



Adoption of Health Information Technology by Private Medical Practitioners in India

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ABSTRACT

Though healthcare information technology is being used in large medical institutions, the rate of adoption of health information technology among independent practitioners is low. Hence the key objective of this research is to understand technology adoption models and study the factors that influence clinicians to adopt health information technology and to design a model to predict health information technology adoption behavior of clinicians who run private clinics, in Chennai, Tamilnadu. This research paper adopts analytic-deductive method to review existing literatures on "Implementation and Adoption of Electronic Health Records in Primary Health Centers / Private Medical Practitioners" and "Value addition through healthcare IT systems as the source of information and simple conceptual method to design a model. The study was based on primary and secondary data. The Secondary data was collected from Books, Journals, Magazines, Newspapers and the Internet. After identifying enough models from the literature, discussions were held with experts which includes experienced private medical practitioners in Chennai and research methodology to improve the model using additional variables. Objective of creating a relationship model based on theoretical review of existing model of technology adoption and the experts from research methodology and independent medical practitioner has resulted in evolution of a new theoretical model. Researcher feels that proposed model can be used by other researchers interested in exploring adoption of technology by private medical practitioners and organizations with suitable modifications.

Keywords: Healthcare Information Technology, Technology Adoption, Electronic Health Records, Primary Health Centers, Healthcare IT Systems, Value Addition, Private Medical Practitioners.

INTRODUCTION

India has universal health care system run by the constituent states and territories of India. The Constitution charges every state with the standard of living of its people and the improvement of public health as among its primary duties. The National Health Policy was endorsed by the Parliament of India in 1983 and updated in 2002.¹

Before Independence, the private health sector accounted for very low per cent of total patient care. The private health care system in India has grown vastly over the years and is well established and flourishing. With the help of numerous government subsidies in the 1980s the private health providers entered the market to cater to the upper and middle class which was disillusioned with the public health sector and sort to exit it wherever possible. Also opening up of the market in the 90s further gave impetus to the development of the private health sector in India.² According to National Family Health Survey-3, the private medical sector remains the primary source of health care for the majority of households in both urban areas (70 percent) and rural areas (63 percent).³

Private hospitals and clinics are modern and well equipped, and the doctors are highly qualified and often trained abroad. They offer an excellent care that is at the same level the care provided is being provided in

developed countries. Hence NRIs and local residents prefer to use the services of private hospitals and clinics.

Most of the primary health care services are being provided by Private Medical Practitioners (both General Practitioners and specialists) as they are the first point of contact in Indian health care system to people living in their communities – outside of hospitals. The Private Medical Practitioners provide accessible, affordable and available primary health care to people, in accordance with the Alma Ata Declaration of 1978 by the member nations of the World Health Organization WHO.⁴ In India, Private Medical Practitioners form a basic part of the health care system. In Tamilnadu, as in most other States, the private sector is the major provider of primary health care, both in rural and urban areas. Private Medical Practitioners in Tamilnadu offer following services:

- Outpatient services
- Minor surgeries
- Vaccinations
- Special clinics (such as antenatal clinics, under-5 clinics and ophthalmic clinics)

In Tamilnadu, Private Medical Practitioners in Community capture patient's demographic details, diagnosis, prescription and vaccination details using paper records because of the following key reasons



- Simplicity to use
- Low implementation cost
- Widespread acceptance

Such data collection is being performed with simple paper forms at the clinic level, tends to be difficult and time-consuming and may provide little or no feedback to the staff collecting data. Hamish stated that "Individual patient data that are collected and accessible at the point of care can support clinical management. Clinicians can easily access previous records, and simple tools can be incorporated to warn of potential problems such as incompatible drugs. Physicians or nurses can check on the outcomes of individuals or groups of patients and perform research studies. Many of these functions will work well on paper or with simple spreadsheets for up to 100 patients but become very time-consuming and potentially unreliable with more than 1000 records, and virtually impossible with 10,000 or more".⁵

There are also other considerable disadvantages in maintaining and using paper records. The key noteworthy ones are specified below:

- Availability to only one service care provider at a time
- Illegible Handwriting
- Inability to access paper records remotely
- Size of records are growing so thick as to be unwieldy
- Multiple volume of records have to be stored at multiple storage sites

The most serious problem with paper records is that they hinder provision of clinical decision support; data stored in inaccessible formats cannot incorporate or trigger decision support tools.⁷

It is clearly evident that Electronic medical records will enable clinicians to ensure that information is captured and best practices are being standardized and to improve the quality of the care. The 2001 publication "Crossing the Quality Chasm: A New Health System for the 21st Century" noted that computer systems lead to an improvement in patient outcomes⁴. Cited reasons for the use of EMRs include improved quality of care^{5,6} documentation, and workflow⁶. EMRs have been found to improve clinician implementation of clinical guidelines⁷⁻⁹. Bordowitz found EMR automatic BMI calculations to improve documentation and treatment of adult obese patients.⁷ EMRs also have been used to educate providers regarding their own performance, to guide pediatric care and to facilitate quality improvement efforts^{5,10}.

The use of IT systems adds value and efficiency in capturing, identifying, preventing and providing health care services in developed countries like UK and US and to ensure that improvements may be more sustainable and more widely disseminated.

The use of healthcare IT systems enables healthcare service providers to offer quality care to the patients at the right time. Developed countries like Australia and England have taken efforts to ensure that the below specified benefits are realized by various stakeholders by adopting healthcare information technologies:

Benefits to Clinicians

- Important patient information is available to authorised healthcare staff treating patients in an emergency where they had previously not had access to it. This will be particularly useful to staff treating patients in an emergency, when a patient is away from their local area.
- Enables clinicians to feel more confident to treat patients

Benefits to Patients

- Transfer of patient information (for example- history of allergy) is quick, thereby resulting in prompt treatment.
- Supports better, safer prescribing of medication for patients by providing up to date information on a patient's allergies, previous adverse reactions and medications.
- Patient care can be supported by healthcare staff having faster access to their medical information and patients may not be required to repeat information to different staff treating them.
- Useful when a patient cannot give information (for example if they are unconscious) or when they are away from home and are unable to see their own general practitioners.

Benefits to Service Providers

- Enables to ensure that right and required services are being procured
- Enables to improve the quality of the care provided

Unfortunately it takes longer time to acknowledge and use electronic medical records in India to capture data during the time of interaction with patients while providing services. One of the main reason for is that private medical practitioners are not ready to adopt healthcare information technology because of the following reasons:

- Healthcare information technology (HIT) will take more time to capture data during the time of interaction with patients while providing services
- Indian private clinicians assumes that HIT might not allow them to offer effective care to patients in as they have to do more administrative work
- They are always under pressure to see more number of patients



- Clinicians don't believe that access to patient's historical data electronically will help them to make informed decisions to improve quality of care

More than 40% of information technology (IT) developments in various sectors including the health sector have failed or been abandoned.¹¹⁻¹⁵ One of the major factors leading to the failure is the inadequate understanding of the sociotechnical aspects of IT, particularly the understanding of how people and organizations adopt information technology.¹⁶⁻¹⁸

Study Objectives

The Key objective of this research is to

- Understand the models and study the factors that influence clinicians to adopt health information technology
- Design a model to predict health information technology adoption behaviour of clinicians who run private clinics, in Chennai, Tamilnadu

Scope of the Study

The study will be confined to understand the various technology adoption models and to evolve a model which will enable to envisage clinician behaviour in adopting health information technology.

Review of Literature

Information technology has become pervasive in the healthcare industry. While the use of IT in healthcare has increased tremendously, key players, particularly clinicians still have not fully embraced clinical information management system in their clinical practices. To understand this issue various researchers across the world studied physicians' intention toward the adoption of healthcare technology and proposed various models to examine physicians' intention towards the adoption of clinical information system.

The models originated from different theoretical disciplines such as psychology, sociology and information systems. These are the Theory of Reasoned Action (TRA),

the Technology Acceptance Model (TAM), the Motivation Model (MM), the Theory of Planned Behavior (TPB), the Combined TAM and TPB (c-TAM-TPB), the Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT) and Social Cognitive Theory (SCT).¹² These theories are concerned with information technology acceptance such as the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), Extended Technology Acceptance Model (TAM2), Diffusion of Innovation (DOI) and the last technology acceptance model "The Unified Theory of Acceptance and Use of Technology (UTAUT)"

Only very few research was done in the area of "Adopting of Clinical Information Systems by private medical Practitioners". However identified a paper titled "Understanding Information Technology Acceptance by Individual Professionals: Toward an Integrative View" by Mun Y Yi, Joyce D Jackson, Jae S Park, Janice C Probst.¹⁹ Hardly any research has been done with Private Medical Practitioners in India. Researchers have studied 220 individual physicians in US region to study technology adoptive behavior. Researcher used constructs from TAM, TPB and IDT. They have found that personal innovativeness in the domain of IT (PIIT) has a significant effect on perceived ease of use, result demonstrability, subject norm and perceived behavior control. PIIT did not have significant effect on Image and thereby it is a major determinant of user acceptance of technology. Researcher has developed a model to understand the acceptance of Personal Digital Assistant (PDA) by individual professionals.¹⁹ However the study is focused on use of clinical information systems by private medical practitioners. Hence our research assumes the importance of studying the maiden area which is apparently unexplored.

Based on literature review and discussion with private medical practitioners and research methodology experts, we found and decided to take most relevant variables and constructs specified in some of the established models. The identified variables and constructs are listed in the below table.

Variables Considered	Model Name	Related variable in other models	Paper and Author
Effort Expectancy	UTAUT	Perceived ease of use in TAM	Venkatesh
Performance Expectancy	UTAUT	Perceived Usefulness in TAM, TAM2, C-TAM-TPB	Venkatesh
Intention to Use	TAM2	Behavior Intention to Use in TAM, Behavior Intention in UTAUT	Venkatesh
Facilitating conditions	UTAUT	Perceived Behavioral Control in TPB, C-TAM-TPB	Venkatesh
Social Influence	UTAUT	Subjective norm in TAM2	Venkatesh
System Quality	DeLone & McLean IS Success Model		William H. DeLone, Ephraim R. McLean
Personal Innovation	Diffusion of Innovation		Everett M. Rogers



Available literature on adoption of PDA by individual practitioners in US also confirms the use of variables including PIIT.

Research Methodology

This research paper adopts analytic-deductive method to review existing literatures on "Implementation and Adoption of Electronic Health Records in Primary Health Centers" and "Value addition through healthcare IT systems as the source of information and simple conceptual method to design a model. The study was based on primary and secondary data. The Secondary data was collected from Books, Journals, Magazines, Newspapers and the Internet. After identifying enough models from the literature, discussions were held with experts which includes experienced private medical practitioners in Chennai and research methodology to improve the model using additional variables.

Discussion on Factors considered

Numerous conceptual and empirical studies have been done to study the Factors influencing health information

technology adoption by applying various technology adoption model and related theoretical paradigms (e.g. Bailey & Pearson, 1983; Ives, Olson, and Baroudi, 1983; Doll & Torkzadeh, 1988; Najdawi, Otto, & Caron, 2000; Muylle, Moenaert, & Despontin, 2004). However, UTAUT model developed by Doll & Torkzadeh (1988) is being used mainly in the healthcare industry to identify the determinants of intention of usage of IT. Although information technology is becoming a vital to individual healthcare professionals, it is still unclear what factors contribute to its acceptance by them. Building upon and integrating the key findings of closely related theoretical paradigms (Technology acceptance model, UTAUT, and innovation diffusion theory), we constructed a more complete, coherent, and unified model in the context of healthcare information systems acceptance by individual private medical practitioners using the variables and constructs specified in the following table:

The below table shows the factors influencing clinical information systems and operating definitions of construct items.

Variables	Models	Type	Definition	Reference
System Quality	DeLone and McLean's	Construct	System Quality mandate the standards in HIT and electronic health record (EHR) systems development and implementation	
Usability	N/A	Local Variable	Extent to which the system is perceived to be user friendly. This includes ease of navigation, training issue, feels of being in control, and learnability	Dias,2001, Sugianto & Tojib, 2006
Reliability	N/A	Local Variable	The ability to measure consistently; that is, repeated measurements would give the same result	
Data Confidentiality	N/A	Local Variable	Ability of the system to provide a sense of assurance that any personal information retrieved or submitted from and through the portal will not be misused by authorised people	Yang, 2005, Sugianto & Tojib,2006
Effort Expectancy	UTAUT	Intervening Variable	defined as the degree of ease associated with the use of the system	Boonchai Kijsanayotin Supasit Pannarunothai Stuart M Speedie, 2009; Nisakorn Pichitchaisopa, Thanakorn Naenna, 2013; Venkatesh
Personal Innovation	DOI	Intervening Variable	The willingness of an individual to try out any new information technology	Agarwal
Technology Familiarity	N/A	Local Variable	assess how healthcare personnel are familiar with technology applications that can be useful	
IT Knowledge		Independent Variable	assess how healthcare personnel have good IT knowledge	
Social Influence	UTAUT	Independent Variable	Social influence occurs when one's emotions, opinions, or behaviors are affected by others	qualities-of-a-leader.com, 2011
Industry and IT Awareness	N/A	Local Variable	assess how healthcare personnel are familiar with current happenings in healthcare Industry	
Peformance Expectancy	UTAUT	Intervening Variable	defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance	Boonchai Kijsanayotin Supasit Pannarunothai Stuart M Speedie, 2009; Nisakorn Pichitchaisopa, Thanakorn Naenna, 2013; Venkatesh
Facilitating Conditions	UTAUT	Construct	defined as the degree to which individual believes that an organisational and technical	Boonchai Kijsanayotin



			structure exists to support the use of the system	Supasit Pannarunothai Stuart M Speedie, 2009; Nisakorn Phichitchaisopa, Thanakorn Naenna, 2013; Venkatesh
Training	N/A	Local Variable	Assess level of training required to adopt healthcare technology	
IT Support	N/A	Local Variable	Assess level of support required to adopt healthcare technology	
Gender	UTAUT	Independent Variable	Measures gender details	Boonchai Kijsanayotin Supasit Pannarunothai Stuart M Speedie, 2009; Nisakorn Phichitchaisopa, Thanakorn Naenna, 2013; Venkatesh
Age	UTAUT	Independent Variable	Captures age details	Boonchai Kijsanayotin Supasit Pannarunothai Stuart M Speedie, 2009; Nisakorn Phichitchaisopa, Thanakorn Naenna, 2013; Venkatesh
Experience	UTAUT	Independent Variable	Measures experience details	Boonchai Kijsanayotin Supasit Pannarunothai Stuart M Speedie, 2009; Nisakorn Phichitchaisopa, Thanakorn Naenna, 2013; Venkatesh
Intention to Use	UTAUT, TAM	Dependent Variable	refers to the individual's decision to perform a specific behavior in the future	Boonchai Kijsanayotin Supasit Pannarunothai Stuart M Speedie, 2009; Nisakorn Phichitchaisopa, Thanakorn Naenna, 2013; Venkatesh; (Chatzoglou)

These variables also were selected based on prior literature available from the field of IT adoption studies in organizations.

Based on perceived relationship between variables and constructs towards the precursor to the adoption of technology by private medical practitioners namely intention to use the following theoretical model of relationship has been constructed.

CONCLUSION

Objective of creating a relationship model based on theoretical review of existing model of technology adoption and the experts from research methodology and independent medical practitioner has resulted in evolution of a new theoretical model.

Further Direction

Researcher intends to use the proposed model and design research instrument to test the model empirically with independent medical practitioners in Tamilnadu, India. Researcher feels that proposed model can be used by other researchers interested in exploring adoption of technology by private medical practitioners and organisations with suitable modifications.

Proposed Model

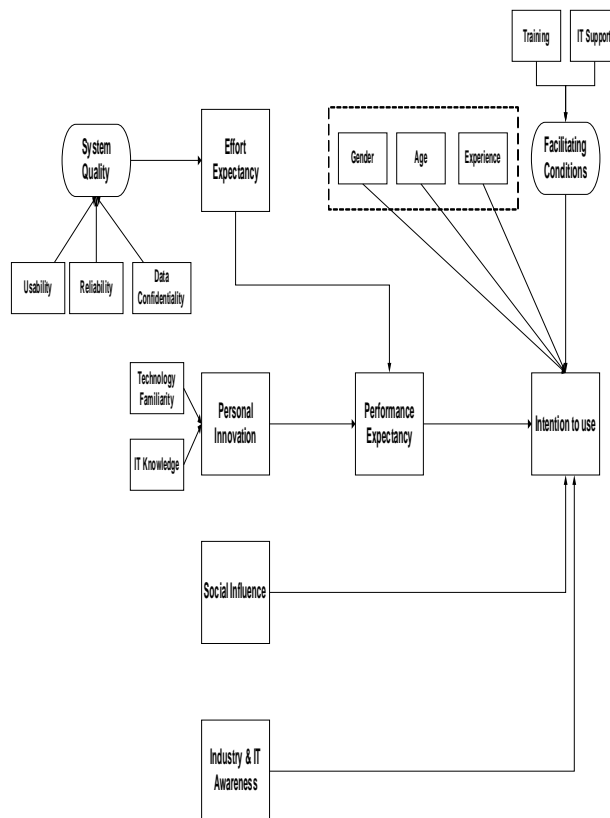


Figure 1: Health information Technology Adoption Model

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