavior
Performance expectancy (PE)	-.005	.034
Effort expectancy (EE)	.228***	.002
Social Influence (SI)	.782***	.005
Facilitating condition (FC)	-.489***	-.186**
UTAUT moderating variables		
Gender	-.055	.062
Age	-.196**	.091
Experience	.247***	-.100
Voluntariness of use	-.030	-.142**
Multiple R	.689	.264
Adjusted R2	.465**	.052*
*p < .05, **p < .01, ***p < .001		

The table 1 of regression equation entered the same UTAUT key variables Performance expectancy (PE), Effort expectancy (EE), Social Influence (SI), Facilitating condition (FC) and the moderating variables (gender, age, experience, voluntariness of use) to estimate their effect on Behavioral intention (BI) and

Use behavior (UB). These results (Table 4.28) showed that UTAUT key variables accounted for 47.5% of the variance in behavioral intention ($F(8, 418) = 47.3$, $p < .001$) and 7% of the variance in use behavior ($F(8, 418) = 3.9$, $p < .001$), The beta weights confirmed a significant relationship between key variables Effort expectancy (EE), Social Influence (SI), Facilitating condition (FC), moderating variables age, experience and behavioral intention. In the case of use behavior, beta weights confirmed a significant relationship between key variable Facilitating conditions (FC) and moderating variable voluntariness of use. According to UTAUT the key variables are, (PE), (EE), (SI), (FC) and moderating variables (gender, age, experience, voluntariness of use). It can be concluded that there is a significant relationship between the key variables (EE), (SI), (FC), moderating variables age, experience and the behavioral intention. Facilitating condition and voluntariness of use have a direct relationship between use behavior. UTAUT was tested using the original data and the results are predicted as the performance expectancy and gender does not show any relationship between behavioral intention (BI) and use behavior (UB). In terms of gender there is no relationship between any of the core determinants (PE, EE, SI, FC) or behavioral intention and use behavior, whereas experience and age have a direct relationship with behavioural intention while voluntariness of use has direct relationship with use behavior.

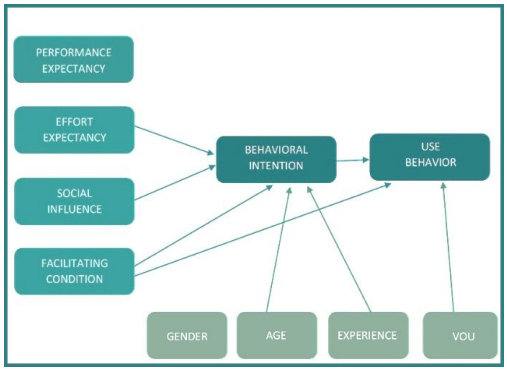

***Fig.1**. UTAUT Model Applied for Indian Medical Context*

6 DISCUSSION

As detailed in UTAUT model [7] the four core determinants that are: performance expectancy (PE), effort expectancy (EE), social influence (SI) and facilitating condition (FC) chiefly induce the adoption of ICT in the field of healthcare. The results of this study indicate a hopeful trajectory in the relationship between adoption of ICT and demographic variables of the medical professionals. In the present study, it is conclusively established that the experienced medical doctors have a greater inclination towards the adoption of ICT resulting in their recurrent use of it. This is in sync with the notions of the earlier studies [20] [21] [22] [23] [24] [25] [26] [27] [28]. Further, the study also establishes that, in spite of demographic differences, the adoption of ICT has been greatly accelerated by the three core determinants (EE, SI and FC) expect (PE) of the medical doctors. Further, the study explores the relationship among four core determinants, VOU, behavioral intention and use behavior in which voluntariness of usage has a positive relationship with (performance expectancy (PE), effort expectancy (EE), social influence (SI), facilitating condition (FC)and behavioral intention (BI) and negatively correlated with, use behavior (UB). This implies that adoption of information and communication technology by medical doctors is positive based on voluntariness of use towards performance expectancy, effort expectancy, social influence and behavioral intention, whereas if we see the relationship between voluntariness and use behavior it is negatively correlated and this notion was earlier supported by [29] [30] [32]. ICT is an inevitable tool in all fields of work, globally. As doctors are life savers, they need to get themselves updated about everything required for their profession, especially with regards to technology which helps them stay at par with their peers worldwide and also to render seamless, timely treatment to their patients. The current study extrapolates the relationship among the four core determinants (performance expectancy, effort expectancy, social influence and facilitating condition) and moderators (age, gender, education, occupation experience and voluntariness of use) with behavioral intention and use behavior.

7 RECOMMENDATIONS

India is a vast country with a population of more than one billion people in an area of three million square kilometers. The country has 29 states and 07 union territories governed by the federal system. The national government does not have a national health insurance policy. Each state has the primary responsibility for public health care delivery, which is commonly organized in a three-tier system. There exists a significant disparity in quality and access to health care services between urban and rural regions. At the same time, with regard to information and communication technology, India is now self-sufficient in meeting the needs of hardware, software, connectivity and services. Thus e-health has the potential to bridge this gap if the tool is integrated into existing e-health care delivery systems. Both public and private health sectors have actively pursued the development and adoption of e-health in India.

Some of the requirements of the eHealth information infrastructure include:

1. An environment for information exchange that is trusted, interoperable, mobile, high-speed, low-power consuming, easily accessible.
2. One single medical record for each patient, accessible on a national wide.
3. A comprehensive national eHealth portal and health data network.
4. A credible certification system for eHealth professionals and multilingual translation platform.

ICT infrastructure should be standardized across India. But the content, messaging and governance be vary by state and district to reflect the different cultures, languages and needs of the diverse peoples of India.

8 CONCLUSION

A significant outcome of the research is the influence of major variables enumerated in the Unified Theory of Acceptance and Use of Technology (UTAUT) model referred in the adoption of information and communication technology by medical doctors in the field of medicine. This study reveals insights into the salient factors for physicians' adoption of information and communication technology. According to UTAUT the key variables are (PE), (EE), (SI), (FC) and moderating variables

(gender, age, experience, voluntariness of use). It can be concluded that there is a significant relationship between the key variables (EE), (SI), (FC), moderating variables age, experience and the behavioral intention. Facilitating condition and voluntariness of use have a direct relationship between use behavior and performance expectancy and gender does not show any relationship between behavioral intention (BI) and use behavior (UB). Thus this investigation concludes that UTAUT model has relevance and applicability in understanding the adoption of information and communication technology in health sector.

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