

**SMACpulseTAM: A conceptual model on disruptive technologies in health care.**

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### **Abstract**

Albert Einstein says, ‘The significant problems we have cannot be solved at the same level of thinking with which we created them,’ which reflects to today’s consumer behavior and the business challenge. The nurses in healthcare industry use Information and Communication technology in their practice to assess, mediate, and appraise the outcomes of nursing care. The trend in using technology for communication has evolved to change in the scope of nursing practice. This study surrounds to the objectives a) to explore the awareness, use and reasons for feedback by use of ICT tools by the nursing carers in order to practice telenursing. b) to propose a health communication model that could be validated. The empirical study employed the survey methodology to study the objectives. Questionnaire as the instrument was intervened to a stratified sample covering different nursing institutions and hospitals in Bangalore urban. A critical analysis on the content of various information distribution and interaction models namely the TAM and SMAC, were assessed from various literatures in order to develop a technology based model explicitly reflecting to socio-technical communication that supports the ideology of critical realism. It was found from the quantitative data upon survey that nursing students and nursing carers have yet to be explicitly exposed to this new trend in telenursing in Bangalore. The focus group discussion from qualitative data supported to the survey data to test the hypothesis. Hence, the study identified vast scope in the health care communication that leads to health relief and life saving decisions by carers, health staff and people. Further, the study attempts to develop a model for communication in critical times identified as SMAC*pulse*TAM which could be validated on the concept, construct and the content in health communication.

*Keywords: SMAC, TAM, telenursing , use of ICT tools*

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Communication involves the sharing of ideas, knowledge, attitudes and feelings which demands for two way communication. There are many reasons for the health messages not attaining the goals set by the message sender to reach the target audience. The message may be received by limited channels but not interpreted correctly by the recipient and many a time it may go against his beliefs. There are a variety of communication channels available to outreach that include interpersonal channels, mass media, small media and now the digital media. If health communication has to be reached, a mix of channels and media has to be used in order to spread the message. From the side of receiving information, it is very important to collect feedback and provide solutions to them. Information and communication technology has geared up in a manner that it has become a part of our daily activities both at home and at the place of work. It has been a significant concern by Governments about the digital divide and the international community. The gap to access basic telephone services has reduced. However, the access to the Internet and broadband services has become a priced alternative for interactive communication for the majority in society across the globe to take advantage of this innovative communication technology. The fifty years old *Gorden E Moore's Law* states that the number of transistors that can be placed on an integrated circuit for the same price will increase exponentially by a factor of 2 every 18 to 24 months continues in practice with relation to economics where he states that "I was to get across the idea that this was the way electronics was going to become cheap... you could see the changes that were coming, make the yields go up, and get the cost per transistors down dramatically" (Intel, 2005). This development of microprocessor has spearheaded in the adoption to technology enabled services in various fields including telehealth care.

The present day trend is using cloud computing which has become increasingly important for Governments and enterprises that enables users to access a pool of data storage and computing resources when required over the Internet or other digital networks. Research indicate that cloud computing could be the disruptive technologies for the next two decades with implication for markets, economies and society with a significant ways of installing over public, private, community and hybrid clouds among others. As this trend expands in different developed nations, the developing countries with better quality of broadband services would begin to consider hosting cloud servers in closer locations as an alternative change for localization, system integration and aggregation. The telecommunication companies are playing

a large role as they would be having a direct link to the end users with suitable broad bandwidth (UNCTAD,2013).

### **eHealth**

At the outset of the technology diffused into the global society in different methods, it is apt to look at some of the ways it could be used in health care among others. eHealth is a term used for all interactions over Information and Communication Technologies(ICT) in health and health care. eHealth includes using ICTs to access, submit, search, monitor, communicate and store digital information in order to share and retrieve data in real time or later. ICTs play a role in health informatics, nursing informatics, telecare and telehealth. Nursing is about empowering and enabling people. ICTs offer nursing a great opportunity to take the role of a health advisor either by interacting or helping patients towards self-help method to access the information they want. Clinical decisions require assessing, diagnosing, planning and implementing appropriate mediations, and appraising the effects which the staff nurse are proficient in indulging in the information management process. This management information system relating to a patient can be appropriately distributed and interacted to remote locations by use of ICTs. eHealth has to be seen as necessary in part of nursing practice to impart value in the new way of delivering care to patients (Royal College of Nursing, 2014).

This research is important as the need for health care information to reach out to patients in order to take acute decisions at the beginning or while suffering in pain from ailments is critical, while anticipating correct clinical advice. As Seale(2005a) argue that media health representations assist in providing information about risks to avoid, pleasures to aspire to and in organizing a generalised denial of ultimate disappointment, since good health is associate with an inevitable progress towards personal fulfillment and psychological actualization. But the general audience to channel programmes are passive. This dissatisfaction with the information-delivery model, which conceives of health message as injections of information into a largely passive audience, has led to other researches which steered to alternative conceptions that imagine a much more active audience role, represented by edutainment, social marketing and media advocacy. Some of the models analysed by Seale were the effects model, active audience model and postmodern view that has resulted in an understanding the complex place that media health representations can have in people's lives immaterial by their forms. There are researches about opinion leaders that conflict to practitioner's advice which leads to health-damaging effects (Seale, 2005b).

The hypodermic needle theory which is a known theory that analyses the correlation between an audience and the media seem to be less effective as mentioned by Seale in many cases, however, it is evident that many people do change their food-purchasing behaviour in response to sensationalist scares and may fail to adjust to more realistic dangers that have not been covered in the media; many people seem to soak up prejudices, copy unhealthy habits, and distrust doctors and medicines unreasonably when media health stories over television, radio or print media encourage these things (Seale, 2005c).

Yet another phenomena that predicts by the year 2022 patients experience may include among many: easy access to health information and advice when needed; excellent communication between the General Practitioner (GP) and specialist with shorter wait to access specialist advice, and more coordinated care; commissioning the provision of 24/7 personalised care to patients with complex co morbidities and those towards the end of their lives. This may require a variety of models and involve different members of care team (*Royal college of general practitioners, 2013*). Telecommunications and information technologies are evolving to provide and support health care at a distance.

Telenursing has been tried at various health activities such as community services, children care, palliative care, patient management and telenursing at Intensive care units (ICU). This practice improves the earnings and career of nurses. The patients can benefit by getting easy access at their convenience with cost savings (Ghai, 2014).

To practice using digital services, nurses need modern computers, networking systems and a high broadband connection. The model of vHospital exposes interested nursing students to an online anytime/anywhere learning environment. Students are exposed to the tools that uses simulation to teach clinical decision making and processes of telenursing in vHospital (Ellis, 2011). Some of the studies conducted at various countries indicate that there is a positive growth in the practice of telenursing. An evaluation by Healthline in New Zealand showed that 97% of the callers were very satisfied with their contact with Healthline and stated they would use the services again (Medibank,2014).

Price (August, 2014) found that General Practice(GP) triage did considerably decrease the number of face-to-face GP consultations over the 28-day follow-up compared with usual care, but it increased the number of GP telephone consultations per patient ten times and also slightly increased face-to-face consultations with nurses in United Kingdom(UK). Telenurses in

Sweden accepted that the decision support system simplified their work, complemented their knowledge, provided security and developed their credibility (Ernesäter, 2009).

A distinction between Customer Service Representatives and telenurses found that in English telenurses project, they must have a specific professional qualification, they must be registered nurses and they must have previously worked in 'conventional' hospital settings. This clearly means that they hold previous occupational knowledge, while CSRs do not (Wise et al. 2007).

In Australia and New Zealand telenursing services availed by people have similar demographics and issues on which they need advice (George, St,Ian et.al., 2008). It is found that people with chronic illness living at their homes by use of ICTs have improved access to District Nurses in Sweden but observed that the use of ICT in home care is not suitable for everyone and that people cannot be replaced by ICT (Nilsson, 2012). In the United States, telenursing is expected to increase the employment by 36% in health sector(Bureau of Labor Statistics,2001). In the United kingdom about 46% of the nursing visits could be replaced by telenursing (Wooten, R,1998, Abbot, B. 1998, Abueloff, A. 1999, Agency for Health Care Research and Quality, 2000). In both nations the patients experienced cost savings (Valero,1999). In Europe large number of people have benefitted from in-home telecommunication services. In UK 15% of in-home patient care cases reported the need for ICT. (Agency for Health Care Research and Quality, 2000)

Another survey study conducted in Australia among nurses find that there is a high adoption of ICT into the nursing workplace. They used health-specific information technology applications for communication with patients. It is also found that younger nurses and recently qualified are the ones to use ICT for effectively. But many did not equate their use of ICTs with the role of caring. The study found that the readiness of nurses to participate in eHealth activities would be popular only if they are trained (Hegney, 2007). In nursing care, communication is one of the most important factors in a well-functioning relationship.

The review concludes that though there are many nations who are practicing telenursing by providing the infrastructure, access and training, which was found by content analysis, case analyses, survey study and focus group studies there is a gap in care communication that fails in the satisfaction level of the patients.

### **Research questions**

Since telenursing is an emerging concept in communication clinical expertise to callers, the first research question is: *RQ1: Would the use of Information and Communication Technology (ICT) tools help the nurses for better interactions between the patient and the hospital?*, which leads to the thought whether integrating Technology Acceptance Model(TAM) with Social media, Mobility, Analytics and big data and Cloud (SMAC) are a fitting theory for health care is an empirical question that requires critical examination.

### **Significance of the study**

This study emerged from the academic interest by looking at the state of affairs of the fragmented family and their helplessness in the event of health issues. The purpose of this paper is to establish that telehealth care with reference to nursing allows patients to experience nursing care at a distance. The paper intends to develop an integrated model designed to predict and explain the advantages of using SMACpulseTAM model, which is conceptualized to change the health consumer behavior. At the primary stage it gathers the readiness of the nursing students to practice telenursing by a survey and focus group discussion. During emergency period especially in February 2015 when the H1N1 has hit back in India, cities around the nation have begun to panic for preventive as well as cure treatment. If the SMACpulseTAM model is validated then it could have implication to the health care sector for measuring performance and having a foresight on health consumer behavior. This would help government and private hospitals to balance the movement of the patients at times of epidemic of diseases.

### **Disruptive innovations in health care**

Many of the most powerful innovations that disrupted other industries did so by enabling less skilled people to do in a more convenient, cost effective manner that traditionally could be performed only by expensive specialist in centralized, inconvenient locations. In health care, disruptions of health care professionals refers to specialist physicians being engaged in curing incurable of ailments for patients and less-skilled practitioners take on more complex roles than they were allowed to do so and allow over-the-counter drugs for patients to administer care which otherwise required a doctor's prescription. Government and health care industry leaders need to unite the stakeholders to work together to facilitate disruption instead of lobby's for each kind of patient diagnosis by the leaders (Christensen, 2000).

Disruptive innovation for Dr. Jason Hwang, a University of Michigan trained physician, in the health care sector means two things in particular (Townsend, April 2013): a) The transference of skills from highly trained but also expensive personnel to more affordable providers, including technology-based care. b) The shift away from traditional health care venues like hospitals into clinics and office settings, and, in some cases, into patients' own homes. By developing the MyMind Program he was in a position to find a solution and follows: Create—then embrace—a system where the clinician's skill level is matched to the difficulty of the medical problem. Invest less money in high-end, complex technologies and more in technologies that simplify complex problems. Create new organizations to do the disrupting and overcome the inertia of regulation. All these require good leadership for availing health care at convenience and being cost effective (Christensen, 1997).

The pace of technology change emerges our present years as the most innovative ever as we have smartphones and supercomputers, big data and nanotechnologies, gene therapy and stem-cell transplants. Governments, universities and firms together spend around \$1.4 trillion a year on R&D, more than ever before (The Economist, Jan 12<sup>th</sup> 2013). Shortening of product life cycles, rapid innovation, inventions and product developments are indicators to the fast changing manufacturing scenario. Velocity is an important outcome of innovation. The factors driving pace of change are known such as better information and communication systems. As communication systems have advanced the distribution of information effectively has improved the pace of change. The distribution of education is another factor for change. Web based education can reach out to more people who can gain education and build skills. Finally, the increasing demand for improved living conditions is a factor for change. With growing demands for better life style, creates an opportunity for a market that can be met with new and better supply (Phillips, May 2012).

### **Problem statement**

Based on the research question the research problem identified is that that the urban citizens are isolated amidst a thick population to communicate with people who are per-occupied with their professions that holds a higher priority than socializing, which is a sociological problem. At times of epidemics of diseases in cities like Bangalore, there is only the media and different mediums of mass communication or digital based two way communication enhance a person's health decision which is a health problem. Thus, it is essential to identify a solution



through a standardized health communication model to distribute one way and interact in two ways with health information.

India has 1.5 beds per thousand patients as against a world average of 2.6 which is a huge potential for healthcare providers. The nation is headed to become the International medical tourism hub based on its cost effective treatment compared to international markets. If it has to achieve this then the entire value chain which includes hospitals, chemists, pharmacists, biotechnologies, scientists, doctors, government, infrastructure developers, medical technology and equipment provides and others work together.

Hence, disruptive innovation will require combining the technologies, tools, and techniques of systems engineering with a deep understanding of business processes and organization in the health care and services industries. As health care markets open up to new business models, engineers can pursue fruitful research on tools, techniques, and engineered technologies to support the design, analysis, and governance of new delivery modes and networks (Grossman, Spring 2008).

The disruptive technologies of social media, mobility, analytics and big data and Cloud (SMAC) will play a crucial role in enabling delivery models with these characteristics. Hence, integrating SMAC with TAM model may suit to the solution for health care communication.

### **Objectives**

Based on the research problem and review the objectives of the study has been framed as follows: a) To explore the awareness, use and reasons for feedback by use of ICT tools by the nursing carers in order to practice telenursing. b) To propose a health communication model that could be validated.

### **Hypothesis**

Based on the review and the objectives of the study the hypothesis was developed to test the survey data on the assumptions:

H<sub>10</sub>: There is no significant difference between awareness and the general use of ICT tools among nursing students

H<sub>20</sub>: There is no significant difference between awareness and the specific use of ICT tools on nursing activity among nursing students

## **METHODOLOGY**

A survey based on questionnaire is used to quantify the level of awareness of ICT tools and assess the nursing students readiness to practice telenursing. A focus group discussion is selected to support the survey results and emphasizes on its advantages and disadvantages.

Further, to achieve the second objective of the study a critical analysis on the content of various information distribution models especially the TAM and SMAC, were assessed from various literatures in order to develop a technology based model explicitly reflecting to socio-technical communication that supports the ideology of critical realism. This study analyses some of the models followed in health care.

### **Sample**

Stratified sampling techniques are generally used when the population is heterogeneous, or dissimilar, where certain homogeneous, or similar, sub-populations can be isolated (strata). When we sample a population with several strata, we generally require that the proportion of each stratum in the sample should be the same as in the population. The strata should be exclusive as every element in the population should be assigned to only one stratum. Simple random sampling is most appropriate when the entire population from which the sample is taken is homogeneous. Stratification is the process of grouping members of the population into relatively homogeneous subgroups before sampling. Hence, stratified sampling was applied for selecting the respondents to the survey.

## **FINDINGS**

The survey had 62 respondents among whom all were female students in the age group of 15 to 24 studying in different nursing colleges in Bengaluru. The respondents preferred to work in the patient care, critical care, advanced practice nurses and physician assistant and medical services more than the other departments mentioned in figure 1.

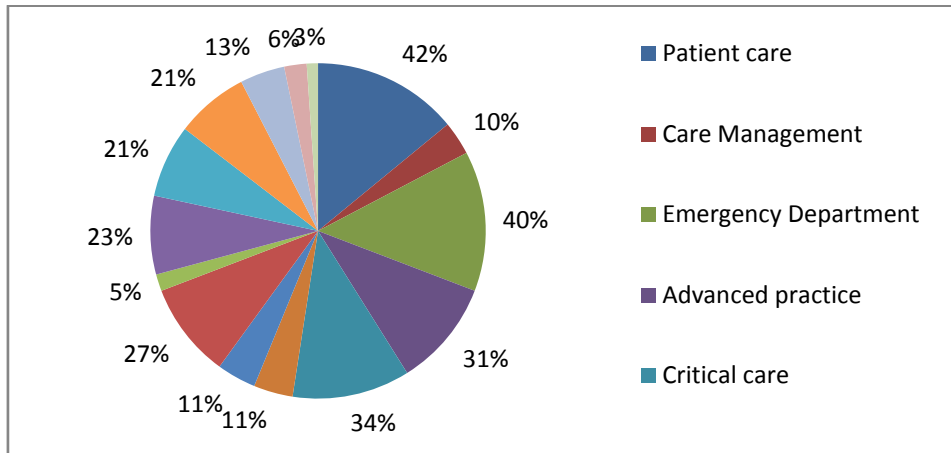


Figure 1. Pie chart showing the interest to work in different departments by nursing students.

In most hospitals today technology is extensively used for diagnosis. But interactions between nurses and patients and between nurses and other employees in hospitals are mainly by face-to-face or by textual writings in print or on computer. Telenursing is becoming popular and some of the examples of telenursing applications include the use of different ICT tools namely the telephone and the internet. About 40% were moderately aware and 37% slightly aware about the term telenursing. The objective of the study was apt to identify the awareness of popular ICT tools in order to measure the interest level of ICTs.

The mean value of the awareness under the five measured scale, projects that the respondents are moderately aware about the popular ICT tools. The popular tools included networked computers, MS-Office applications, broadband, world wide web, browser, e-mail, SMS, Instant chat by teleconference and videoconference, cloud computing, digital TV broadcasting and receiving. About 90% of the respondents of the study use the ICT tools. Among them about 59% use the digital tools from home, 67% use from college and about 12% from cyber café. This indicates that the role of cyber café for providing internet services is dropping.

Table 1

Mean score of awareness of popular ICT tools

Scale	Mean
Not at all aware	1.951613
Slightly aware	1.919355
Somewhat aware	2.951613
Moderately aware	3.758065
Extremely aware	2.16129

Those who used the ICT tools, it was necessary to identify the time they spent on the tools. It was gathered from their use in different time intervals of the use of TV, radio, Internet, Smart phone, standard mobile phone, computer, digital stereo, tablet and laptops. The mean value shown in Table 2 indicate that most of the respondents use the ICT tools for about 1 hour daily and the mean value of 5.85 indicate the use of TV for more than 5 hours.

Table 2

*Mean score of the average time of use of ICT tools*

>15 minutes	> 30 minutes	> 1 hour	> 2 hours	> 3 hours	> 4 hours	> 5 hours
9.714286	9.428571	9.285714	5	2.571429	1.714286	5.857143

Most of the respondents had an instance of a telephone call by patients on one or more of the ailments indicated in Figure 2, which indicate that tele-advising experience were more on medication prescription, abdominal pain, dieting advice and persisting vomiting / diarrhea. This indicates the emergence of readiness of the respondents towards telenursing.

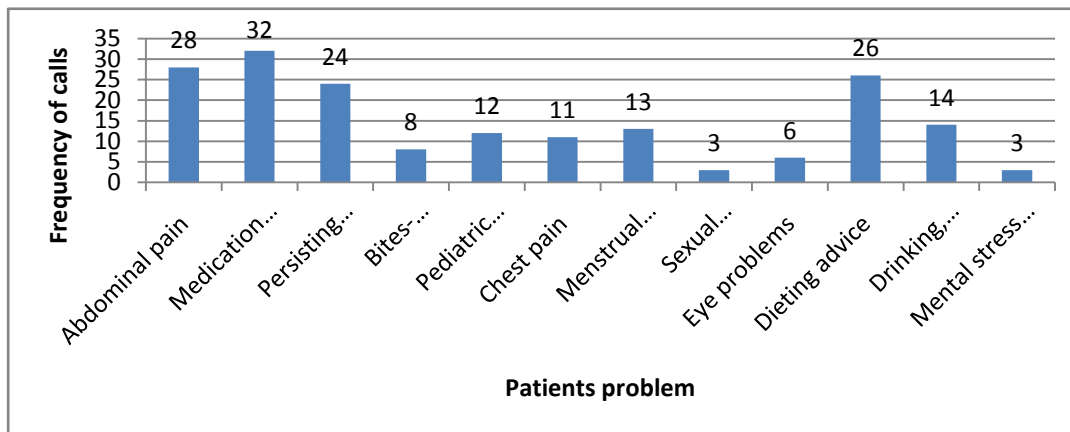


Figure 2: Frequency of patients call to nurses for different problems

RQ1: Is the awareness and use of ICT associated with the use of ICT tools for general purpose?

A correlation coefficient was used to test the null hypothesis ( $H_{10}$ ). A correlation coefficient that is very close to zero means an absence of correlation. Spearman’s rho of 0.324962, shown in Table 3, suggested the absence of relationship between the awareness of ICT tools and use of ICT tools among nursing students. There was not enough evidence to accept the null hypothesis. The awareness and use of ICT tools are shown in Figure 3.

Table 3

Correlation measure between awareness and use of ICT tools.

	Awareness & general Use	Awareness for nursing activity	Use of ICT tools and use for Nursing activity
<i>Pearson's</i>	0.361003	0.180922	0.422781
<i>Spearman's</i>	0.324962	0.031526	0.299627

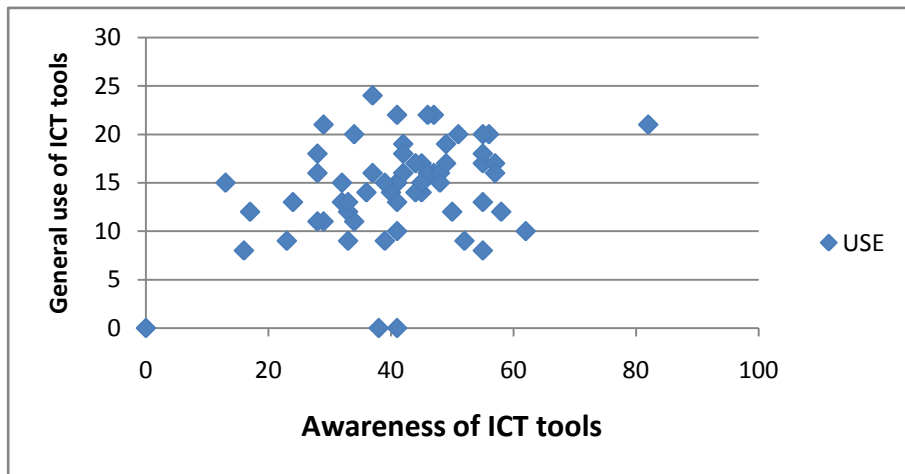


Figure 3. Scatter diagram showing the awareness and use of ICT tools.

Since  $n=62 \geq 10$ , t-test was used. By theory of one sample hypothesis testing for correlation, we use the test statistic

$$t = \frac{r_s}{\sqrt{(1-r_s^2)/(n-2)}}$$

$H_0$  was tested with t-test at a significant level of 0.05. Using 60 degree of freedom and 0.05 probability level, statistics calculator provided by Spearman's Rho generated a t-value:  $\pm 2.661595$ . Since p-value: 0.009965 (Table 4) was lesser than 0.05 and that the statistic value  $t$  fell in the rejection region, it was evident to reject  $H_0$  inferring that there is a significant correlation between awareness and use of ICT tools by the respondents of the study and to accept alternative hypothesis  $H_1$ .

Table 4

Results of sample hypothesis testing for correlation using Spearman's Rho.

	H1 <sub>0</sub> : Awareness & general Use		H2 <sub>0</sub> : Awareness and use for nursing activity		H3 <sub>0</sub> : Use of ICT tools and use for Nursing activity
<b>r=</b>	0.324962	<b>r=</b>	0.031526	<b>r=</b>	0.299627
<b>p</b>	0	<b>p</b>	0	<b>p</b>	0
<b>n</b>	62	<b>n</b>	62	<b>n</b>	62
<b>df</b>	60	<b>df</b>	60	<b>df</b>	60
<b>Sroot</b>	0.122093	<b>Sroot</b>	0.129035	<b>Sroot</b>	0.123168
<b>t</b>	2.661595	<b>t</b>	0.24432	<b>t</b>	2.432669
<b>a</b>	0.05	<b>A</b>	0.05	<b>α</b>	0.05
<b>t-cirt</b>	2.000298	<b>t-cirt</b>	2.000298	<b>t-cirt</b>	2.000298
<b>p-value</b>	0.009965	<b>p-value</b>	0.807817	<b>p-value</b>	0.017987
<b>Sig</b>	<b>Yes</b>	<b>sig</b>	<b>No</b>	<b>sig</b>	<b>Yes</b>

RQ2: Is the awareness of ICT tools associated with the use of ICT tools for specific purpose?

A correlation coefficient was used to test the null hypothesis (H2<sub>0</sub>). Spearman rho of 0.031526 shown in Table 4 suggested a no correlation between the awareness of ICT tools and the use in nursing activity among nursing students. As 0.05 is the usual p-value threshold for statistical significance, using ICT for nursing activity is statistically insignificant. This led to the acceptance of H2<sub>0</sub>. The awareness and use of ICT tools for nursing activity are shown in Figure 4.

H2<sub>0</sub> was also tested with t-test at a significant level of 0.05. Using 62 degree of freedom and 0.05 probability level, Statistics Calculator provided by Spearman's Rho generated t-value: ± 0.24432. Since the p-value (.02) is greater than than 0.05 and that the statistic value t was inside the acceptance region, H2<sub>0</sub> was accepted. At the 0.05 level, there was no significant correlation between the awareness of ICT tools and the use of ICT tools for nursing activity.

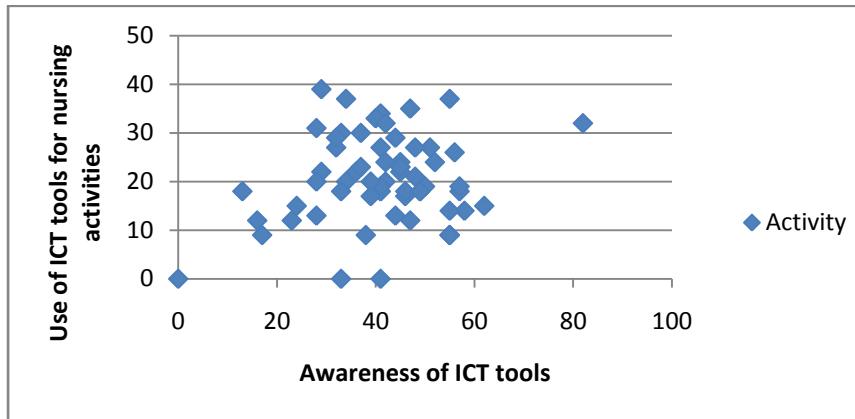


Figure 4. Scatter diagram showing the closeness of awareness of ICT tools and the use for nursing activities.

With the interest to gather nursing students interest on expressing their opinion and generate a discussion about face-to-face and telecommunication for nursing activity a small group of about 12 respondents of nursing students gathered in the moderated session. There were about six questions addressed to the participants of the focus group discussion. This could also support the evidence in the survey

FGQ1: Do you use the computers, mobile phone and the internet in your daily life? The group participants agreed that they used these ICT tools daily.

FGQ2: What do you think of those being engaged on the screen most of their free time? Some participants opinioned that the users engaged on screen communication would be busy or on emergency. Some even mentioned that they may want to show off their digital equipment to others. "I have a Smart phone with large screen so I watch movies....."

FGQ3: How do you feel like meeting and speaking with strangers everyday who are patients?

The respondents answered that it is their duty and hence, they boldy meet them and interact. Some said that they have a preference whom to answer and not based on the department they work. "As a profession I enjoy and it is a need....."

FGQ4: How do you feel like NOT meeting BUT speaking with strangers everyday who are patients by telephone?

The opinion generated were different, it was gathered that if they are trained how to go about they will be keen to talk to strangers. However, on a casual mode, they would talk to provide generic information.

FGQ5: How do you think you can achieve to provide remedy to the caller?

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Few respondents were of the opinion that that they can answer to the extent of the knowledge they have.

“I can identify the right consultant, talk to him and find the solutions and tell the same to the patient.”

FGQ6: How would you feel haivng provided a remedy to a patient over phone?

“ I will feel happy...”, “Will feel good to advice and feel nice as we may be in a position to save a patient’s pain.” “ It saves time, money and the confusion created at patient’s home or office.”

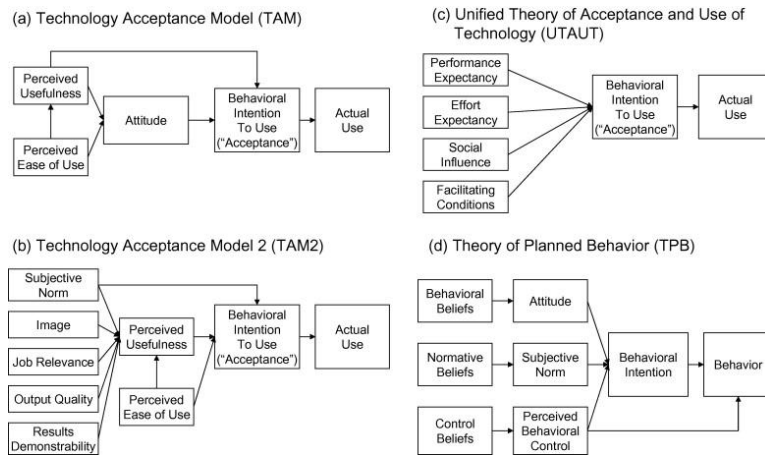
Thus, having gathered the readiness of the nursing students to practice telenursing, a consistent model that is proposed with a mix of TAM and SMAC (*SMACpulseTAM*) which might give wider and quick access to information and change in behaviorual intention. The most proximal antecedent to IT use is behavioral intention to use it (BI), and this is now commonly what is meant when one refers to acceptance (Davis, 1989, Mathieson, 1991, Sjana, 1996) although another common conceptualization of acceptance is end-user satisfaction (Brown,2002, Ives, 1983). This is where the Uses and Gratification theory plays its reasoning on consumer behaviour.

### **Technology acceptance models**

The concept of various strategies using technology as an alternative model is analyzed to arrive at a framework for Government hospitals to follow and to some extent that may perhaps achieve customer satisfaction. Some studies use early psychological models of behavior on which TAM was originally based (Fishbein M,1975, Ajzen I,1980, Ajzen I,1991). These models are the Theory of Reasoned Action (TRA), or, more often, its successor, the Theory of Planned Behavior (TPB). The antecedent to the use of Information Technology is behavioural intention to use it (BI), which refer to acceptance or end user satisfaction. BI is influenced by one’s attitude towards technology use with two dominants of attitude namely perceived usefulness (PU) and perceived ease of use (PEOU).TAM2 added a variable meant to capture the social influence (e.g., from colleagues or bosses) that compels end users to positively evaluate and accept IT, called subjective norm (SN). The Unified Theory of Acceptance and Use of Technology (UTAUT) was developed (Venkatesh,2003) to present an integrated view of user acceptance and usage of new technology. The models reviewed and integrated into UTAUT include TRA, TPB, TAM, TAM2, IDT, Motivational model, Model of PC utilization and Social



Cognitive Theory. UTAUT integrates four core determinants of intention and usage with up to four moderators of key relationships. The four key constructs, performance expectancy, effort expectancy, social influence, and facilitating conditions, affect intention to use. The key moderators in the model are gender, age, voluntariness and experience. The Theory of Planned Behavior (TPB) states that behavioral achievement depends on both motivation (intention) and ability (behavioral control). It distinguishes between three types of beliefs - behavioral, normative, and control. The TPB is comprised of six constructs that collectively represent a person's actual control over the behavior. The constructs are attitudes, behavioural intention, subjective norms, social norms, perceived power, perceived behavioural control. The Health Belief Model (HBM) derives from psychological and behavioral theory with the foundation that the two components of health-related behavior are 1) the desire to avoid illness, or conversely get well if already ill; and, 2) the belief that a specific health action will prevent, or cure, illness. Ultimately, an individual's course of action often depends on the person's perceptions of the benefits and barriers related to health behavior. There are six constructs of the HBM. Perceived susceptibility, Perceived severity, Perceived benefits, Perceived barriers, Cue to action, Self-efficacy.



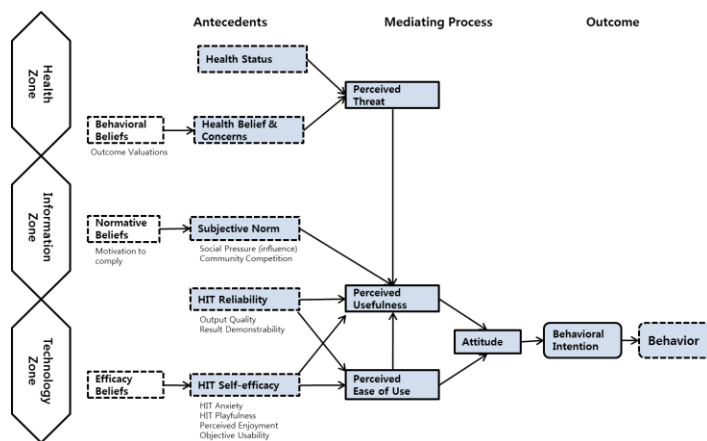
Source: Holden, Richard J and Ben-Tzion Karsh. (2009).

Figure 1: Illustration of TAM, TAM2 and UTAUT and TPB

There are five constructs in Health Information Technology (HIT) model namely health status, health belief and concerns, subjective norms, HIT reliability, HIT self-efficacy. The first two factors lead to a mediating process of perceived threat toward consumers' health. This leads to consumer determining the perceived usefulness of HIT, and in the case of positive interaction, it results in positive attitude, which leads to their behavioral intention. Subjective norm concerns social pressure within community. When health consumers discover a given HIT in social

## SMACpulseTAM

networking services or instant messaging, they are likely to perceive HIT as useful which leads to positive attitude resulting in behavioral intention. HIT-reliability is different as it lies both in the information zone and the technology zone. It can come from direct experience or from information gathered from other HIT consumers. This can lead to perceived usefulness, because a user who finds a given IT easy to use will generally perceive it to be useful. HIT-self efficacy leads to perceived usefulness and perceived ease of use which come from the consumer's confidence in using a given technology. The mediating process lead to positive attitude resulting in behavioral intentions.



Source: Kim, Jeongeun, Hyeoun-AePark(Sep-Oct 2012).

Figure 2: The Health Information Technology Acceptance Model (HTIM)

## SMAC

The disruptive technologies of social media, mobility, analytics and big data and Cloud (SMAC) will play a crucial role in enabling delivery models with these characteristics. For SMAC model to succeed, stakeholder need to collaborate to develop shared risk and reward delivery systems which can offer quick and affordable services to the patients at times of need and rush. With the convergence of disruptive technologies in society and businesses in specific, the stakeholders are becoming more alert, and technologies such as Social media, mobility, analytics and cloud computing are coming together to unleash unlimited opportunities for everyone. There are over a billion people who have registered to different social media networks in the world. Many of the companies use social media for customer service function. But of late it has been used in the sales and marketing functions enabling businesses to use data generated by the customers effectively to get more sales leads. In the hospitals it could be used in line with the function of customer

service functions in businesses(KPMG,2013). Mobile devices have created a new wave in communication among people who use networks for accessing digital content. Short Message Services (SMS) became such a hit that the new ways to integrate messages beyond just text have emerged. New applications can attach audio, photos and video to Instant messaging communication tools used in mobile devices. The mobile banking has become the most innovative products in the financial services industry. Shoppers have increased to use mobile applications for searching and buying goods and services. The government is also reaching out to the citizens for various services by text and voice alerts. In the government hospitals must look at this consumer behavior change and take the opportunity to connect to the patients in critical times for informing about preventive measures and about treatment for cure in the case of any epidemic using mobile applications. With digitization of business transactions, the emergence of big data has become a business opportunity for many. This chance for developing new customers and products or services by analyzing the big data appears as an unbeatable competitive advantage. The Government can give services directly to the citizens and it can also help in scenario building actions. The concept of cloud computing to support innovations and improve productivity has been accepted in the IT industry with their clients. Companies and Government opting for more security have opted for private cloud while health care and other retailers have chooses public cloud (Figure 3).

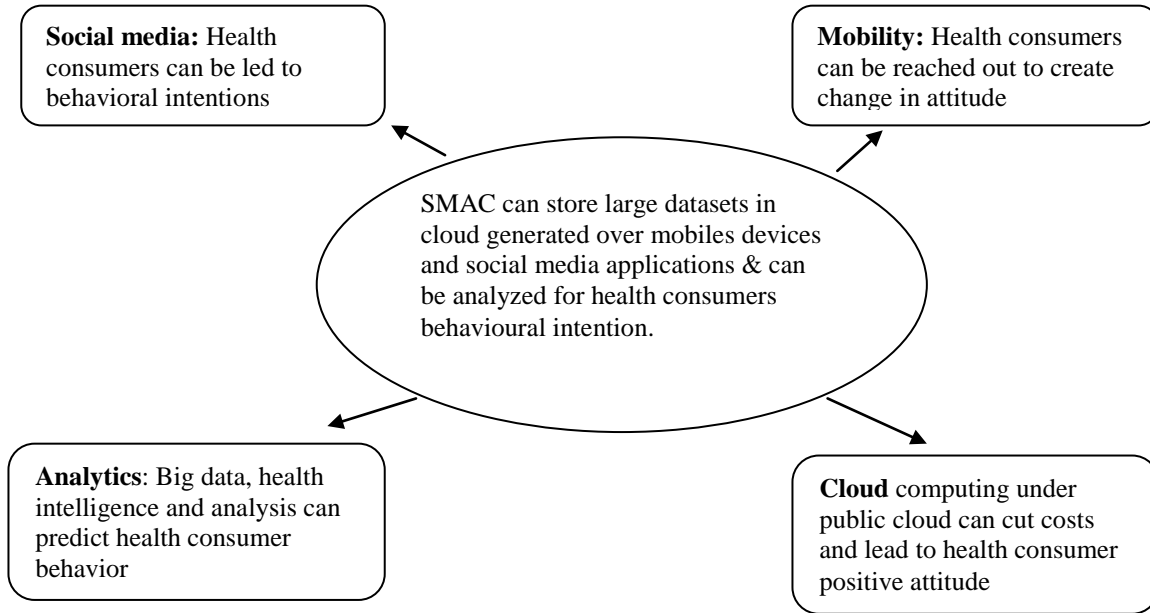


Figure 3: SMAC illustration of the conceptualized use in health care.

### SMACpulseTAM Model

Developing a model requires determining the interrelationships among the factors of health information by integrating various behavior and information technology theories. Additional antecedents and mediating variables were added to the hypothetical model, based on their theoretical relevance from the TAM, HIT and SMAC model. A critical examination was done based on the understanding of the principle *concept + construct = content*, thereby proposing the SMACpulseTAM model for the health care hospitals to test and measure the health consumer behavior to support telenursing.

A concept may have multiple dimensions and one dimension may have many constructs. Here, the concept relates to the use of social media applications over mobile devices to intervene at key moments—by sending text or audio or video messages to people who show symptoms of a specific ailment and reminding individuals who have opted to receive alerts to take precautions in any epidemic like in the case of H1N1 virus in Bangalore, the message can be wash your hands with soap and water frequently and thoroughly, ensure proper sanitation, sleep well and follow a nutritious diet and be physically active and talk to a doctor. When such a message is being transmitted, the health consumer behavior can be monitored by analyzing their attitude on using IT to continue to collect information for prevention or cure from genuine registered

sources. This will reduce their physical visits to the hospitals thereby creating more confusion and chances for spread of the virus to those who are tested H1N1 negative too. The constructs that could be included in this case are related to the ones available in TPB and HBM with added antecedents as technology smart applications (social media, mobile phones, computers, mobile applications, Instant messaging, short message services, simple analytical and search tools, and habituating to store and access information from the cloud), and patience that leads to behavioural intention. Construct validity can be done using survey, experiment or observations.

Content validity can be carried out to test the health consumer behavior on using technology for solutions based on the objectives of the study. The conceptualization validity and content validity can be measured by nominal, ordinal, interval or ratio methods.

## **CONCLUSIONS**

This study was set to identify the awareness level of ICT tools among the nursing students in Bengaluru. It was found from the survey that there is a variation in the level of awareness of ICT and the use of ICT tools for general purpose and also between awareness, use and use for communication in nursing activities. This result led to a focus group discussion to find out the reasons. It clearly supported the facts of the survey that majority are aware of ICT tools but have not ventured into experimenting to talk to people over telephone and provide medication to ailments for callers. Roger's(1995) Diffusion of Innovation Theory project that the majority of the respondents of the study are aware about the ICT tools used for communication resulting in their usage of the tools in general and for specific use. The Technology Acceptance Model(TAM) designed by Davis F (1989) show that there is an emerging need to communicate using ICT tools for nursing activities. It is recommended that the Union budget include a percentage of the healthcare expenses towards development of telenursing. Technology tools have been seen as a stress buster for many youngsters and it should be harnessed. The benefits of using these tools by the nursing community has to be promoted. The people who do not have access from remote areas must be given priority to have digital access for solving health problems though telenursing. It is recommended that the policy developed by both the government and the organization should be integrated with the department of health and information and communication technology. Appropriate training should be imparted to the nursing students. However, only the registered nurses should be allowed to practice telenursing.

## SMAC*pulse*TAM

The study also intended to find a solution to reduce the anxiety by health consumers to gain information related to prevention or cure for an ailment in times of epidemic diseases. It was decided to identify a model that would suit best in changing times with technological innovations in the environment. Having analyzed some of the best models related to use of technology for productivity that is in practice both in health care and business namely TAM, TAM2, TRA, TPB, UTAUT, HBM, HIT and SMAC a new model was perceived and proposed to be used by researches to test named SMAC*pulse*TAM. This is because based on the theory of diffusion of innovation, we notice that there is immense use of technology for communication and the level of trust and anxiety have increased in its presence or absence at different situations. When people are accustomed to use one type of technological tool, if they are satisfied they adapt to it and they find it easy to use. Once they achieve the level of easiness to use they will graduate to use other tools by which they experience the ease and convenience thereby concerting their attitude to behavioural change. SMAC has progressively increased productivity in businesses especially in marketing. People with smart phones have also adapted to change in communication by using multiple digital Identities(IDs). Hence, SMAC pulses the change in behaviour as in the process of TAM. The velocity of change is important innovations when we refer to Gorden E Moor's Law on the processing power of computers doubling every two year period(actually diminishing) which has led to multiple business opportunities with exponential growth. Future research can be carried out to test and validate SMAC*pulse*TAM in health care.

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