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Adoption of Information Communication Technology Tools Among Medical Doctors

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ABSTRACT

Information and Communication Technology (ICT) proves to be a touchstone and becomes a part of a developing and also a developed country. This research explores the accessibility and the extent of Information Communication Technology usage by health professionals. Data was collected using a sample size of 427 medical doctors in different public and private hospitals, placing a particular focus on the Indian state of Tamil Nadu, by means of a structured questionnaire. The finding of the study reveals that ICTs were commonly available and are used by the health professionals. A comparative analysis designates that there was superior availability and use of computers, internet and mobile phones by medical doctors in private hospitals than those in government hospitals and individual clinic. Interestingly, the level of awareness is higher among users on the numerous benefits of ICTs on their job and productivity. Therefore, it is concluded that there is a significant usage of ICT tools among the medical professionals.

Key Words: Internet, New media, Medical professionals, Online medical database, Online medical journals

1. Introduction

Information and communication technologies are fast, interactive and user-friendly. They support rapid communication and are one of the biggest knowledge libraries among the users and its need may differ according to the people who use them accordingly. Claudia Parlanti (2009) determines Information and Communication Technology (ICT) as a term used to indicate a broad subject connected with technology and other aspects of managing and processing the information. Now a day, it has become an essential and inseparable part of everyone's life and its usage is increasing day by day. It is expected that this will develop even more in future, becoming an indispensable part of people's work, social and personal lives. The word ICT denotes hardware, software, personal computers, laptops, tablets, communication devices like telephones and mobile phones, internet modems and internet data cardsand so on. It also includes the communication technologies through which people seek and access information including internet, email and video conferencing.

1.1 ICT in the field of Medicine

It denoted as a 'key instrument' in healthcare delivery and public health internationally (Drury 2005).The health sector has always relied on technologies. According to the World Health Organization (2004), technologies are the backbone of the services to prevent, diagnose and treat illness and disease. ICTs are only one category of the vast array of technologies that may be of use. Given the right policies, organization, resources and institutions, ICTs can be powerful tools in the hands of those working to improve health.

In the current circumstance information technology is started penetrating more into the medical domain, researchers Priti Kalode, Onkar S. Kemkar, P. R. Gundalwar (2014) remark that healthcare sector has become an important part of our society and it represents a considerable economic and financially attractive area for informatics research and ICT industry.

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Everyone will have some sort of relationship with the health care sector; some are closer than others and it has become difficult for people to imagine that someone has never been inside a physician's practice or a pharmacy Reinhold Haux (2002). As patients, many people will have gathered personal experiences with the institutions of the respective health care system and due to the development of health information technology many are largely benefited and the entire world has become a small village with regard to ICT and health care.

1.2 Use of ICT among the medical professionals

According to Wole Michael Olatokun and Olufunke Christey Adeboyejo (2009), Health workers play important roles in a nation's socio-economic growth. ICTs are vital tools that help them to access and use relevant information which are needed for their profession. ICT usage can be highly effective whenit satisfies the needs of health professionals.

It is a well-known fact that physicians play a very significant role in the field of medicine. Their role in adoption of information technology and its tools are very important. Ammenwerth, Buchauer and Bludau (2000) explain theseinformation communication technology tools' adoptions have numerous advantages like improving the clinical and administrative performance within a hospital to promote quality and safe care. The benefits of computers and laptops to medical care are widely accepted; however, physicians have started adopting and utilizing new media tools as a part of their practices.

Gbolahan Olasina and Tobi Popoola (2014) explain that use of information technology supports in information processing, decision making and records keeping in the health sector and level of adoption various according to health professionals, especially the doctors.

Fiona Chew, William Grant and Rohit Tote (2004) denote that information technology has enabled health professionals to obtain and share increased amounts of health care information and to track and monitor diseases. In addition to this, the internet has allowed physicians all over the world to collaborate, communicate, and interact with each other. Increasingly, physicians use online databases to search for the latest information on clinical protocols in different medical specialties, for patient management, to consult with specialists and seek continuing medical education.

Communication technologies increase the ability of healthcare providers to improve patient care, reduce cost, streamline processes, and comply with government rules and regulation by providing access to real-time data at the point-of-care (Kalorama, 2009). In short, communications technology assists the healthcare providers by enabling physicians and nurses to expedite access to high-risk patients' information anytime, anywhere, to save their lives. Therefore, the patients may give more attention to their health as well as foster closer relationship with the caregivers (Chao et al., 2007).

1.3 The importance of the present investigation

Information and communications technologies (ICTs) are playing a critical role in the improvement of health care sector in the developing countries Okpalla, Chidimma (2015) by providing new and more efficient ways of accessing, communicating, and storing information, ICTs are being a bridge between health professionals and the communities. They serve the producers of health research and the practitioners who need it. Through the development of databases and other applications, ICTs also provide the capacity to improve health system efficiencies and prevent medical errors.

The usage of ICT differs between the developed and developing countries. While developed countries have invested heavily in the ICT integration and made it easy and possible for the medical professionals to have access to the latest updates while in the developing countries, they are lacking behind when compared to the developed countries due to economic, social and infrastructural limitations. The information technology knowledge and computer skills among medical doctors are higher in developed countries while comparing with developing countries (Kommalage and Gunawardena, 2008).

Though, India is a developing country, but adoption of ICT is very high comparing with other developing countries. Pichandy, Natchimuthu (2014) states that India's ICT revolution began in the late 1980's when Prime Minister Rajiv Gandhi and Pitroda implemented the New Telecommunication Policy (NTP) with a missionary zeal, diffusing it to the grass roots level. This made telecommunication facility within the reach and access of the common people of India. It is no wonder that India is now a leading ICT global resource base. The present investigation throws a light on the usage of information communication technology in the field of medicine by medical doctors to enhance their profession.

1.4 Theoretical background

ICT uses by doctors offer an opportunity to improve the coordination and quality of care. Information Communication Technologies allow doctors access to calling capability, access to e-mail and the internet for

research and communication, access to word processors and presentation documents, electronic prescription and access to patient records. In order for these opportunities to be realized, doctors must first choose to adopt and use information communication technology as such; studies have used theoretical constructs from the technology acceptance model (TAM) and the innovation diffusion theory (IDT).

Technology Acceptance Model (TAM) has been used by the researchers for the study, as it is most widely researched theoretical model used to explain adoption of new systems and other information technologies. TAM, based on the theory of Reasoned Action (Fishbein and Ajzen, 1980), is a simple model of IT adoption that claims that the overall IT acceptance or utilization is based on users' beliefs like (a) system's perceived usefulness (PU) and (b) systems' perceived ease-of-use (PEOU), which are the major impact factors for their (c) attitude towards use (ATT) and also (d) behavioral intentions to use (BI).

Diffusion of innovation has been widely applied in disciplines such as education, sociology, communication, agriculture, marketing, and information technology, etc. (Rogers, 1995; Karahanna, et al., 1999; Agarwal, Sambamurthy & Stair, 2000). An innovation is "an idea, practice, or object that is perceived as new by an individual or another unit of adoption" (Rogers, 1995). Diffusion, on the other hand, is "the process by which an innovation is communicated through certain channels over time among the members of a social system" (Rogers, 1995). Therefore, the IDT theory argues that "potential users make decisions to adopt or reject an innovation based on beliefs that they form about the innovation" (Agarwal, 2000).

The investigators try to attempt to use the most widely applied theoretical model in the Information Systems field, the Technology Acceptance Model (TAM) innovation diffusion theory (IDT). The study aims at evaluating the attitude of medical doctors towards the use of technology in the field of medicine to enhance their knowledge and for an easy work culture.

2. Objective of the Study

- To identify the usage of computer for maintaining database and using software among medical doctors.
- To identify the usage of internet for accessing e-mails and website among medical doctors.
- To identify the usage of mobile phone for accessing mobile application and short message service (SMS) among medical doctors.

3. Review of Literature

The entire universe started to adopt E-Health environment in a smooth way. In fact, there is a smooth transition to the new technological atmosphere, particularly towards the medical professionals. Information Communication Technology is becoming an essential part of health department, just as they are a part of all other aspects of life. In the early periods adoption of information communication technology was intermittent. But today in this techno world, particularly in developing countries, the adoption is little bit higher while comparing with others.

Hiroshi Takeda et al (2003): health care has always tried to make use of the capabilities of emerging technologies so as to improve the quality of treatment. Hospital computer information system, intranet and other information communication technologies (ICT) increasingly robust communication in the health care environment. In the early days, ICT contributed mainly to the timely and efficient communication of care data. Now its attention is turning to improve quality and efficiency in health care by using on-line clinical data acquisition and processing.

If we notice the reality of information, processing in health care environment for past several years, we can identify that there has been a great change over from paper-based processing and storage to computer based processing and storage R. Haux, E. Ammenwerth et al (2002). This helps the doctor to trace the history of the patient very easily even though the patient visited the hospital long back.

ICT literacy consists of the experience and ability to operate internet, mobile, computers, including knowing the structures of computer software and hardware, having the skills to operate computer software, and applying computer usage to social issues (Li, 2008).

3.1 Computer/ Database Usage

The amount of information processing in hospitals, especially in larger ones, should not be underestimated. R. Haux, A. Winter, et al. (2004) it has many advantages like easy accessible, there is no need for big place to store the data or need not to worry about maintaining the paper based data base were possible for more risk .

A Pamela Lewis Dolan (2012) Acceptance of computer has grown rapidly among medical professional, according to Manhattan Research's "Taking the Pulse U.S. 2012" survey of 3,015 physicians in 25 specialties. The survey, conducted in the first three months of 2012, found that 62% of physicians have their own computer; there is growth of 27% in 2011, by comparison, most surveys put

electronic health record use by medical doctors at around 50%, and that has required federal incentive programs to help get adoption to that mark.

Johanna Viitanen and Hannele Hypponen (2010) point outs that today, hundreds of information and communication technology (ICT) systems are used in healthcare organisations to serve physicians and other professionals in their daily work with patients. These systems cover a broad range of applications, from widely used electronic health records (EHR) and computerised physician order entry (CPOE) systems. Among other industries, healthcare has already profited extensively by the development of ICT.

Marc Berg (2013) stated in this article that "We can make systems that help professionals do their work better: providing reminders, allowing free and fast communication, allowing fast access to patient information and so forth. On the other hand, we can also make systems that require meticulous data entry for the sake of "completeness", or that help managers' overview and control the work of professionals."

Isabelle Vedel (2011) concludes in her study that different user profiles drawn from the dynamics of implementation are linked to different sets of perceived drivers and barriers that evolve over time. Certain factors favour the decision of adopting Da Vinci early on: e.g. user skills and the system's expected ease of use and usefulness. Certain concerns hinder its adoption: e.g. perceived negative impact on the doctor–patient relationship. As computer is one of the most important gadgets in the informative world the internet also plays vital role in bridging the knowledge among the people.

Adrian Gropper (2011) explores software tools are yet another new technology competing for the attention of physicians. Medical software is evolving rapidly from a record-keeping tool to a communications system to a source of decision support and plays the role of a medical device or clinical service.

Shinji Kobayashi (2012) indicates, in many hospitals they have adopted information systems software to manage clinical practice. Commonly, a hospital needs integrated EHR to administer clinical information from subsystems for departments, such as laboratory data, pharmacy, radiology section etc.

According to supporting literature, researchers seek to determine usage of information and communication technology tools, computer or laptops for maintaining database. Therefore, first two research questions were raised:

RQ1: Do medical practitioners prefer using computers/ laptops for database management systems?

RQ2: Do medical practitioners prefer using computers/ laptops for accessing software related to their profession?

3.2 Internet Usage

The Internet has become the world's biggest library where retrieval of scientific resources can be done within minutes. Young adults are heavy users of internet. It is integrated into their regular communication habit and has transformed as an ordinary thing just like telephones or televisions. Mainly this internet is being accessed through internet modem which is a fixed device or through internet data card, which is a portable device.

Benjamin Hughesa (2009) states that physicians use the internet far more than the general public, and although physicians still prefer to consult with colleagues on complex cases, internet is viewed as an increasingly important source of medical information among them. This use of the internet is being impacted by Web 2.0, a term that represents a second generation of web- based tools and communities (e.g., social-networking sites, wikis) which aim to facilitate user collaboration by user centric design

A study was conducted by researchers Priyadarshini M. Deodurg, Nandini T, Srikanth and Praveen Kumar Doddamani (2013). In the study, respondents was separated according to their professional grade, from professors to tutors. The Assistant professor/Senior residents (80%) were the respondents who use medical information in higher level; associate professors were in the second categories (71.7%). Assistant professor/Senior resident used the Internet daily for general as well as medical purposes. PubMed was the website mostly accessed by Assistant professors/Senior residents (81.9%), which was tailed by Tutors/junior residents (79.5%). Majority of the doctors had access to internet and was using it for both medical and general purposes.

Access and use of internet to seek health related information among medical doctors is important to provide a high quality of health services and to solve various health issues. In their medical practice, "physicians experience very specific information needs, in relation to which precision, reliability and promptness are fundamental aspects" (Martinez and Oddone 2008).

With the development of technology, the practice has started to change through the years. Some recent studies have reported Internet or electronic resources as popular sources of information for physicians. A study by Jackson

et al. (2007) on the information-seeking behaviors of health and social care professionals in Barnsley, England, showed that the usage of new media is high among professionals, followed by verbal queries to coworkers, libraries or paper materials. In the new scenario the internet usage rate has become higher because of the mobile phone revolution. The smart phones started to replace the desktops. With the help of smart phones, doctors are able to access their data very easily without any hindrance. There are many new medical applications coming up day by day which aid them in this.

Terez Malka and Chad S. Kessler (2015) points out e-mail is now a primary method of correspondence in health care, and proficiency with professional e-mail use is a vital skill for physicians. Physicians use e-mail for a multitude of purposes: to obtain consults, both formal and "curbside"; communicate with patients; collaborate on scholarly projects; perform administrative duties; and conduct routine communication.

Jaffar M. A. Bareeq (2002) indicates that through e-mail doctors receive the latest advance in medicine from their respective societies around the world. Doctors can read their medical journal on the Internet before they receive their hard copy and it fulfill an important function as communicating media between the professional societies and their members. Many pharmaceutical and medical instrument companies send their information about their most recent drug or gadgets through emails. The latest advance in medicine and professional decision that may affect his practice is sent by emails.

With the extent of available literature on usage of internet for communicating through e-mail and for gathering information from websites the following questions were raised.

RQ3: Do medical practitioners prefer using internet for sending and receiving e-mails?

RQ4: Do medical practitioners prefer using internet to access websites for gathering information?

3.3 Mobile Usage

Rajesh R Mane, R.V. Kulkarni and Pallavi M. Dessai (2014) observe that smart phones, both i-Phones and Androids, have changed the way medicine is practiced on many levels. The smart phones are used to run apps, which are special software programs for various purposes, such as the following: functions inimage viewing, diagnostics, remote monitors and microscope.

In the increasing development of mobile health care system yields the largest growth among mobile users and there are few studies on mobile healthcare alert system that delivers the proper timing and emergency case alerts. Ruchi Dass (2012) exposes that there are 20,000 plus m-Health applications in the major app stores today, and by 2015, it is projected that there will be 500 million m-Health application users worldwide. The access of smart phones in India is growing at a great pace, with 40 percent of people using internet daily through smart phones; 34 percent of these users log in for more than half an hour each day.

Karl Frederick Braekkan Payne, et al. (2012) argues that smartphone usage has disseminated too many settings including that of healthcare with numerous potential and realized benefits. The ability to download custom-built software applications (apps) has created a new wealth of clinical resources available to healthcare staff, providing evidence-based decisional tools to reduce medical errors.

Munish Aggarwal (2012) explores in his recent survey research, India stands 2nd largest country in mobile phone purchase, after China and the consumer base is expanding in India at a faster pace than that of China. Studies from various parts of the world have shown adverse physical and psychological consequences of excessive use of mobile phones applications. However, no systemic study is available that has evaluated the abuse and dependence potential of mobile phone use in India.

According to the results of 'Healthcare Data Solutions' recent survey (2012), leading the way are doctors, a group known for early adoption of technology, 68 percent of who are already using mobile applications in their practice. It also denotes that Mobile usage among older doctors is surprisingly high.

Short Message Services (SMS) technology offers advantages in terms of more convenient communication between patient and physician, including transmission of life style information, diagnosis in emergencies, clinical test results and promotion of self-management for those who have been diagnosed with chronic illnesses (Qasim Hameed Afridi, 2011).

Med Adherence (2011) explains through SMS, healthcare providers can help their patients stay connected with medical professionals on an immediate basis. Some use cases include patients receiving confirmation messages when an appointment is made, a reminder message with a link to directions in Google Maps and follow-up communication to remind patients of an upcoming appointment. By sending alert notifications through text messaging, healthcare providers are able to stay better connected with their patients.

In general the history of this literature has attributed to the usage of smart phones for communication purposes have provided more substantial elucidations. The following research questions have been raised.

RQ5: Do medical practitioners prefer using smart phones for accessing mobile applications?

RQ6: Do medical practitioners prefer using mobile phones to communicate through short message services?

4. Methodology

With the reference of review of literature it is denoted that adoption of information communication technology is comparatively good among the medical practitioners. Hence, the research steps into further investigation to know how the doctors in India, Tamil Nadu get adopted to the access of Information Communication Technology in the field of medicine.

According to literature review the researchers mooted the research questions for the study to understand how the medical practitioners use ICT tools in the field of medicine.

With the main objective of understanding the uses and effects of information and communication technology among the medical doctors across Tamil Nadu. At the first stage, the researcher took three major district of Tamil Nadu as Chennai the capital of the state, Madurai as a largest city in the state after to Chennai and third city Coimbatore because of medical facilities prevails in the city. At the third stage, the researchers identified the regular users and administrated instrument developed for the study to the medical doctors. At the fourth stage, the researchers explained the nature of research and the medical professionals are requested to respond to the issues raised in the questionnaire. Thus, using the stratified random sampling, care was taken to include a cross section of the population who use the ICT. 427 samples that are completely answered were included for the study. Usage and effects of ICT such as computer database system, internet, and mobile phone were taken as dependent variable for the investigation and demographic variables such as age, gender, education qualification, experience and occupation were also included in the study.

4.1 Development of the Scale

As a first step, the Researcher, from the extensive scrutiny of the review of literature, identified the major dependent variables the usage of ICT (Computer database usage, internet usage and mobile usage) and users' demographics (gender, age, education qualification, occupation and experience). The Researcher framed descriptive questions to elicit the nature of ICT usage.

At the second level, in order to collect data to measure the dependent variables, 7 Statements were included on the lines of the Likert type five-point scale (most often, often, rarely, very rarely and never). The Statements were structured on the usage of ICT tools and issues so as to bring about internal consistency and to prevent the respondents from answering the questions mechanically.

5. Data Collection

The study was conducted using a stratified multi-stage sampling procedure for collecting data from medical professionals. The sample for the present study was gathered from three types of medical industries namely: Government, Private and Own Clinic.

The researchers collected a total sample from 510 respondents. After careful scrutiny it was found that some of the respondents did not answer some of the questions and some of the items were incomplete. After removing those incomplete samples, the final tally of respondents included in the study is 427.

Table: 1.Gender * Age Cross-tabulation

	25-35	36-45	46 and Above	Total
Male	95	103	26	224
Female	101	67	35	203
Total	196	170	61	427

5.1 Sample Characteristics

According to the cross tabulation table above it is projected that there are 224 male out of 427 samples selected for the study in which 95 respondents belong to the age group of 25 to 35 years, 103 male samples belongs to the age group of 36 to 45 years. 26 male were belongs to the age group of 46 and above. When it comes to female there are 196 female respondents in the age group of 25 to 35 years and 103 female samples belongs to 36 years to 45 years. 26 respondents belong to the age group of 46 and above.

Table: 2. Education * Occupation Cross-tabulation

	Goverment	Private	Own Clinic	Total
UG	66	35	22	123
PG	66	74	36	176
OTHERS	34	66	28	128
TOTAL	166	175	86	427

The above table reveals about the occupation and educational qualification of the respondents for the study. Out of 427 sample 166 respondents belongs to government sector, 175 respondents works in private hospitals and 86 respondents have their own clinic and if we see their education qualification 123 member belongs to under graduation in which 66 are working as government doctors, 35 of them works in private hospital and 22 of them have their own clinic, out of 427 respondents 176 of them finished their post-graduation works in all the three category with the number 66 works in government, 74 are in private sector and 36 keep their own clinic and 128 medical doctors studied above post-graduation also there in various sectors such as 34 in government, 66 doctors are in private and 28 focus their own clinic.

Table: 3. Gender * Computer-Internet-Mobile Cross-tabulation

	Computer			Internet			Mobile		
	Not Using	Using	Total	Not Using	Using	Total	Not Using	Using	Total
Male	60	164	224	53	171	224	34	190	224
Female	50	153	203	63	140	203	32	171	203
Total	110	317	427	116	311	427	66	361	427

The above table reveals the usage of computer, internet and mobile phone in terms of genders category. In whole of 427 samples in male, 60 do not use computer for their work and 164 male use computers in their work place which denotes that there are more adoptions in using computer. When we see the female respondents 50 of them not using the computer and 153 of them use it official so it denotes the usage of computer is more towards the doctors.

If we see the usage of internet the same trend is prevails, out of 224 total male samples 171 use the internet and 53 of them does not turn up to internet. In the mean while if see the female respondents users are more with 140 members use internet and only 63 are not using. This again proves that the usage of internet is higher and female doctors are using internet equally to male doctors.

If we see the mobile usage only 66 of total 427 respondents are not using mobile phone. Here 190 male and 171 female respondents are constantly using mobile phones. Usage of all this three ICT tools denotes that there are more adoptions towards the ICT tools for various reasons. The main motive of this test is to find how many respondents are still not adopting the ICT tools and here with we finds that there are people still not using ICT.

The independent variable, age included three groups: 25 to 35 years ($M=3.78$, $SD=1.352$, $n=196$), 36 to 45 years ($M=3.84$, $SD=1.177$, $n=170$), 45 years and above ($M=3.21$, $SD=1.250$, $n=61$). The ANOVA was significant, $F(2, 425)=5.5$, $p<.05$. Thus, there is significant evidence in usage of software by doctors based on their age (Table 4).

The independent variable, age included three groups: 25 to 35 years ($M=3.91$, $SD=1.146$, $n=196$), 36 to 45 years ($M=4.04$, $SD=.981$, $n=170$), 45 years and above ($M=3.69$, $SD=1.253$, $n=61$). The ANOVA was not significant, $F(2, 425)=3.6$, $p>.05$. Thus, there is no significant difference in usage of computer for data storage by doctors based on their age.

The independent variable, age included three groups: 25 to 35 years ($M=2.74$, $SD=.951$, $n=196$), 36 to 45 years ($M=2.73$, $SD=.761$, $n=170$), 45 years and above ($M=2.34$, $SD=.958$, $n=61$). The ANOVA was significant, $F(2, 425)=7.8$, $p<.05$. Thus, there is a significant evidence difference in usage of email by doctors based on their age.

The independent variable, age included three groups: 25 to 35 years ($M=4.01$, $SD=.934$, $n=196$), 36 to 45 years ($M=3.98$, $SD=.910$, $n=170$), 45 years and above

5.2 Results of the Study

Table: 4. Age wise Table of ANOVA

Independent variables	Software		Computer data storage		Email		Website		Mobile Application		Mobile SMS	
Age	F =5.540 Sig. =.004		F =7.757 Sig. =.000		F =3.563 Sig. =0.29		F =11.724 Sig. =.000		F =3.847 Sig. =0.22		F =10.911 Sig. =.000	
Groups	Software		Computer data storage		Email		Website		Mobile Application		Mobile SMS	
	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value
25 to 35 years	196	3.78	196	2.74	196	3.91	196	4.01	196	3.61	196	2.95
36 to 45 years	170	3.84	170	2.73	170	4.04	170	3.98	170	3.58	170	2.84
46 years and above	61	3.21	61	2.34	61	3.69	61	3.34	61	3.16	61	2.10
Total	427	3.72	427	2.68	427	3.93	427	3.90	427	3.54	427	2.78
	SD Value		SD Value		SD Value		SD Value		SD Value		SD Value	
25 to 35 years	1.352		1.146		.951		.934		1.054		1.304	
36 to 45 years	1.177		.981		.761		.910		1.190		1.198	
46 years and above	1.250		1.253		.958		1.237		1.241		1.274	

(M=3.34, SD=1.237, n=61). The ANOVA was significant, F (2, 425) =11.7, p<.05. Thus, there is a significant difference in usage of website by doctors based on their age.

The independent variable, age included three groups: 25 to 35 years (M=3.61, SD=1.054, n=196), 36 to 45 years (M=3.58, SD=1.190, n=170), 45 years and above (M=3.16, SD=1.241, n=61). The ANOVA was not significant, F (2, 425) =3.6, p>.05. Thus, there is no significant difference in usage of mobile applications by doctors based on their age.

The independent variable, age included three groups: 25 to 35 years (M=2.95, SD=1.304, n=196), 36 to 45 years (M=2.84, SD=1.198, n=170), 45 years and above (M=2.10, SD=1.274, n=61). The ANOVA was significant, F (2, 425) =10.9, p<.05. Thus, there is a significant difference in usage of mobile SMS by doctors based on their age.

The independent variable, education included three groups: under graduate (M=2.85, SD=1.385, n=123), post graduate (M=3.48, SD=1.209, n=176), others (M=3.20, SD=1.199, n=128). The ANOVA was significant, F (2, 425) =9.2, p<.05. Thus, there is a significant difference in usage of software by doctors based on their education (Table 5).

The independent variable, education included three groups: under graduate (M=3.81, SD=.935, n=123), post graduate (M=3.86, SD=1.084, n=176), others (M=3.45, SD=1.272, n=128). The ANOVA was significant, F (2, 425) =5.7, p<.05. Thus, there is a significant evidence to reject the null hypothesis and conclude there is a significant difference in usage of computer data storage by doctors based on their education.

The independent variable, education included three groups: under graduate (M=3.69, SD=.993, n=123), post graduate (M=4.14, SD=.817, n=176), others (M=3.87, SD=.807, n=128). The ANOVA was significant, F (2, 425) =9.9, p<.05. Thus, there is a significant difference in usage of email by doctors based on their education.

The independent variable, education included three groups: under graduate (M=3.06, SD=1.027, n=123), post graduate (M=2.87, SD=.925, n=176), others (M=3.79, SD=1.032, n=128). The ANOVA was significant, F (2, 425) =5.2, p<.05. Thus, there is a significant difference in usage of website by doctors based on their education.

The independent variable, education included three groups: under graduate (M=3.46, SD=.969, n=123),

Table: 5. Age wise Table of ANOVA

Independent variables	Software		Computer data storage		Email		Website		Mobile Application		Mobile SMS	
Education	F =9.279 Sig. =.000		F =5.761 Sig. =.003		F =9.959 Sig. =.000		F =5.206 Sig. =.006		F =7.003 Sig. =.001		F =8.983 Sig. =.000	
Groups	Software		Computer data storage		Email		Website		Mobile Application		Mobile SMS	
	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value
Under-Graduation	123	2.85	123	3.81	123	3.69	123	3.76	123	3.46	123	3.06
Post-Graduation	176	3.48	176	3.86	176	4.14	176	4.09	176	3.77	176	2.87
Others	128	3.20	128	3.45	128	3.87	128	3.79	128	3.29	128	2.41
Total	427	3.22	427	3.72	427	3.93	427	3.90	427	3.54	427	2.78
	SD Value		SD Value		SD Value		SD Value		SD Value		SD Value	
Under-Graduation	1.385		.935		.993		1.027		.969		1.404	
Post-Graduation	1.209		1.084		.817		.925		1.135		1.237	
Others	1.199		1.272		.807		1.032		1.256		1.153	
Total	1.284		1.117		.886		.997		1.145		1.288	

post graduate (M=3.77, SD=1.135, n=176), others (M=3.29, SD=1.256, n=128). The ANOVA was significant, F (2, 425) =7.0, p<.05. Thus, there is a significant difference in usage of mobile applications by doctors based on their education.

The independent variable, education included three groups: under graduate (M=3.06, SD=.1.404, n=123), post graduate (M=2.87, SD=1.237, n=176), others (M=2.41, SD=1.153, n=128). The ANOVA was significant, F (2, 425) =8.9, p<.05. Thus, there is a significant difference in usage of mobile SMS by doctors based on their education.

The independent variable, occupation included three groups: government (M=3.17, SD=1.284, n=166), private (M=3.64, SD=1.146, n=175), own clinic (M=2.43, SD=1.174, n=86). The ANOVA was significant, F (2, 425) =29.1, p<.05. Thus, there is a significant difference in usage of software by doctors based on their occupation (Table 6).

The independent variable, occupation included three groups: government (M=3.79, SD=1.105, n=166), private (M=3.75, SD=1.239, n=175), own clinic (M=3.53, SD=.836, n=86). The ANOVA was not significant, F (2, 425) =1.5, p>.05. Thus, there is a significant difference in usage of computer data storage by doctors based on their occupation.

The independent variable, occupation included three groups: government (M=4.01, SD=.936, n=166), private (M=3.94, SD=.865, n=175), own clinic (M=3.76, SD=.750, n=86). The ANOVA was not significant, F (2, 425) =2.2, p>.05. Thus, there is a significant difference in usage of email by doctors based on their occupation.

The independent variable, occupation included three groups: government (M=4.00, SD=.991, n=166), private (M=3.92, SD=1.031, n=175), own clinic (M=3.67, SD=.913, n=86). The ANOVA was significant, F (2, 425) =3.1, p<.05. Thus, there is a significant difference in usage of website by doctors based on their occupation.

The independent variable, occupation included three groups: government (M=3.73, SD=1.040, n=166), private (M=3.52, SD=1.231, n=175), own clinic (M=3.19, SD=1.079, n=86). The ANOVA was significant, F (2, 425) =6.7, p<.05. Thus there is a significant difference in usage of mobile applications by doctors based on their occupation.

The independent variable, occupation included three groups: government (M=3.03, SD=1.300, n=166), private (M=2.69, SD=1.295, n=175), own clinic (M=2.51, SD=1.176, n=86). The ANOVA was significant, F (2, 425) =5.5, p<.05. Thus, there is a

Table: 6. Occupation wise Table of ANOVA

Independent variables	Software		Computer data storage		Email		Website		Mobile Application		Mobile SMS	
Occupation	F =29.136 Sig. =.000		F =1.559 Sig. =.211		F =2.288 Sig. =.103		F =3.098 Sig. =.046		F =6.719 Sig. =.001		F =5.585 Sig. =.004	
Groups	Software		Computer data storage		Email		Website		Mobile Application		Mobile SMS	
	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value
Government	166	3.17	166	3.79	166	4.01	166	4.00	166	3.73	166	3.03
Private	175	3.64	175	3.75	175	3.94	175	3.92	175	3.52	175	2.69
Own Clinic	86	2.43	86	3.53	86	3.76	86	3.67	86	3.19	86	2.51
Total	427	3.22	427	3.72	427	3.93	427	3.90	427	3.54	427	2.78
	SD Value		SD Value		SD Value		SD Value		SD Value		SD Value	
Government	1.284		1.105		.963		.991		1.040		1.300	
Private	1.146		1.239		.865		1.031		1.231		1.295	
Own Clinic	1.174		.836		.750		.913		1.079		1.176	
Total	1.284		1.117		.886		.997		1.145		1.288	

significant difference in usage of mobile SMS by doctors based on their occupation.

The independent variable, experience included four groups: 1 to 5 years (M=3.18, SD=1.288, n=144), 6 to 10 years (M=3.07, SD=1.496, n=92), 11 to 16 years (M=3.68, SD=.969, n=115), 16 years and above (M=2.76, SD=1.221, n=76). The ANOVA was significant, F (3, 424) =9.0, p<.05. Thus, there is a significant difference in usage of software by doctors based on their experience (Table 7).

The independent variable, experience included four groups: 1 to 5 years (M=3.87, SD=1.092, n=144), 6 to 10 years (M=3.91, SD=1.045, n=92), 11 to 16 years (M=3.76, SD=1.081, n=115), 16 years and above (M=3.16, SD=1.144, n=76). The ANOVA was significant, F (3, 424) =8.6, p<.05. Thus, there is a significant difference in usage of computer data storage by doctors based on their experience.

The independent variable, experience included four groups: 1 to 5 years (M=3.92, SD=.947, n=144), 6 to 10 years (M=3.99, SD=.871, n=92), 11 to 16 years (M=4.08, SD=.807, n=115), 16 years and above (M=3.63, SD=.846, n=76). The ANOVA was significant, F (3, 424) =4.2, p<.05. Thus, there is a significant difference in usage of email by doctors based on their experience.

The independent variable, experience included four groups: 1 to 5 years (M=3.96, SD=.897, n=144), 6 to 10 years (M=4.07, SD=1.146, n=92), 11 to 16 years (M=4.08, SD=.892, n=115), 16 years and above (M=3.47, SD=1.039, n=76). The ANOVA was significant, F (3, 424) =6.1, p<.05. Thus, there is a significant difference in usage of website by doctors based on their experience.

The independent variable, experience included four groups: 1 to 5 years (M=3.77, SD=.980, n=144), 6 to 10 years (M=3.45, SD=1.083, n=92), 11 to 16 years (M=3.59, SD=1.290, n=115), 16 years and above (M=3.12, SD=1.166, n=76). The ANOVA was significant, F (3, 424) =5.9, p<.05. Thus, there is a significant difference in usage of mobile applications by doctors based on their experience.

The independent variable, experience included four groups: 1 to 5 years (M=2.86, SD=1.180, n=144), 6 to 10 years (M=3.07, SD=1.381, n=92), 11 to 16 years (M=2.66, SD=1.176, n=115), 16 years and above (M=2.49, SD=1.456, n=76). The ANOVA was significant, F (3, 424) =3.4, p<.05. Thus, there is a significant difference in usage of mobile SMS by doctors based on their experience.

The result of t-test seen in Table 8 reveals there is no significant difference between male and female respondents in the usage of software, email, mobile applications and mobile SMS, and also the table reveals that there is a significant difference between male and

Table: 7. Experience wise Table of ANOVA

Independent variables	Software		Computer data storage		Email		Website		Mobile Application		Mobile SMS	
Experience	F =9.068 Sig. =.000		F =8.653 Sig. =.000		F =4.172 Sig. =.006		F =6.106 Sig. =.000		F =5.866 Sig. =.001		F =3.391 Sig. =.018	
Groups	Software		Computer data storage		Email		Website		Mobile Application		Mobile SMS	
	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value
1 to 5 years	144	3.18	144	3.87	144	3.92	144	3.98	144	3.77	144	2.86
6 to 10 years	92	3.07	92	3.91	92	3.99	92	4.07	92	3.45	92	3.07
11 to 16 years	115	3.68	115	3.76	115	4.08	115	3.96	115	3.59	115	2.66
16 years and above	76	2.76	76	3.16	76	3.63	76	3.47	76	3.12	76	2.49
Total	427	3.22	427	3.72	427	3.93	427	3.90	427	3.54	427	2.78
	SD Value		SD Value		SD Value		SD Value		SD Value		SD Value	
1 to 5 years	1.288		1.092		.947		.897		.980		1.180	
6 to 10 years	1.496		1.045		.871		1.146		1.083		1.381	
11 to 16 years	.969		1.081		.807		.892		1.290		1.176	
16 years and above	1.221		1.144		.846		1.039		1.166		1.456	
Total	1.284		1.117		.886		.997		1.145		1.288	

Table: 8.Gender wise Table 'T' test

Groups	Software		Computer data storage		Email		Website		Mobile Application		Mobile SMS	
	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value	NR	Mean Value
Male	224	3.26	224	3.81	224	3.95	224	3.87	224	3.67	224	2.91
Female	203	3.16	203	3.63	203	3.91	203	3.94	203	3.38	203	2.65
Total	427	3.42	427	7.44	427	7.86	427	7.81	427	7.05	427	5.56
'F' value	F =1.255		F=8.969		F=1.829		F=11.565		F=3.854		F=.060	
Sig. Value	Sig. =.263		Sig. =.003		Sig. =.177		Sig. =.001		Sig. =.050		Sig. =.807	

Variable	T	Df	Sig. (2-tailed)
Software	.810	425	.418
Computer Data storage	1.688	425	.092
Email	.466	425	.642
Website	-.676	425	.499
Mobile Application	2.631	425	.009
Mobile SMS	2.060	425	.040

female respondents in the usage of computer data storage and website usage by doctors.

The Mean value from the table reveals that in case of computer data storage male respondent's (M-3.81) use more than of Female respondent's (M-3.63). The Mean value from the table reveals that in case of using websites female respondent's (M-3.94) use more than of male respondent's (M-3.87).

Thus, it can infer that there is a significant influence between male and female respondents on the usage of computer data storage and website usage by doctors.

6. Discussion

With an intense penetration of the digital media, it can be perceived that there has been a transition towards the usage of information communication technology among medical doctors. The medical doctors in particular have easy access to the information communication technology at their office and also at their houses.

Through this research, it has been discovered that the usage of computer and software for database management by medical doctors are comparatively high this indicates the level of using information communication technology tools is higher among medical doctors, in particular doctors who are in the middle age, educated up to post-graduation and above, working in private and government sectors, having an experience above five years use the computer database system more. When it comes to gender, male dominate their female counterparts in using it.

Dolan (2012) study shows that acceptance of computer has grown rapidly among medical professionals. According to Manhattan Research's survey conducted in 2012, it is found that 62% physicians have their own computers; there is a growth of 27% in 2011. By comparison, most surveys put electronic health record use by medical doctors at around 50%, and that has required federal incentive programs to help get adoption to that mark. In another study by Michelle and Trevor (2013) conclude that Vietnamese doctors could successfully navigate and use a computerized CDS (software) tool written in English, as measured by improved performance on a written clinical exam testing knowledge on pediatric emergencies.

Further the result of the study explores: usage of internet for communication and gathering information by medical doctors are comparatively high and this indicates that the usage level of internet is high in developing countries like India. Younger medical doctors in the age group of 25 to 35 years, doctors who are post-graduates, those working in government sectors and those who have experience of 11 to 16 years make the utmost useof the internet. While it comes to gender, both male and female doctors use internet in a same level. According to the research conducted by Priyadarshini, Deodurg, et al. (2013) doctors who are assistant professors/senior residents (80%) were the respondents who use medical information in a higher level; associate professors were in the second category (71.7%). Assistant professors/Senior residents used the internet every day for general as well as medical purposes. PubMed was the website mostly accessed by Assistant professors/Senior residents (81.9%), which was tailed by tutors/junior residents (79.5%). Majority of the doctors had access to internet and was using it for both medical and general purposes.

In a yet another study, Shou and Dennis (2005) predicated that E-mail communication was found to be a more convenient form of communication among doctors. Satisfaction was attained at both the ends of patients and physiciansin the e-mail group. The volume of messages and the time spent answering messages for the e-mail group physicians was not increased. E-mail has the potential to improve the doctor-patient relationship as a result of better communication.

When it comes to the usage of mobile phones, 66 of the total respondents do not use mobile phones to communicate with the patients which again denotes that the level of usage of the ICT tools to be higher among the doctors in their profession. Doctors who are in the age group of 25 to 36, those who have finished their under graduation and post-graduation,those working in government sector, those who have experience of 1 to 10 years and male respondents use mobile phones more frequently while comparing with others. Ruchi Dass (2012) exposes that there are 20,000 plus m-Health applications in the major app stores today, and by 2015, it is projected that there will be 500 million m-Health application users worldwide. The access of smart phones in India is growing at a great pace, with 40 percent of people using internet every day through smart phones; 34 percent of these users log in for more than half an hour each day. Carole and Suzanne (2012) find out in their result that sharing best practices and providing strategic directions will allow the building of evidence for the use of mobile health technologies. Consequently, the promises of using mobile phones and SMS may translate into an equitable improvement in health.

7. Conclusion

The overall result of the study denotes that there is high evolution in using ICT tools. On the whole, 317 doctors of 427 collected samples are using computers in their work place denoting that there is a good transition in using computers. The usage of internet is also high: out of 427 samples, 311 users use internet for various reasons. This again proves that the usage of internet is higher among doctors for strengthening their professional knowledge. Only 66 of total 427 respondents do not use mobile phones, so the level of communication between the medical practitioners and others are good and smart phones help them in many ways. With these kinds of

usages of ICT tools the researcher finds significant results in using and accessing computers with software or for data storage, internet for various reasons like accessing websites, online journals to get themselves updated, for communicating through emails and mobile phones for accessing apps and communicating through SMS with the co-workers and being in touch with the patients and monitoring their health development.

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