JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Investigating the factors affecting the acceptance of Telemedicine services among consumers in India in the post COVID era using the TAM Technology acceptance model.

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Abstract: Social distancing has become a new normal after the outbreak of COVID 19, which made online services more relevant than ever. Yet many health care service providers are still struggling and in a dilemma whether telemedicine as a service is acceptable among the patients or not. Present research aims to study the impact of all factors affecting the acceptance of telemedicine services in India using the TAM.
Objective of the present work is to investigate the factors affecting the adoption of telemedicine among consumers in India using TAM, and Study the importance of extended TAM model by using standard TAM factors like perceived usefulness, perceived ease of use, user satisfaction with three more factors to is which are Trust, Context, and Personal Initiatives and Characteristics.
In this research survey method is used. The primary data collected from the users through a questionnaire covering all aspects of each factor responsible or covered under the TAM model.Study concluded that all the variable have positive influence but "Perceived usefulness" has the highest impact on "Behavioural intention to use" of the user for Telemedicine services.

Key Words: TAM, Telemedicine, Perceived Ease of Use (PEU), Perceived Usefulness (PUS), Behavioural Intention to use (BIU), Trust (T), Context (C) and Personal Initiatives and Characteristics (PIC) .

Introduction

Social distancing has become a new normal after the outbreak of COVID 19, which made online services more relevant than ever. Yet many health care service providers are still struggling and in a dilemma whether telemedicine as a service is acceptable among the patients or not. Various studies are conducted in different countries to study the same using the technology acceptance model. Doctor-population ratio recommended by WHO is 1:1000 but in India the current doctor population ratio is only 0.62:1000. Training of new physicians is time consuming and expensive, hence the doctor to patient ratio can be expected to remain low for a long time to come. This deficit is partly being made up by the active telemedicine services in various parts of the country. In India usage telemedicine service is still unacceptable by most of the population.
Present research aims to study the impact of all factors affecting the acceptance of telemedicine services in India using the TAM. These factors are considered in the study as already studied or considered in previous studies which are conducted in other countries or are conducted in different context.

TAM or Technology acceptance model is one of the most important and widely accepted model to study the acceptance of a technology among the consumers by identifying and studying the impact of various factors which are responsible for the acceptance or adoption of a new technology in the market. Among various models available in the market , TAM, which is the extension of the theory of reasoned action (TRA) is one of the widely accepted model to study the impact of various factors

on the consumers which results in the adoption of technology among the consumers. There are three primary factors in TAM which are perceived usefulness, perceived ease of use and Behavioural Intention to use. Here is our model we are adding three more elements into the model after investigating a similar study done for a different type of technology but in the similar model. Those three factors are, Trust, Context, and Personal Initiatives and Characteristics.

Table 1 : Definition of each factor considered in the model

Factor	**Definition**	**Reference**
Perceived Ease of Use	*The extent to which a person believes that using a particular system would be free from effort.*	*[6]*
Perceived Usefulness	*The degree to which a person believes that using a particular system would enhance his or her task.*	*[6]*
Behavioural Intention to use	*The user's likelihood to engage in telemedicine services*	*[1]*
Trust	*The user's beliefs or faith in the degree to which a specific service can be regarded to have no security and privacy threats.*	*[2]*
Context	*Any information that can be used to characterize the situation of entities (i.e., a person, place, or object) that are considered relevant to the interaction between a user and an application, including the user and the application themselves.*	*[6]*
Personal Initiatives and Characteristics	*The user's willingness to experiment with new services.*	*[6]*

In addition to how the quality of healthcare services from online platforms can be ensured, it is also important to understand what customers are looking for and how can a service provider make sure that the customer adopts the telemedicine services willingly and remains confident while trusting the platform in the same manner as they were while going for physical healthcare facilities. Although TAM was originally proposed to study the acceptance of IT services and hence researchers were reluctant to approve it for other technologies but since last few years we have found that various quality researches were conducted using the same model to study the acceptance of other technologies and even the telemedicine acceptance in other countries using standard TAM model.

Since some new factors were added into the original TAM model or the standard TAM model previously utilized by the researchers in various studies, hence we will try to build the construct here and explain the overall idea to utilize the model in this study:

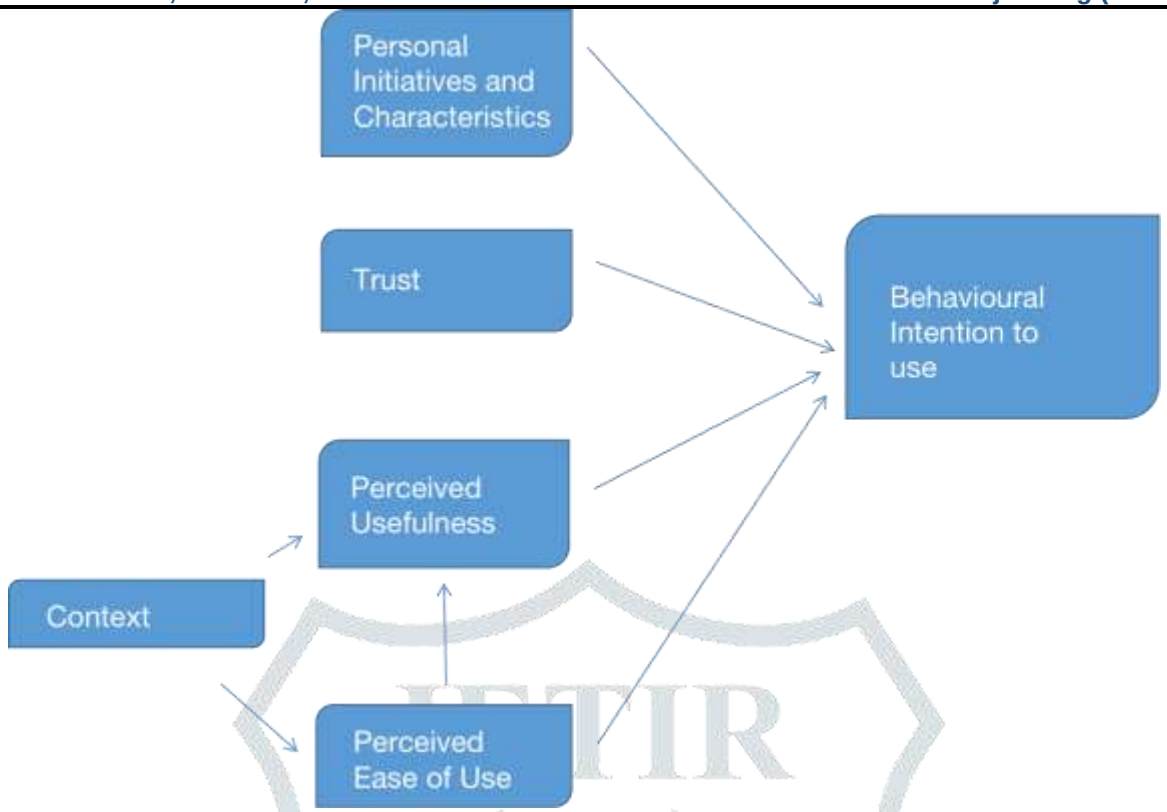


Fig. 1 The Research Model: Extended TAM for Tele Medicine Services

The telemedicine acceptance model as shown in the figure is an extension of Technology acceptance model. In the addition of perceived usefulness, perceived ease of use and context we have also considered factors like personal initiatives and characteristics, trust and behavioral intention to use. The above model summarizes the same. Context provides an understanding of the way and circumstances for performing an activity and here in this case the telemedicine services. Here all elements are considered which are relevant to the overall experience during the interaction between the user and the application or platform, including the user and the application both. Telemedicine services are provided basically to support the healthcare services and add value to it and not to replace the existing service model or channels completely. The use of telemedicine is providing access to unmatchable and high quality healthcare services regardless of time and place restrictions. Most of the areas or regions in India are still not connect with good transport and healthcare facilities but are having good internet services and mobile connectivity hence these can be utilized to implement the telemedicine services in all possible corners of the country specially for those diseases or health issues which does not require the physical presence of the patient hence this is covered in the context construct in our research model. When a patient needs immediate attention regardless of time and place restrictions, the usefulness of the mobile service is perceived as the highest but the opposite happens when there is no emergency and the healthcare facility is easily available offline nearby. Hence, the value to the user of the services depends on the need and situation. Also, it is believed that user's perception of the ease of use and usefulness of telemedicine services may vary in different contexts.

Also, users willingness and needs play important roles in the adoption of telemedicine services. As different type of users may perceive a telemedicine service in different ways, their final intention to adopt or utilize the service may differ from each other. Also, all the tech platforms are skill based and required a special skill set or knowledge to use a particular platform hence knowledge of such platforms or skills to use it also plays an important role for a comfortable adoption of a service. Hence, we believe that personal initiatives and characteristics have significant role to play in the the user's adoption of any tech based services.

A consumer's belief or trust on the technology or the online healthcare facilities and their platform also plays an important role in accepting the services but for the healthcare service providers it is very difficult to build customer's trust as it eventually comes from the experience and time and many factors influence it. Corporate branding and reputation may also be used to build trust in the intention to use telemedicine services.

Research Objectives

Research problem: Telemedicine initiatives are bringing the world closer and distance is no longer a barrier in attainment of quality healthcare. Despite having so much potential still telemedicine has not attained the 'boom' which it was meant to create.

Aim: Investigating the factors affecting the acceptance of Telemedicine services among consumers in India in the post COVID era using the TAM Technology Acceptance Model.

Objectives:

- To investigate the factors affecting the adoption of telemedicine among consumers in India using TAM.
- Study the importance of extended TAM model by using standard TAM factors like perceived usefulness, perceived ease of use, user satisfaction with three more factors to is which are Trust, Context, and Personal Initiatives and Characteristics.

Research Question:

- What are the factors which actually influence the acceptance of Telemedicine services among consumers/patients in India with reference to TAM model?
- Utilizing the extended TAM model to study the relevance of three more factors in the acceptance of a technology.

SMART Objectives

Question / Objective	Specific	Measurable	Achievable	Relev	Time
What are the factors which actually influence the acceptance of Telemedicine services among consumers in India ?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
What is the correlation of each factor with the consumers' level of acceptance of Telemedicine? Which are positive and which are negatively impacting the acceptance of Telemedicine?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Which age group is mostly impacted by what factors?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Can we rank the factors based on their impact for each of the three age groups?	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

- Specific: After going through the previous researches and studying the parameters carefully in the real world entities, it looks like the objectives are all framed keeping all details in mind and are specific to the consumer's mindset about the telemedicine industry in India with specific factors which are taken from literature review.
- Measurable: All the factors to be studied to find out the answers are quantifiable and can be tracked with a survey using a questionnaire and this will be studied further to find out the effect of six factors impacting the acceptance of telemedicine among consumers.
- Achievable: We have seen a similar research performed in some other countries while performing the literature review with same parameters and factors. We are conducting the same in Indian context for consumer's acceptance of telemedicine.
- Relevant: Being a Digital Marketing manager since last 6 years this was always in my mind to study the impact of new technology in the medical industry and pharmaceutical industry is something which is a biggest challenge as to break the years old tradition and start the online prescriptions and tele medicine. If digitization can bring some development in healthcare then that will be the biggest achievement and value addition of technology ever to the society.
- Timed: We are trying to study the impact of these factors responsible to setting the acceptance level towards tele-medicine among consumers in India in the post covid era. During Covid it was the only option but still many were not ready or aware about this but now that we are done with Covid and there may be the chances that such pandemic can be back and there are locations in India where internet is available but doctors and healthcare facilities are not, are we ready to accept this model? We have to study this before pandemic strikes back during this post covid era or for the development of our social pharmacy.

Research Methodology

In this research we have studied the impact of factors, under the extended TAM model, on the acceptance of Telemedicine services in India using the survey method. We have collected the primary data from the users and for that we have designed a questionnaire covering all aspects of each factor responsible or covered under the TAM model moreover we have added three more factors which previous study says are useful in understanding the acceptance of similar technologies' acceptance among the consumers in different other countries as well. We have selected the factors from different studies after reviewing the importance in our study and healthcare sector and hence build a TAM extended model.
We have utilized the online as well as offline methods to collect our data using the clustered sampling method as we have only taken the data from people who have used the telemedicine services before. Also the factor of convenience is considered here because we have majority of known healthcare professionals in Delhi, Uttarakhand, Uttar Pradesh, Chandigarh and Bengaluru who are helping is connecting us with their patients who have used their online services in past or have used the telemedicine services from any other service provider after discussing with them. Hence, this study will focus on people from these four big regions but is not just confined to these cities because these people are currently living there but belong to different other states also and have taken these service for someone who belongs to some other state. Hence, this study can be generalized for entire population.
Once we had our data, we have collated and analyzed using the correlation method to find out the impact of each factor on the acceptance of telemedicine services and then have explained the influence of each factor and its role in acceptance of the services.
By directly drawing constructs and their causal relationships from TAM, the impact of behavior beliefs on intention to use Telemedicine services are proposed below:

Hypothesis 1: Perceived usefulness has a positive effect on intention to use telemedicine services.

Hypothesis 2: Perceived ease of use has a positive effect on intention to use telemedicine services.

Hypothesis 3: Trust has a positive effect on intention to use telemedicine services.

Hypothesis 4: Perceived initiatives and characteristics has a positive effect on intention to use telemedicine services.

Hypothesis 5: Perceived ease of use has a positive effect on perceived usefulness.

Hypothesis 6: The Context of using the services has positive impact on perceived usefulness.

Hypothesis 7: The Context of using the services has positive impact on perceived ease of use.

Sampling and Data Collection

ETHICAL ISSUES: Our research stakeholders are all the Medical experts who are constantly innovating and working hard to satisfy the never ending demand of the healthcare industry.
The consent of respondents is explicitly taken by adding the **Consent form** at the initial stage of the survey form. All the respondents were also verbally informed clearly that this data will be utilized for the research purpose and who are the stake holders of the research.

Primary data: As our aim is to perform an correlational research to study the various factors under our extended TAM model which impacts the acceptance of Telemedicine among the users or patients hence, we had prepared a questionnaire to cover all questions which covers our research objectives which were further shared to be filled by the respondents, who were the users of telemedicine services, through online in google forms as well as offline in the hard copy wherever required. Respondents were the patients or users who have used the telemedicine services directly or indirectly for them or their known ones. We have used the mix of likert scale, few open ended questions and Yes/No type close ended questions to allow respondents to answer the questions.

Secondary data: Platforms like Google scholar and Research-gate were utilized to identify the research history and authors who worked in the similar domain and hence all those studies were gone through to perform the literature review of nearly 20+ different similar researches before finalizing the topic and framing he research questions. We have taken the complete access of few researches previously performed to find out the exact Technology acceptance model used and exact factors which were considered, the questionnaire used and research problems, we will further utilize this data to compare with our own findings

so that we can either approve or challenge the previous researches. Using these findings we have build our extended TAM model to study the factors impacting the telemedicine services among the consumers/ users / patients.

Sampling: We have utilized the online as well as offline methods to collect our data using the clustered sampling method as we have only taken the data from people who have used the telemedicine services before. Also the factor of convenience is considered here because we have majority of known healthcare professionals in Delhi, Uttarakhand, Uttar Pradesh, chandigarh and Bengaluru who are helping is connecting us with their patients who have used their online services in past or have used the telemedicine services from any other service provider after discussing with them. Hence, this study will focus on people from these four big regions but is not just confined to these cities because these people are currently living there but belong to different other states also and have taken these service for someone who belongs to some other state. Hence, this study can be generalized for entire population.

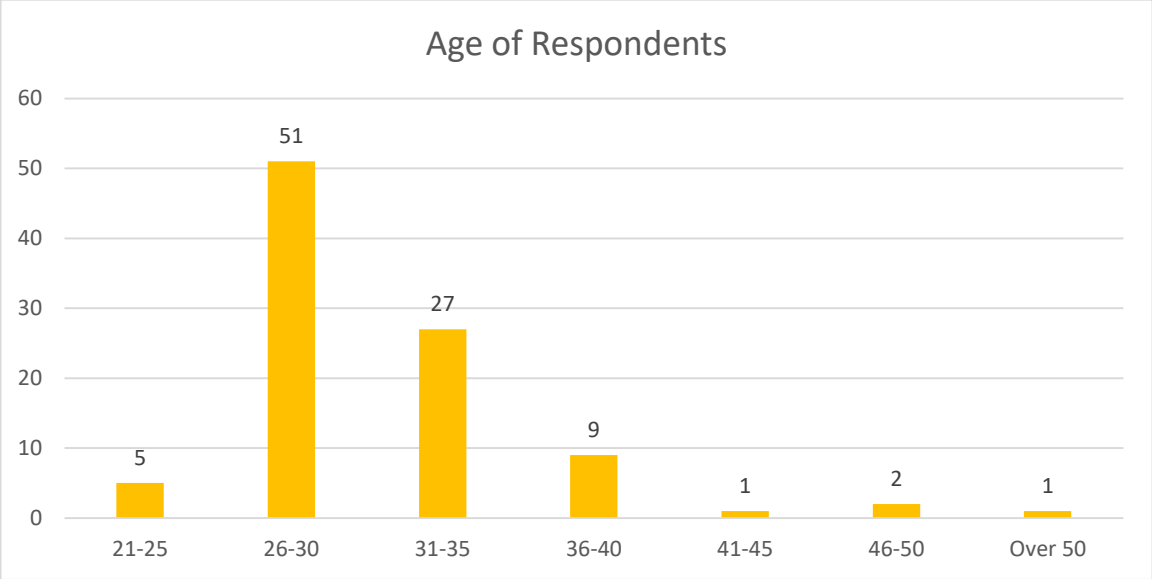
Results and analysis

We shared our questionnaire with approximately 172 users and had received the data of 95 respondents who have used the telemedicine services ever from any service provider in any part of India. We have hence analyzed the insights shared from all those 95 respondents and have organized, structured and then applied the statistical tool to analyze the correlation as per TAM model. Shared below is the overview of all respondents who has filled the questionnaire form.

Profile of respondents:

The gender distribution of survey distribution is 43% males and 57% females, reason being most of the females who used the services were for the gynecologist support and consultation.

The results also indicated that the samples have age predominantly between 26 - 35 years, which accounts to 81.25% of the total respondents. Also, the results reflect a very interesting fact that out of 95 respondents 57 were working in the technology-based profiles. Below is the age distribution of various age groups



Reliability Analysis

We have considered studying the reliability of the scale to eliminate any sort of random error from the scale. We have studied the internal consistency of the scale in this research by calculating the Cronbach's coefficient alpha. Cronbach's alpha, α (or coefficient alpha), developed by Mr. Lee Cronbach in 1951 is used to measure the reliability or internal consistency. "Reliability" is another name for consistency. This method is very useful and widely accepted specially while utilizing the Likert scale for the study. Cronbach's coefficients of aplha are the tests performed to see if multiple-question Likert scale surveys are reliable. These questions measure latent variables like: a person's conscientiousness or openness. We have studied the reliability using the SPSS tool and hence got the following results:

Table 2: Reliability analysis

Variables	Cronbach's Alpha
Perceived Ease of Use	0.870
Perceived Usefulness	0.810
Behavioural Intention to use	0.820
Trust	0.780
Context	0.750
Personal Initiatives and Characteristics	0.740

We have considered the below standard of Cronbach's coefficients to study the consistency of our variable in the study:

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable

Source:https://www.statisticshowto.com/probability-and-statistics/statistics-definitions/cronbachs-alpha-spss/

As all our factors have Cronbach's coefficients above 0.7 hence all are acceptable for the study and considered as consistent. This indicates that the survey instrument is a reliable method to measure all variables consistently. Moreover, all of the measures of constructs had been used in past studies as well for different other types of technologies, and have thus been validated.

Correlation analysis of variables:

Before testing the hypothesis we tried to test out and find the correlation among the variables which we have considered for the study purpose in this research. Hence, Pearson coefficients were found out to study the analysis of variables: ***Perceived Ease of Use (PEU), Perceived Usefulness (PUS), Behavioural Intention to use (BIU), Trust (T), Context (C) and Personal Initiatives and Characteristics (PIC)*** .
Correlation analysis discusses the strength and directionality of the correlation between two variables, using a correlation coefficient to describe the strength of the correlation between them. Pearson correlation analysis was applied to explore the correlations among the dimensions of the theoretical model of this research. The points of all the questions of each dimension were added up and averaged. The average point of each dimension was then used in the Pearson correlation analysis. As indicated by Table 3 that lists the analysis results.

Table 3: Correlation study

	PEU	PUS	BIU	T	C	PIC
PEU	1	0.65	0.47	0.52	0.59	0.41
PUS	0.65	1	0.61	0.49	0.54	0.37
BIU	0.47	0.61	1	0.62	0.3	0.45
T	0.52	0.49	0.62	1	0.62	0.55
C	0.59	0.54	0.3	0.62	1	0.37
PIC	0.41	0.37	0.45	0.55	0.37	1

Correlation is significant at the 0.01 level (2-tailed).

The table above shows that the correlations between Perceived Ease of Use (PEU), Perceived Usefulness (PUS), Behavioural Intention to use (BIU), Trust (T), Context (C) and Personal Initiatives and Characteristics (PIC) are positive and significant. Hence, TAM model factors were proved to be all significant to determine the acceptance of Telemedicine and the approach so far in this study was correct while selecting the factors and the entire model construct.

Hypotheses Testing

Now, since we knew that our TAM model is valid and construct is relevant as well as significant, to further enhance these findings, a regression analysis was conducted to test all the hypothesis.

(a) For the predictors Perceived usefulness (PUS), Perceived ease of use (PEU), Trust (T), Perceived initiatives and characteristics (PIC) on dependent variable Behavioral Intention to use (BIU)

Model	R	R Sq.	Adj. R Sq.	Std. Error of estimate
1	0.783	0.621	0.617	0.458
a. Predictors: Constant, PUS, PEU, T, PIC				

Model	Unstd. Coeff.		Std. Coeff	t	Sig.
	B	Std error	Beta		
Constant	0.315	0.156		1.755	0.081
PUS	0.605	0.068	0.552	8.51	0.000
PEU	0.283	0.065	0.296	4.53	0.000
T	0.365	0.056	0.195	3.46	0.000
PIC	0.421	0.039	0.332	4.11	0.000

In the above results of regression model, the value of R square indicates that the four predictors (PU, PEOU, T and PIC) explained 62.1% of the variation in Behavioral intention to use.
PUS, PEU, T and PIC are all relevant and important factors to explain the change on the response of acceptance of Telemedicine according to the TAM model. PUS, with the highest beta value is the strongest independent variable to explain the dependent variable BIU, then PIC with 0.332 and then the other two independent variables are also significant to determine BIU.

(b) For the predictors Perceived ease of use (PEU) and Context (C) on dependent variable Perceived usefulness (PUS).

Model	R	R Sq.	Adj. R Sq.	Std. Error of estimate
1	0.77	0.609	0.623	0.398
a. Predictors: Constant, C, PEU,				

Model	Unstd. Coeff.		Std. Coeff	t	Sig.
	B	Std error	Beta		
Constant	0.286	0.185		1.149	0.13
PEU	0.327	0.045	0.341	6.721	0.000
C	0.584	0.052	0.545	10.542	0.000

The model above have R square 0.609 which means the above model explains the 60.9% variation in PUS from the independent variables PEU and C. Moreover the positive values of beta indicates that both PEU and C are positively effecting the PUS variable although C have more positive impact as compared to PEU on PUS variable.

(c) Predictor: Context "C" on Perceived ease of use (PEU)

Model	R	R Sq.	Adj. R Sq.	Std. Error of estimate
1	0.539	0.291	0.286	0.643
a. Predictors: Constant, C				

Model	Unstd. Coeff.		Std. Coeff	t	Sig.
	B	Std error	Beta		
Constant	1.985	0.184		10.811	0.001
C	0.462	0.05	0.536	9.21	0.000

The model above have R square of 0.291 which is very low and means that "C" variable explained only 29.1% of the variation in PEU variable. Based on the standardized coefficient value (Beta = 0.536), Context C had a significant impact on Perceived Ease of Use (PEU).

Conclusion

Based on the results of regression model used for the study of each hypothesis we have then concluded and summarized the results in the table below:

Hypothesis	Specification	Results	P value
H1	Perceived usefulness has a positive effect on intention to use telemedicine services.	Supported (Beta=0.552)	p < 0.001
H2	Perceived ease of use has a positive effect on intention to use telemedicine services.	Supported (Beta=0.296)	p < 0.001
H3	Trust has a positive effect on intention to use telemedicine services.	Supported (Beta=0.195)	p < 0.001
H4	Perceived initiatives and characteristics has a positive effect on intention to use telemedicine services.	Supported (Beta=0.332)	p < 0.001
H5	Perceived ease of use has a positive effect on perceived usefulness.	Supported (Beta=0.341)	p < 0.001
H6	The Context of using the services has positive impact on perceived usefulness.	Supported (Beta=0.545)	p < 0.001
H7	The Context of using the services has positive impact on perceived ease of use	Supported (Beta=0.536)	p < 0.001

The model seems to be effective to study the impact of selected factors on acceptance of Telemedicine in India as all the factors have shown the positive impact with considerable Beta value which reflects the influence of all individual factors on acceptance level. Hence, we had now prepared a graphical representation of our model displaying the influence of each independent variable on the dependent variables as per the TAM model.

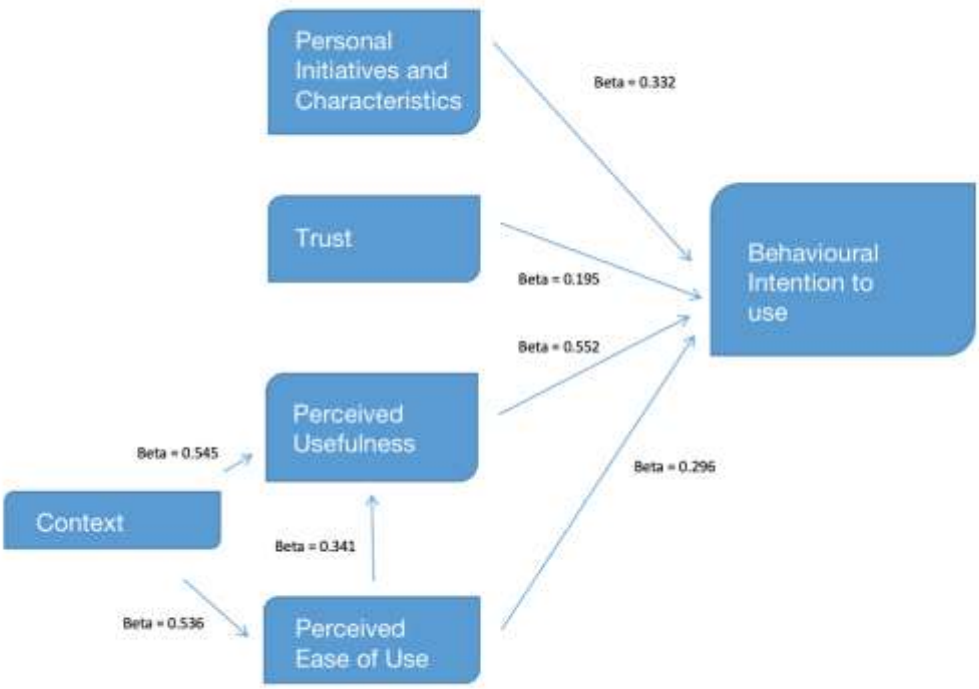


Fig. 2 TAM model with results

Using the results from regression model we have now concluded that all the variable have positive influence but "Perceived usefulness" has the highest impact on "Behavioural intention to use" of the user for Telemedicine services, followed by "Personal initiatives and Characteristics" with beta value of 0.332, followed by " Perceived ease of use" and "trust" with beta values of 0.296 and 0.195 respectively.
The "Perceived ease of use" have considerably high impact on "Perceived usefulness" with beta value of 0.341, Moreover, the "context" have nearly same impact on both "Perceived Usefulness" and "Perceived ease of Use" with nearnly same values on Beta of 0.545 and 0.536 respectively.

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