

Psychological Factors Affecting Consumer's Adoption of Health Apps for Enhanced Healthcare Management

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Abstract

The broad assortment of health apps available are soon using up space on the covers of every smartphone owner. This study aims to identify the factors responsible for consumers' adoption of health apps which involved a questionnaire based survey among the consumers of health apps. A stepwise regression analysis in SPSS software identified Perceived Usefulness and Perceived Benefits to be the most important factors for consumers' adoption of health apps. It proposes that consumers will not use health apps till they feel the need to utilize them for better health management. This survey gives important managerial implications for health app developers and managers in creating better marketing efforts for increased usage of their apps.

Keywords: Consumers, Health Apps, Perceived Usefulness, Perceived Benefits

1. Introduction

The wide spread use of smart phones have also brought a huge number of applications with it. Diverse applications are available not only to manage our daily activities but also our health. Health apps have the potential to influence both the efficiency as well as quality of healthcare (Bates et al., 2018) services Influenced from various other industries thousands of health, wellness and medical apps are available. These apps have become the latest trends in managing our health and have popularly emerged into a new branch called m-health. The availability of a number of health apps has made it easier for the consumers to assess the right time to consult the physician and adopt healthy living practices. Several health apps are

available for monitoring of vital records of the patients to manage chronic diseases. But despite several efforts people also face problems in accepting such apps. The fast adaptation of health apps can often contribute to replacing a doctor, self-diagnosis and frequently might lead to wrong diagnosis. Seeing the number of availability of these apps, its actual benefit in providing quality health care services is yet to be realized. Besides, a huge gap exists between the number and types of apps being developed and the type of apps required by the consumers (Bates et al., 2018). We need to assess the various factors which influence the consumer's decision in adoption of health apps and their preferences in adopting them. Before the initiation of any new

technology, we need to consider the behavioural intentions of the users to use this technology. TAM is one of the most popular and frequently used models for research into new information technology adoption. Developed by Davis, (1985) this model has its origin from the theory of Reasoned Actions. Adoption of any new technology by the user depends mainly upon two factors, perceived usefulness and perceived ease of use. A number of Psychological factors are responsible for the consumer's adoption of technology. Psychological factors are those factors that affect an individual's mind to do an action. Different models can be used to study the psychological factors responsible for consumer's adoption of technology in enhanced health management. Meyers, (2003), observed that modern day patients believe better services from doctors, along with easy admission, timely intimation of appointments, right to their medical records, improved patient doctor relationship with no waiting time. Use of health apps can play a major role and help in meeting some of the requirements of the consumers. The health Belief model (HBM) believes that a consumer will not take a decision to take any health action until he is psychologically prepared to do so (Cummings et al, 1978). This model believes that an individual will act only if they feel threatened about their health (Tarkang and Zotoro, 2015).

2. Review of Literature

A huge variety of health apps are available in the market but only few cater all the needs of the consumers (Singh et al 2016). Iturriaga, (2012) described smart phones as movable systems which enable users to undertake everyday jobs somewhere, at any hour of the

day, are importantly cheaper than personal computers and can be easily transported anywhere. Similarly, Hadel, (2011), analyzed that mobile app had tremendous potential to play a significant role in patient education and disease management, delivering easy tracking, motivational sophistication and disease adherence. Many doctors along with supplementary health care workers are also adopting the use of health apps as part of their professional practice (Buijink, 2013). Smartphones can be used as an inimitable source of knowledge and as healthcare management tool which provides information strategies and training skills related to patient self-management and their approach to health and wellness (Hadel, 2011). Smartphones are like having a doctor in your pocket due to the handiness of the self-diagnostic apps used most commonly by the people, but apps required by the consumers despite the availability of such self-diagnostic apps the process of diagnosing is technically, administrative and legally the preserve of doctors Lupton and Jutel (2015). The negative impacts of Smartphone usage have also been addressed by some of the researchers (Kreiger, 2013); Lupton, (2014a, 2014b) emphasized that not much is known regarding the promises made by these apps are being fulfilled and up to what extent. Whether these apps provide safe medical information and advice can only be found by reading through the comments and reviews, as no regulatory body has been assembled for vetting these medical technologies. Yarbrough & Smith, (2007) proposed a modified version of the TAM model, to identify barriers to technology acceptance. TAM is addressed as a deterministic model and an individual's deed will be governed by their own intentions to act. Various factors have been found to

affect the adoption of any technology (Bagozzi, 2007).

As per the Technology Acceptance Model (TAM), Perceived ease of use (PEOU) is the amount to which the user relies that using the system will be effort less and Perceived usefulness (PU) is the degree to which user relies that the system use will be helpful in enhancing their performance. Perceived usefulness and perceived ease of use are recognized as prominent factors for technology adoption. User's with an advanced perceived ease of use accepts a technology to be easy for usage and keeps a positive attitude. Whereas, consumers with a lesser perceived ease of use adopts a negative attitude towards the system. Venkatesh and Davis (2000) analyzed the effect of social influence in the extended model of TAM. Social influence is the degree to which an individual believes that since others known to him are using a technology, they should also use. (Martin and Herrero, 2011). Previous studies have proved that adoption of technology has an effect of social influence (Beldad and Hegner, 2018). Perceived health threat refers to patients awareness regarding his health (Duo et al, 2017). Perceived benefit is an individual's decision on the usefulness of changing a behaviour to avoid the risk of developing a disease. It plays a significant role in preventive behaviour (Champion and Skinner, 2008; Gates, 2015). Perceived benefits are believed to perform the target behaviour in the positive direction and emerge as the strongest predictors of behaviour (Carpenter, 2010). However, the constructs of Health belief model vary in different fields in their prediction of behaviour. Patient doctor relationship is important for the adoption of any healthcare technology as doctors have a significant role to play in the

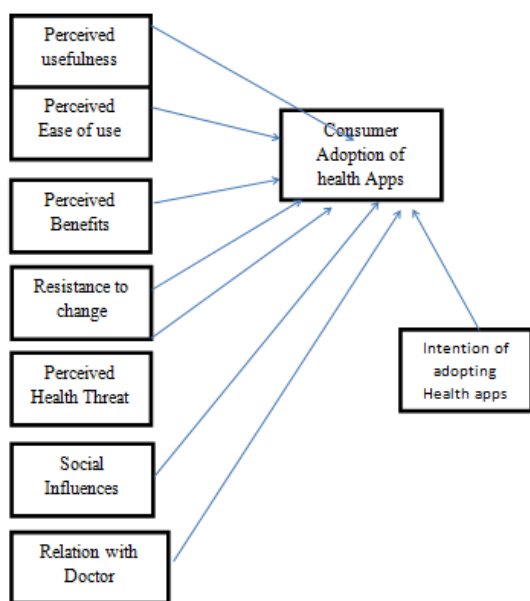
management of chronic diseases (Kaplan et al, 1989; Dou et al, 2017)

3. Significance of Study

The intensification of internet has given consumers the opportunity to be more participative in their health care decisions. Smartphones are playing an important role in it and have a huge potential to boost the e-healthcare industry. A lot of research is being done in relation to health apps. There is less research regarding the awareness level of health apps of the people of India and their extent of using them. The easy availability of more than 100,000 apps some areas need to be explored further, like the awareness regarding health apps, consumer's choice of health apps and the factors responsible for choosing health apps and up to what extent are they useful for them. Several studies have been done on Technology Acceptance but few have been done on the consumer acceptance of health apps.

The intention of the study is to make a theoretical model and predict the factors that influence consumer's adoption of health apps in better health management. A theoretical model (Figure 1) was developed based on the technology acceptance model and health Belief model. The factors which were thought to influence the minds of the consumers were included in the theoretical model from various sources. Based on the theoretical model, hypotheses were framed.

Figure 1: Theoretical Model



H1-Perceived Usefulness influences consumer's decision to adopt health apps.

H2-Perceived ease of Use influences consumer's decision to adopt health apps.

H3-Perceived benefits influence consumer's decision to adopt health apps.

H4-Resistance to change influences the consumer's adoption of health apps.

H5-Perceived Health Threat influences the consumer's adoption of health apps.

H6-Social factors influence consumer's decision to adopt health apps.

H7-Relation with Doctors influences consumer's decision to adopt health apps.

4. Research Methodology

To achieve the objectives of the proposed model a self-administered questionnaire was designed. The pilot study helped in identification of the important items to be included in the questionnaire. The inclusion of the items under various factors was further discussed with the experts in the area. The questionnaire comprised of three parts. The first part consisted of demographic information of the respondents. The second part included initial questions regarding the

preferred category of health apps, frequency of using health apps and basis for selection of health apps. The items included in the third part of the questionnaire were relevant for technology adoption of the health apps of the consumers and distributed amongst the respondents sitting in the waiting halls of various public hospitals identified in different districts of Punjab. Each variable was measured on a five point Likert scale, where "1" represented strongly disagree and "5" represented strongly agreement. Only those respondents were selected which agreed to be aware of health apps and were using at least one app or had used in the past for their health management. More than 300 questionnaires were distributed of which 263 were returned back. Incomplete questionnaires were rejected and the final analysis was conducted on 237 questionnaires. The analysis was done using SPSS software.

5. Results

5.1 Analysis of the First and Second Part

The Demographic analysis of the respondents revealed that out of the total 237 respondents 74.3% (176) were males and 25.7% (61) were females. Most of the respondents 46% (109) belonged to the age category of 20-30 years. The respondents belonging to the age category of 31-40 years were 31.2% (74) and 14.3% (34) belonged to the age category of 41-50 years, while 8.4% (20) were found to be above 51 years of age. The analysis of the educational level of the respondents shows that 45.1% (107) are graduates, 27.4% (65) were post graduates while 20.7% (49) had qualified twelfth standard. Only 6.8% (16) of the respondents were having qualifications above post-graduation.

The second part of the questionnaire included questions regarding category of health apps used by the respondents, frequency of health apps used and the respondents criteria for the selection of health apps. The analysis revealed that 35.4% (84) respondents were using preventive/wellness apps while 25.3% (60) used apps to find a suitable doctor, 21.9% (52) respondents were using apps for self-diagnosis and 17.3% (41) were using apps for knowledge or information. The analysis of the frequency of using health apps revealed that most of the respondents 53.6% (127)

used health apps only sometimes and 15.6% (37) of the respondents had used them rarely. However, 30.8% of the respondents agreed to be regular users of health apps. In response to the criteria for selecting health apps 40.9% (97) agreed that they selected the health apps on the basis of the popularity or the ratings of the app and 34.6% (82) selected health apps after consultation with their doctors. Apps suggested by friends were used by 19.8% (47) of the respondents, while 4.6% (11) selected apps on the criteria of being paid or free. The results are shown in Table 1.

Table 1: Initial Information Regarding Health Apps

Category of Health Apps used		Frequency N=237	Percentage%
	Preventive/wellness	84	35.4
	Self-diagnosis	52	21.9
	To find a suitable doctor/facility	60	25.3
	Knowledge/information after diagnosis	41	17.3
Frequency of Using Health Apps			
	Regularly	73	30.8
	Sometimes	127	53.6
	Rarely	37	15.6
Selection Criteria of App			
	After doctors consultation	82	34.6
	Popularity/Rating	97	40.9
	Friends suggestion	47	19.8
	Paid/Free	11	4.6

5.2 Analysis of the 3rd Part

Exploratory factor analysis was conducted on the data of 237 respondents using SPSS software. The data reliability is determined by the value of Cronbach's alpha of each factor (Table 2) which was found to be more than 0.7 for all the factors. The assessment of

Cronbach alpha validates the application of factor analysis on this data as according to Nunnally (1978), a reliability score of 0.60 and above is appropriate for component analysis. Only the items with factor loadings > 0.5 are retained and the remaining items were scored out as their factor loadings were

<0.50. The Eigen value of each factor was also found to be more than 1. The strength of the scale was examined by calculating the Kaiser Meyer Olkin (KMO) Measure of Sampling Adequacy KMO value >0.6 and up <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 $\chi^2 = 4701.224$, DF = 406. Out of 29 variables eight factors were extracted showing 78.495% of variance. The results of the exploratory factor analysis are shown in Table 3.

The strength of affiliation between Consumer's adoption of health apps and explored factors is analyzed by regression analysis. To identify the top predictors of Consumer's adoption of health apps. In this model seven dimensions served as independent variable and consumer's intention served as the dependent variable. The analysis shows that two factors namely Perceived usefulness and Perceived benefits are the significant predictors of consumer's adoption of health apps. Table 4 reports the strength of affiliation between the model and the dependent variable. The table shows R, R² and adjusted R² and the standard error of estimate. The multiple correlation coefficients (R), is the linear correlation amongst the observed and model-predicted values of the dependent variable, have a high

value. Its large value indicates a strong affiliation between the two constructs. The coefficients of determination (R²), is illustrated in Table 4. It is found that Perceived Usefulness and Perceived Benefits cause 35.9% of the variance in Consumer's adoption of health apps.

Table 5 recapitulates the analysis of variance. The ANOVA table is to test the acceptability of the model from a statistical standpoint. The significance value of the F statistic is less than 0.05, which means that the variation explained by the theoretical account is not due to chance. It can be perceived that the consumer health app adoption has a good fit with the model (adjusted R² = 0.359). A closer inspection of the outcomes in Table 6 displays that the vital explanatory variables, namely Perceived Usefulness and Perceived benefits are important predictors of Consumer adoption of health apps. Whole of the coefficients are in the probable course, and Perceived benefits have the uppermost Beta coefficient (0.466). Hence, it is concluded that 46.6% increase in Perceived benefits will ensue in 100% gain in Consumer adoption of health apps. It stands for that consumer acceptance of health apps will improve if perceived usefulness and Perceived benefits improve.

Table 2: Cronbach Alpha Values of Different Factors

Variables	No. of Items	Cronbach Alpha value	Eigen values	Percentage Variance	Source of Variables
Perceived Usefulness	5	.926	3.893	13.425	Dou et al (2017), Venkatesh, & Davis (1996).
Perceived Ease of Use	4	.936	3.637	25.967	Venkatesh, & Davis (1996).
Perceived Benefits	4	.763	3.418	37.754	Capik and Gozum (2011)

Resistance to Change	3	.911	3.159	48.646	Dou et al (2017)
Perceived Health Threat	4	.903	2.593	57.588	Dou et al (2017)
Social Influences	4	.890	2.288	65.479	Dou et al (2017)
Relation with Doctors	2	.760	2.110	72.754	Dou et al (2017)
Intention of adopting health apps.	2	.734	1.665	78.495	Dou et al (2017)

Table3: Exploratory Factor Analysis

Exploratory Factor Analysis								
	Component							
	1	2	3	4	5	6	7	8
S1_Health apps give me the confidence	.892							
S2_Health apps will help save a lot of time and money.	.882							
S3_Health apps will address my needs	.869							
S4_Overall health apps are useful.	.854							
S5_Health apps will reduce my hospital visits.	.854							
S6_My friends always prefer using apps.		.869						
S7_The slow network affects my decision of using apps.		.854						
S8_Doctors often suggest using some apps.		.845						
S9_I feel more and more people should use apps.		.838						
S10_Huge no. of apps are available.		.776						
S11_Learning to use health apps will be easy.			.958					
S12_It's easy to monitor my health.			.933					
S13_health apps will be beneficial for me.			.871					
S14_Health apps will help me take better care of my health			.864					
S15_Health apps may sometimes delay medical advice.				.924				
S16_I am aware of my health condition.				.906				
S17_I would make efforts to manage my				.894				

health in a better way.								
S18_I am concerned about my health.				.784				
S19_It requires a lot of mental effort while interacting with e-Health system.					.918			
S20_It is frustrating to use e-Health services.					.912			
S21_I have to consult others for selecting apps.					.906			
S22_health apps will make my work easier						.893		
S23_People who help me in my decisions think that I should use e-Health services.						.890		
S24_I feel health apps often mislead people.						.756		
S25_If given the opportunity I will use health apps.							.820	
S26_I would consider continuous use of health apps.							.791	
S27_Overall e-Health apps are very useful for me.							.728	
S28_I trust the doctors most regarding my health.								.892
S29_In case of any health problem I consult my doctor.								.887

Table4:Model Summary: Consumer Adoption of health Apps

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.515 ^b	.365	.359	1.48398
a. Predictors: (Constant), MF3				
b. Predictors: (Constant), MF3, MF1				

Table 5: Consumer Health App adoption

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	185.989	2	92.994	42.228	.000 ^c
	Residual	515.311	234	2.202		
	Total	701.300	236			
a. Dependent Variable: MF8						

b. Predictors: (Constant), MF3(Perceived Benefit)
c. Predictors: (Constant), MF3, MF1(Perceived Usefulness)

Table 6: Stepwise Regression Analysis: Consumer Health App adoption

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	2.416	.592		4.080	.000
	MF3	.181	.022	.466	8.211	.000
	MF1	.041	.015	.156	2.748	.006
a. Dependent Variable: MF8(Consumer Intention)						

6. Discussion

The examination of the demographics suggests that health apps are primarily widespread amongst the young generation of 20-40 years of age as this age category is mainly using smart phones and more aware of different health applications. The initial questions regarding health apps suggests among the different categories of health apps ,preventive/wellness apps is the more favourable category as compared to other apps.This could be because such apps do not involve any type of consultation, hence preferred more. The ratings of the apps and their popularity being the most preferred criteria of app selection suggests that consumer's believe in ratings of the apps more as compared to other things.

In the second part of the analysis Perceived usefulness has emerged to be the important criteria for consumer adoption of health apps. The results are analogous to various other studies.However, Percieved ease of use, which has been an important criteria for various other studies has not emerged to be important for consumer's health app adoption, which is comparable to the results of the study done by Dou et al.(2017).as the

participants were already using health apps could be the possible reason for it being unimportant. Perceived benefits being the most important further proves that consumers will not use health apps till they feel the need to use them for better health management. The rest of the factors like Perceived ease of usefulness, Resistance to change, Perceived health threat, Social Influences and Relation with doctor do not show any significance with the model of consumer's adoption of health apps.

7. Research Implications and limitations

This study has been successful in predicting the factors which are most significant in adoption of health apps by the consumers. This gives important managerial implications for the health app developers as it gives them insight to market their apps in a way which will make the make the consumers to feel the need to use those apps. The study has certain limitations as the data has been collected from a small area of selected hospitals. The results might differ if conducted on a larger population.

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