

Understanding the Factors Affecting Consumer's Acceptance of E-Healthcare Services

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Abstract: E-health platforms are fast becoming popular as they provide faster and hassle free services to the consumers and also proving to be time and cost effective. With the help of Technology Acceptance Model (TAM) present research is an attempt to study the elements attracting the consumers' technology adoption in healthcare and also to identify and propose a conceptual model. Primary data was collected from 298 respondents from the various private hospitals of Punjab and Union Territory using a questionnaire with five point likert scale. The exploratory and confirmatory factor analysis was done using AMOS 21. The factor analysis explored four factors which were named as Perceived usefulness, Perceived ease of use, Behavioral intention and risk. Model fit indices of the default model were chi-square degree of freedom-806.310/316, RMR-0.54, GFI-0.835, AGFI-0.803, NFI-0.896, TLI-0.926, RMSEA-0.07 suggest a good fit model. The study suggests the important factors responsible for technology acceptance for e-Health care consumers

Keywords: Acceptance, consumer, E-health, hospitals, technology

I. INTRODUCTION

Health is important for all and receiving trouble free health services is essential for the citizens of any country. Technology is said to improve the healthcare quality services, with the potential to expand healthcare access for the consumers in various ways. E-Health is now being established as a popular platform for the people of the country. This platform promises to provide faster and hassle free services to the consumers'. Health not only gives convenience, saves time and money but also enhances their knowledge and awareness to make them more health conscious. It is becoming a popular platform where consumers can collect information, explore the available options as well as share their experiences with others [1]. Since, using ICT in healthcare is comparatively newer in developing countries like India, it is essential to know the factors that impact the recognition of technology by the consumers before its proper implementation.

Revised Manuscript Received on September 25, 2019

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Evaluation of technology is important not only for the decision makers but also for the users [2]. Continuous promotions by the government and healthcare providers are attracting the attention of the healthcare consumers which has led to more and more people using technology in healthcare. Before the introduction of any new technology, we need to study the behavioral intentions as well as the attitude of the consumers. Although the use of technology has been realized by many, very little work has been done to understand its acceptance by the consumer. TAM is the most frequent and extensively established models for research into introduction of any new technology in various fields. Based on the theory of reasoned actions it was originally developed by Davis, (1985) [3]. This model states that the acceptance of the user for any new technology widely depends upon perceived usefulness and perceived ease of use. These factors could be used in our research work to know the behavior intentions of the patient's use of technology in healthcare services. We also need to study up to what extent and areas the patients are ready to use technology in their health services, and are they ready to accept treatment without even meeting the doctor.

II. REVIEW OF LITERATURE

TAM is a popular model to find the attitude of the user's in accepting technology, which specifies that certain factors impact the user's attitude towards accepting a new technology. As suggested by Davis, TAM is an individual's use of technology voluntarily or through his own intentions. Present day patients demand better services from health care providers, including access, immediate scheduling of appointments, access to their medical reports, additional time with doctors and littler waiting time [4]. TAM model has been usually accepted to understand user's acceptance of e-health care System [5]. As many patients/users are becoming tech savvy and also using more and more electronic communications (email, internet), they have also started demanding electronic services in health care [6]. Though the patient does not see IT in use, still it can have huge effects on the quality and efficiency of care [7]. The health care providers have a direct role to play in the implementation of new technology services [8]. There are also certain limitations of TAM model, Legris, Ingham & Colletette, (2003) [9]

pointed out self-reported use

data to be a subjective measure thus, unreliable in measuring the actual use of a system. Bagozzi, (2007) identified TAM as a deterministic model and an individual's act will totally be determined by his or her intentions to act [10] The intention may not be a representative of actual use of technology as the time period between intention and adoption would be influenced by other factors which in turn will influence an individual's decision in adopting a technology. Yarbough and Smith, (2007) & Holden and Krash, (2010) did a meta analytic review regarding the application of TAM in healthcare and identified variations amongst the sample and technologies applied [11],[5]. They also identified that a majority of studies has been conducted on a smaller sample and the absence of a uniform model of relationships between variables. The factors identified and included in the study have been discussed below.

A. Perceived usefulness and perceived ease of use

Perceived usefulness and perceived ease of use have been identified as prominent factors for technology acceptance. Perceived usefulness is defined as the degree to which a person believes that using a particular system would be helpful in enhancing his or her work performance [12]. Whereas Perceived ease of use refers to the extent to which a person believes that using a particular system would be effortless [12]. PU recognizes the belief of consumer that technology use will improve user's performance at work [13]. Though, TAM is a popular model in studying technology acceptance the dimensions of Perceived usefulness and perceived ease of use can be different in different organizations [14]. The frequency of using a technology increases if it is easy to learn and user friendly. It will also be more easily accepted by the consumers. Updating useful information on the website also creates a positive effect on the consumer's to further use that website [15]. User's having a higher perceived ease of use assumes a technology to be easy to use and keeps a positive approach. Whereas consumer's with a lower perceived ease of use keep a negative attitude towards the system [16].

B. Perceived Risk

Perceived risk is defined as some loss while expecting a desired result. It is an important factor for technology use in health care. Health information is a sensitive issue and consumers are always under risk of their personal health information being used for other purposes. Using any new technology creates a risk of loss [17]. Fear of risk may increase the degree of uncertainty to use the service. Consumers are expected to perceive more risk while purchasing online services and such risk anxious consumers are less likely to purchase online services [18]. Perceived information deals with searching information for products and services prior to making their purchase decisions [19]. Perceived risk has been categorized differently by different researchers i.e. financial risk, performance risk, Physical risk, psychological risk and social risks [20],[21]. However, the perceived risks may differ from organization to organization.

C. Behavioral Intention

Behavioral intention reflects the extent to which a person

proposes to purchase particular products or services [12]. Behavioral intentions play important role in consumer's actual buying behavior. Individuals having higher buying intention are intended to be more inclined towards any new technology acceptance [22]. Behavioral intention proves to be a major determinant of actual usage behavior. Enhancement of consumer's behavioral intention does not need promotion of value added services but instead focus should be on consumer's attitude. Adoption of any new technology needs study of behavioral intention [12]. Thus; to study the technology acceptance of the e-health Consumer's we need to study the behavioral intention of the consumer's choice of technology acceptance.

III. PURPOSE OF STUDY

The above review suggests that TAM and its modified versions have been used in healthcare frequently to study the attitude and intentions of the user, with most of them getting a positive result. While some of the authors have also highlighted the limitations of this model. However, more studies have been conducted on the technology adoption of healthcare providers'. E-healthcare adoption will require technology adoption to both healthcare providers as well as the patients. Fewer studies have been conducted regarding patients use of technology. We need to research the attitude of the patients, whether they are intended to use technology in health and if yes up to what extent. The purpose of the study is to identify the factors affecting the user's intention to use technology in health care and propose a conceptual model for the same. This study will help the service providers to design the services according to the perceptions and expectations of the users.

Two objectives were formulated for this study: To explore the factors associated with technology acceptance criteria in e-Health was the first objective and the second was to find the association of the explored factors with the technology acceptance criteria with the help of a model using SEM.

IV. RESEARCH METHODOLOGY

In this study a structured questionnaire was prepared based on the literature review which included 38 items in all. The statements included were modified depending on the area of study and further revised by experts working in the field of health management. The respondents had to rate the items according to their choice on a 5 point Likert scale (1-strongly disagree and 5-strongly agree) as it is thought to be the most reliable method of measuring the responses. A scale over five makes it difficult for the respondents to choose the right response [23]. Before the final survey was conducted, pretesting of the questionnaire was done from one of the private hospitals of Punjab and UT of Chandigarh. The final survey was done on the respondents of various private hospitals in Punjab and UT of Chandigarh. The universe of the study comprised of hospitals providing e-health care facilities, owned by private sector hospitals in the selected area. Data collection involved two phases, the first phase of data collection included identification of hospitals from various districts of Punjab and UT. The second phase included adoption of Non-Probabilistic convenience sampling



technique to ascertain various respondents from the waiting areas of different identified hospitals. While collecting the data it was ascertained that the respondent is aware and had knowledge about e-health care facilities. The final questionnaire was distributed to 330 respondents in the waiting areas of selected hospitals of UT and Punjab. The incomplete questionnaires were excluded from the study. The final sample comprised of 298 respondents. All the respondents included belonged to different categories of gender, age, income and profession

V. DATA ANALYSIS AND FINDINGS OF THE STUDY

The initial analysis consisted of exploratory factor analysis using SPSS software. The data reliability is checked by the value of Cronbach’s alpha (0.862), which is a widespread technique for defining reliability. The value of Cronbach alpha justifies the use of factor analysis on this data as according to Nunnally (1978), a reliability score of 0.60 and above is appropriate for factor analysis [24]. The corrected item total co-relation > 0.5 and inter item total co-relation is >0.3. Researchers suggests that values > 0.5 for corrected item total co-relation and inter item total co-relation are believed to be appropriate for scale reliability [25]. On applying factor analysis 27 items were found to be relevant in the questionnaire out of 33 variables. Only the items with factor loadings > 0.5 are included while the remaining items were deleted as their factor loadings were <0.5. Pearson’s Correlations coefficient is used to find the correlation between the variables which were found to be satisfactorily correlated and appropriate for factor analysis. The validity of the scale was tested by calculating the Kaiser Meyer Olkin (KMO) Measure of Sampling Adequacy (MSA) value which was found to be 0.847. KMO value >0.6 and p <0.5 are said to be appropriate for research. The Bartlett test of Sphericity was also found to be significant (p <0.5) with values $\chi^2 = 7466.729$, df = 351. Out of 27 variables four factors were extracted showing 73.48% of variance. The extracted four factors were named as F1 (Perceived Usefulness), F2 (Perceived ease of use), F3 (Behavioral intention), and F4 (Risk). Each factor had minimum five items based on the factor loadings and Eigen values greater than 2. i.e Perceived Usefulness (8 items) Perceived ease of use (7 items), Behavioral intention (7 items), and Risk (5 items) presented in Table 1 & 2. F1 (perceived usefulness) alone explains 21.4% of the total variance. With a reliability of 0.935 the loadings of this factor ranged from 0.764 to 0.905 with an Eigen value of 5.79. The results suggest that consumers are aware of the benefits of e-Health services and believe that e-Health will improve the quality of the existing healthcare services along with saving time and money. F2 (Perceived ease of use) alone explains 19.5 % of the variance with an Eigen value of 5.33. The factor loadings ranged between 0.757 to 0.947 and the variables suggest that consumers believe that e-Health services are easy to understand and use also the instructions given on health websites are easy to follow. F3 (Behavioral intentions), explains 18.35% of the variance with an Eigen value of 4.95. The factor loadings ranged between 0.765 and 0.878. The variables under this factor explain that consumers believe that the health care system has become more organized with the introduction of e-health services and they are intended to use these services provided they have the

necessary resources. F4 (risk) explains 13.90 of the variance with an Eigen value of 3.75. The range of the factor loadings lies between 0.795 and 0.908. The results suggest that consumers are also aware that health information is sensitive and involves various risks while using e-health services. Based on these four factors a conceptual model was developed to check the relationship of all factors with technology acceptance criteria.

S. No.	Table 1 : Factor analysis	
	Statements	Factor loadings
Factor 1		
1	e- Health will save a lot of time and money.	.905
2	E-health will help me to finish my work faster.	.899
3	The e-Health system addresses all the requirements of health care delivery	.868
4	Quality of health care services will improve.	.855
5	E-Health will provide greater control to patients.	.842
6	E-Health will improve the performance of health services	.835
7	More number of patients can be seen in a day by using e health care system.	.808
8	Without e-Health it would be difficult to get quality healthcare services.	.764
Factor 2		
1	Interaction with e-Health care is easy to understand	.947
2	It is easy to remember how to perform tasks under e-Healthcare system.	.939
3	It is easy to use the e-Health care system.	.886
4	I have to consult others while using e-Health services.	.866
5	Learning to use the system for e-Health services was easy	.846
6	It is easy to recover from errors I make while using e-health system.	.813
7	The instructions given by health websites are usually clear and easy to follow	.757
Factor 3		
1	I have the required knowledge to use e-health systems	.878
2	The necessary resources to use the system are available to me.	.865
3	Computerization has made the healthcare system more organized.	.856
4	Too much skill is not required to use the system	.855
5	I’m able to use my system for e-health services during my job.	.815
6	Using an electronic system during my work is under my control.	.811
7	Knowing the benefits, I will use the e-Health system.	.765
Factor 4		
1	The e-Health care system sometimes behaves in unexpected ways.	.908
2	Online services are sometimes frustrating.	.889
3	E-health care is not useful every time.	.886
4	There is more risk in e-health services as compared to other services.	.806
5	There is a risk to privacy in using e-Health services.	.795
	Kaiser-Meyer-Olkin Measure of Sampling Adequacy(KMO)	0.847
Bartlett’s Test of Sphericity	Approx. Chi Square	7466.729
	Df	351

	Sig.	.000
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Out of the total respondents 43.6% (130) were doing job, 28.5% (85) business and 21.8% (65) were students (Table 3).

Table 2: Factor Extraction Criteria

Scale	No. of Items	Cronbach alpha	Eigen value	% variance	Cumulative variance
F1:Perceived Usefulness	8	0.935	5.79	21.471	21.47
F2:Perceived Ease of Use	7	0.945	5.33	19.75	41.23
F3:Behavioral Intention	7	0.929	4.95	18.35	59.58
F4:Perceived Risk	5	0.912	3.75	13.90	73.48

Table 3:Demographic Analysis

Demographic Profile		Percentage	Frequency (n=298)
Gender	Male	69.8%	208
	Female	30.2%	90
Age	20-30 years	43.6%	130
	31-40 years	33.9%	101
	41-50 years	14.1%	42
	51 and above	8.4%	25
State	Punjab	40.3%	120
	Chandigarh	27.9%	83
	Others	31.9%	95
Education	10+2	20.1%	60
	Graduation	40.3%	120
	Post-Graduation	32.2%	96
	above	7.4%	22
Occupation	Business	28.5%	85
	Service	43.6%	130
	Student	21.85%	65
	Any Other	6%	18

Depending upon the explored factors the following hypotheses were framed (Figure 1):

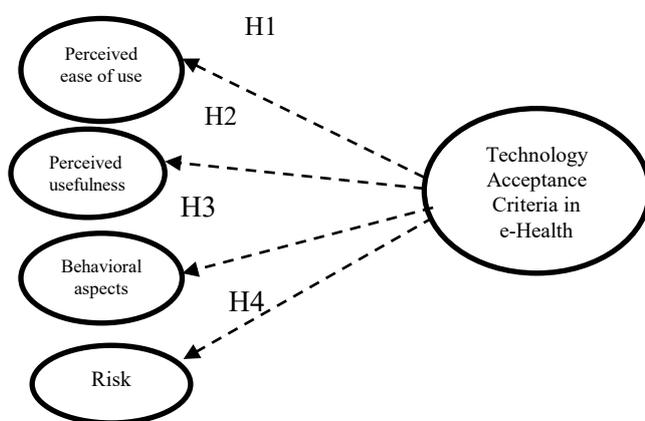


Fig. 1. Conceptual Model

- H1: Perceived ease of use is positively associated with technology acceptance in e-Health.
- H2: Perceived usefulness is positively associated with technology acceptance in e-Health.
- H3: Behavioral intention is positively associated with technology in e-Health.
- H4: Risk has a negative association with technology acceptance in e-Health.

A. Demographic Analysis

Out of 298 respondents, majority 70% (n=130) are males and 30.2% (n=90) are females as usually the ratio of male patients/attendants in the waiting areas of the hospital is usually more than the females. Analysis of the region to which they resided shows that 40.3% (n=120) belonged to Punjab, 27.9% (n=83) belonged to Chandigarh and 31.9(n=95) belonged to other states. Analyzing the age of the respondents it was found that majority of respondents 43.6% were in the range of 20-30 years as this group was more aware and using e-Health.33.9% belonged to 31-40 years of age and 14.1% belonged to 41-50 years of age. Very few respondents (8.4%) belonged to the age group of 51 years and above as the people of this age mostly denied to be aware of e-Health, though majority of the patients in the hospital belonged to this group.

B. Confirmatory Factor Analysis

To find the association of different factors with the technology acceptance criteria, Structure Equation Modeling (SEM) using AMOS 21 was used to develop a model. As suggested in the literature, the model fit is assessed by indices like Comparative Fit Index (CFI). The goodness of fit Index (GFI) - The GFI calculates the fit of the model equated to other models, Normed Fit Index (NFI) -measures the value of the model by which it has improved in terms of the fit, Root Mean Square error of Approximation (RMSEA) -It gives information regarding inconsistency for the degrees of freedom for the model. The accepted fits for GFI, NFI, RFI and CFI are 0.90. The model’s Chi - square value was 806.310 with 316 degrees of freedom, which are signifying a good fit model. As the Chi-square value is quite sensitive to sample size, indices like GFI, NFI, RFI and REMSEA were further tested. Initially, the values of the default model were not fit as per the given guidelines. Thus, it required necessary modifications depending on the modification index, standardized residual values and regression weights which helped us to achieve the required fit indices in this model. The model fit indices of the accepted default model have been shown in Table 4.

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(65) were students (Table 3).

C. Hypothesis Path Testing

After the analysis, the entire hypothesis discussed earlier in the conceptual model, have shown a positive association with technology acceptance criteria, with significant values of H1, H2, H3, and H4 $p < 0.05$. Thus, the analysis supports the entire hypothesis. The values of the results obtained are shown in Table 4.

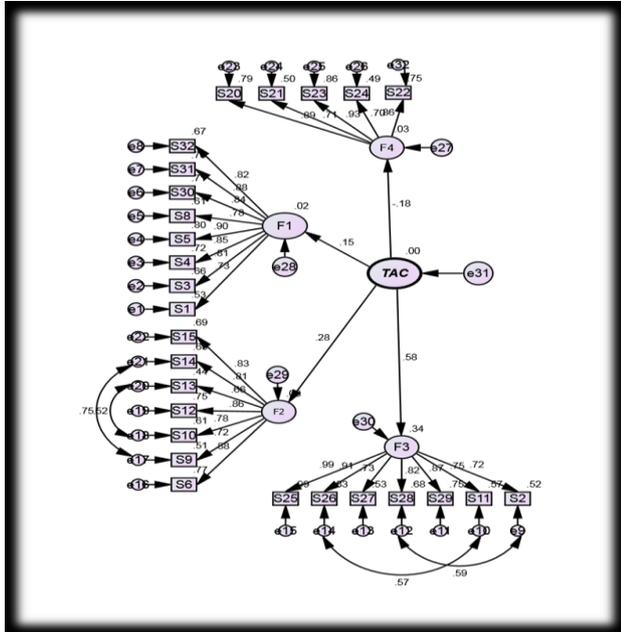


Fig. 2. Default Model

Table 4 : Model Fit Indices

Name of Indices	Default model	Data fitting of the model
Chi square/degree of freedom	806.310/316=2.55	Good Fit [value should be less than 3]
RMR [Root Mean Square]	0.54	Good Fit, should be less than 0.08
GFI [Goodness of Fit]	0.835	Not a Good Fit [should be greater than 0.90]
AGFI	0.803	Not a Good Fit [should be greater than 0.90]
NFI	0.896	Good Fit [should be greater than 0.90]
RFI [Relative Fit Index]	0.884	Good Fit [should be greater than 0.90]
IFI [Incremental Fit Index]	0.934	Good Fit [should be greater than 0.90]
CFI [Comparative Fit Index]	0.933	Good Fit [should be greater than 0.90]
TLI	0.926	Good Fit [should be greater than 0.90]
RMSEA [Root Mean Square Error Approximation]	0.072	Good Fit [should be less than 0.08]

In the default model (Figure 2), the regression weight for behavioral intention is maximum (0.58) which suggests that the behavior of the person or the intention to use technology will have the maximum effect on an individual’s decision to use the technology. The regression weight of perceived ease of use is 0.28 followed by perceived usefulness (0.15). Risk is negatively correlated with technology acceptance criteria with a regression weight of - 0.18. which suggests that if there is more risk people hesitate to use technology in healthcare (Table 5).

Hypothesis	Regression weight	Standard Error	P Value
H1: Perceived Usefulness is positively associated to Technology acceptance criteria	0.151	0.269	***
H2: Perceived ease of use is positively associated to Technology acceptance criteria.	0.277	0.549	**
H3 : Behavioral aspects are positively associated to Technology acceptance criteria	0.584	Reference point	***
H4: Risk is negatively associated to Technology acceptance criteria	- 0.181	0.384	**
P<0.05			

D. Discussion and Significance of the Study

Consumers are more aware with technology use and have thus become more demanding [26]. TAM remains a popular model to study technology use in different fields. To examine factors affecting user’s intention to use technology in e-health services this research has helped in developing an integrated model. This study supports the acceptance of technology in healthcare by the consumers and justifies the relationship between various factors and technology acceptance criteria for consumers. It is observed in the initial analysis that technology acceptance is mainly popular amongst the younger generation between 20-30 years. People of more than 50 years of age were either unaware of the e-health services or did not have the intention to use them. In these study behavioral aspects has emerged as the most important criteria in technology adoption of the consumers. This is similar to the results obtained in the study done in Portugal, where behavioral intention had a significant effect in Electronic health record patient portal adoption by the consumers [26]. Every aspect of online health is different and various factors influence a consumers decision in adopting a technology or not [27]. The research model of this study explains that the key determinants of technology use for e-health consumers are perceived ease of use, perceived usefulness, behavioral intentions and risk. This study confirms that for the consumers technology acceptance depends on ease of use and perceived usefulness along with behavioral intention. The model highlights that risk may have a negative effect on any new technology acceptance for healthcare consumers. The results of perceived risk are similar to other studies which suggest a negative effect on the consumers for using any new technology. The results of this research signify that behavioral intentions have come out to be the most important determinant, with the largest regression weight of 0.58. followed by ease of use. Perhaps, healthcare consumers feel that they will be inclined towards any new technology if they are fully aware of the advantages of that technology. Thus, to attract the consumers in using e-Health services the e-health providers as well as website developers need to focus more on behavioral intentions of the consumers. Further results suggest that perceived ease of use



is more important for the consumers as compared to perceived usefulness regarding e-Health services. This research has practical implications in the development and use of healthcare websites. Thus, service providers must focus on developing and providing simpler technologies which are user friendly and easy to learn. E-health service providers should clearly reveal their privacy policies on their websites and should take proper measures to secure consumer's personal health information; this would help in increasing the confidence of the consumers in e-health services and would lead to improvement of better websites. The study is useful for the e-healthcare providers as it suggests that it is important to generate a positive usage towards a technology before it is implemented.

LIMITATION

Certain limitations are also associated with this research, as it has been conducted on selected private hospitals and only those respondents using e-health services have been selected, also the major category of respondents belong to the younger age group as they are more inclined towards technology use. The study sample consists of 298 respondents and the results are based on the opinions and responses of these selected respondents only. However, the responses may vary if a larger sample size is chosen from other categories of hospitals including public hospitals belonging to the higher age group.

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