

Investigating E-Wallet Adoption in India: Extending the TAM Model

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ABSTRACT

This study aims to investigate the customer adoption of e-wallets in India. The paper further seeks to explore the significant relationships amongst the constructs of TAM in explaining consumer intention to use the digital wallet. The present study employs an extended TAM framework. The variables of the study are risk, cost, compatibility, usefulness, ease of use, behavioral intention to use, actual usage, etc. for exploring digital wallet usage intentions in Indian consumers. The sample considered was North Indian customers to understand their plan to use a mobile wallet. A standardized scale was used for the present study. The data was collected using a questionnaire with variables of external factors, perception, preference, and usage. Structured equation modeling has been used to check the model fit of the proposed model, and path analysis revealed the correlations between the endogenous and exogenous variables of the study.

KEYWORDS

E-Payment, E-Wallet, TAM

INTRODUCTION

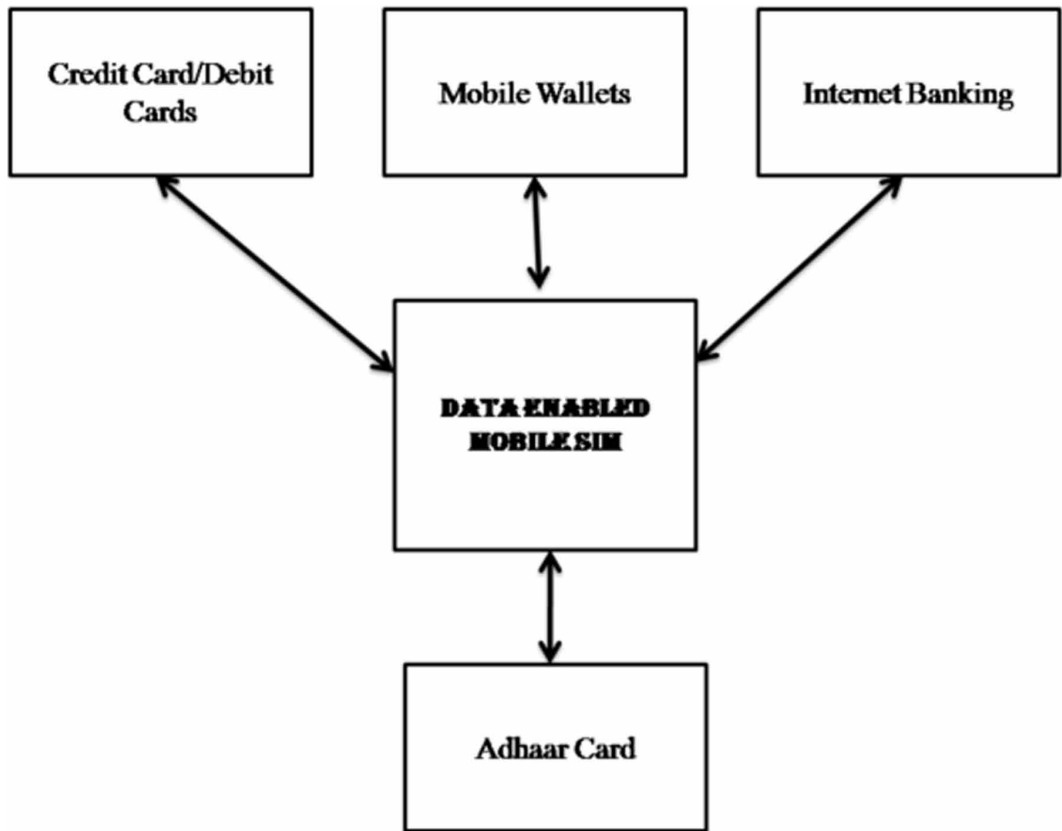
The eventful day of 8-Nov-2016, in India, due to a big step was taken by the government to demonetize some currency; a huge urgency appeared amongst the citizens who were motivated to pay their micropayments using mobile wallets or services related to (Unified Payment Interface) UPI. The upgraded technology-enabled payment gateways are trying to bridge the issues of demonetization in Indian economy. It becomes difficult to measure the contribution of Mobile phones as the enabler in this process as the Information and Communication Technology framework has intangible features and characteristics (Mao & Palvia, 2001). Various measures are developed by the researchers in this field to solve this issue. All the technology framework implementers need to understand the factors and determinants of the mobile framework to plan its effective implementation. Mobile phones were treated very narrowly by the society as payment interfaces prior to the demonetization wave in India. But, since then every Indian customer starts exploring the factual regarding micropayment mechanism using various gateways. The inclusion of “Adhaar card” as a validation mechanism has eased out the workflow of the transparent payment system (Figure 1).

Indian citizens seek the easiest way of payment mechanism regarding their day to day micropayments. Gradually, they come to know the cost-effectiveness, compatibility with existing financial framework in the Indian economy, its usefulness, most optimally is ease of use while

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Figure 1. System of Mobile Wallet



transferring amount against any transaction for micropayment. Once they come to know the least risk incorporation while using mobile wallets, due to which their intention to use such wallets has increased.

LITERATURE REVIEW

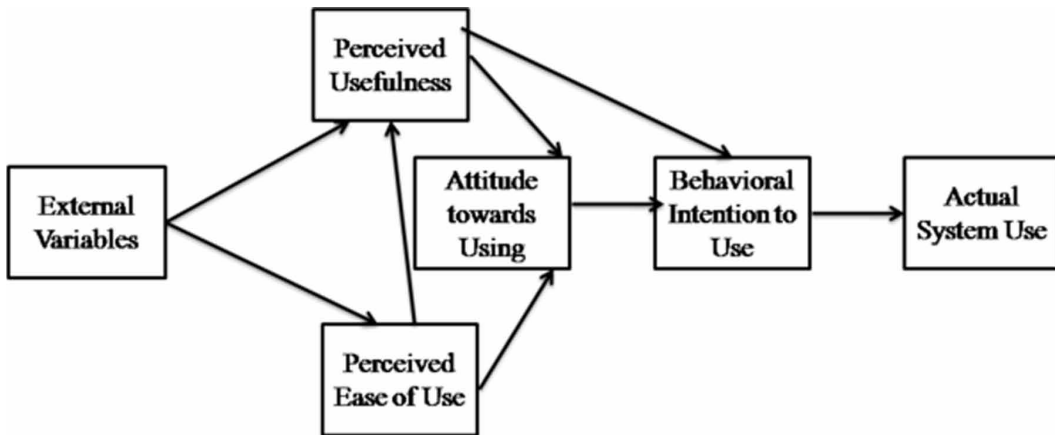
Technology Acceptance Model and E-Wallet

Fred Davis in 1986 introduced Technology Acceptance Model (TAM) which was an adaptation of the Theory of Reasonable Action (TRA). TAM is specifically customised for modelling the acceptance of information systems or technologies. Davis (1989) used TAM for explaining human behaviour in computer usage. Davis (1989), using TAM aimed at identifying the primary causation of technology acceptance that leads to users' behaviour across a wide range of end-user computing technologies.

Venkatesh & Davis (1996) concluded that perceived usefulness and perceived ease of use directly impacts behavioral intention, so they discarded attitude from the construct. According to Chuttur (2009) Technology Acceptance Model is the sole model that attracts the attention of the Information Systems practitioners. Historical overview of the Technology Acceptance Model (TAM) has been provided by the author to explain the evolution of TAM, its applications and limitations referring to well known journals

It is observed that currently TAM is a highly referred model. Some researchers still consider TAM lacking sufficient rigidity and significance. For predicting students' perceptions and understanding the role of perceived convenience of accepting and using Moodle - an open source e-learning

Figure 2. Final version of TAM (Venkatesh, Davis 1996, pg.453)



system, Hsu & Yu (2013) used TAM. Constructs in their study like Perceived ease of use, perceived convenience, and perceived usefulness showed significant positive impacts on attitude toward using Moodle (Figures 2-3).

This research work was carried to find out the causation influencing the adoption of mobile wallets for micro-payments. Further, if there are benefits of e-wallet usage by Indians customers, identification of the causative factors affecting the adoption of mobile wallets have to be done to facilitate government to strategize the creation and provision of infrastructure for implementation of electronic micro-payment system. This will not only solve the problems related to micropayments but also reduce the circulation of money in the form of cash transactions leading towards re-monetization in Indian economy.

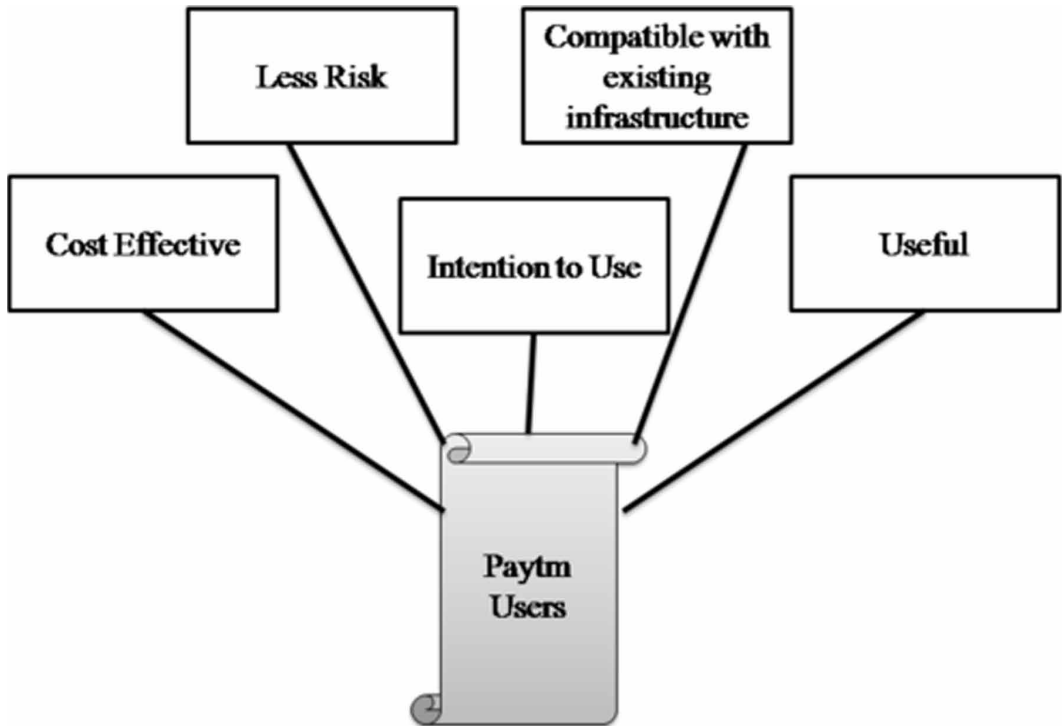
Implementation, merits and future scope of an electronic wallet was proposed by Salodkar et al. (2015). Electronic wallet as defined by authors, as a virtual or a cashless service used as a replacement for physical cash. They elucidate that primary anxiety related to cashless transaction was security. Authors are very much optimistic for e-wallets as a secure, fast and futuristic way of transactions, many advantages including the liberty to shop and pay securely from anywhere.

Dospinescu (2012) the author explained that there are many implementations related to e-wallets but they have explained new technical approach related to “e-wallet” concept, that can be used to improve the present level of knowledge about e-wallets by using the near field communication technology. In their study, they have experimented and created a prototype based on the Android platform using the Near Field Communication technology.

Authors predicted the future of the electronic payments systems to be based on the different fundamentals like the mobile milieu and devices, the electronic wallet and standards in order to increase the flexibility of the transactions. Upadhyaya (2012) explained the various challenges of payment transactions in e-commerce. According to him, e-commerce is governed by the payment methods traditionally, but as per the recent advancement has become essential to introduce new payment methods like E-wallet which is convenient, easy-to-use and secure global payment system.

The use of digital money as a payment mode is becoming a trend in this digital economy, as proposed by Braga et al. (2013). In the paper, they have incorporated a variety of theory and models related to payment methods and re-examine their influence on consumer buying behaviour. They propose that same as credit and debit cards digital money also influences consumer behaviour. Fourteen propositions were made and summary of payment modes were made which led to proposition of ‘Payment Mode Influencing Consumer Purchase Model’. They explained that the type of product and payment mechanism also influences buying behavior.

Figure 3. Mobile Wallet usage reason

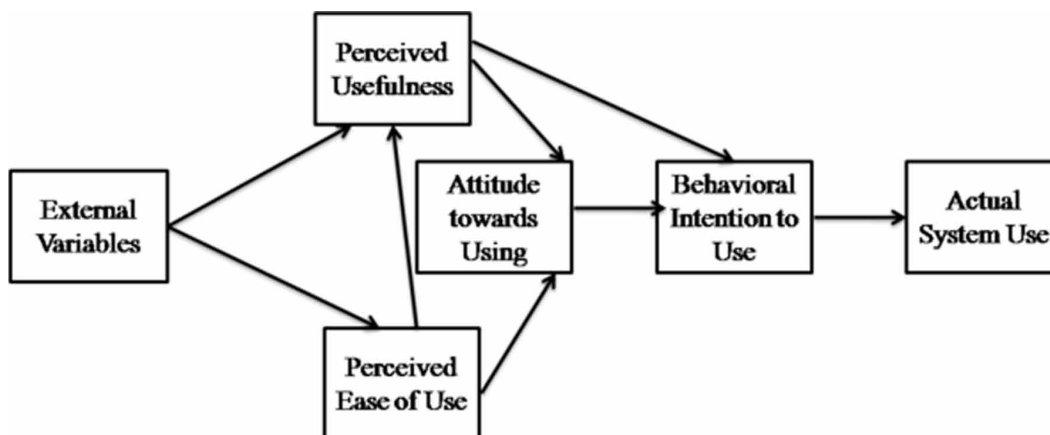


Rathore (2016) explained the importance of the usage of Smartphone's these days. Due to advancement in technology, Smartphone users these days make payment by using various payment apps on mobile. Smartphone's which function like a leather wallet, so it is termed as "Digital Wallet" or widely known as "Mobile Wallet". The author explained various factors as well as risks and challenges a customer's faces, become the deciding factor of a consumer's adoption or rejection of digital wallet as a mode of online payment. According to author digital wallets are very easily and quickly becoming a profusely used mode of online payment. Shoppers are rapidly using digital wallets due to convenience and ease of use. The author is very much confident that 2016 will be a pivotal year as far as acceptance of digital wallets is the concern.

Kaur (2017) Stated that demonetization is a unforgettable occurrence which will go to generations. Demonetization will be very important economic events of our country and its impact will be felt by each and every citizen of the country. With a greater focus on digital transactions, demonetizing helps to bring cashless economy. Increase in usage of credit cards, debit cards, net banking, and other online payment mechanisms will be the most positive outcome of demonetization. The cashless transition is safe, less time consuming and free from the trouble of wear and tear as in the case of paper currency. It also helps in the recording of the all the transaction. All these advantages proved that it will be the future transaction system. The outcome of demonetization is the improved usage of the cashless transaction which leads to e-transactions, but at the same time drastic adoption of electronic transactions may boost cybercrime, so to avoid this. The awareness level of the customers is to be increased on how to keep credit, debit cards safe and have hassle-free transactions. Greatest needs of the hour are special infrastructure comprising of forensic labs, skilled cyber cop, with state of the art evidence-gathering tools, public prosecutors in order to implement safe and secure e-transactions is

Technology Acceptance Model (Davis,1995), explained that three factors guiding usage of technology are Perceived Ease of use, Perceived usefulness and attitude towards system. According

Figure 4. first modified version of TAM (Davis, Bagozzi and Warshaw 1989, pg.985)



to him, whether an user accepts or rejects a system depends solely upon attitude towards using the. Furthermore, Perceived Ease of Use and Perceived Usefulness influences attitude towards use. Lee et al. (2003) states that TAM is such a well accepted model that it is cited in most of IS researches on acceptance or rejection of system. Davis et al. (1989) incorporated behavioral intention in the existing model because according to the authors a strong behavioral intention must be there to use the system which is more important than perceived usefulness and ease of use. This resulted in the modified version of TAM (Figure 4).

Venkatesh & Davis (1996) concluded that since perceived usefulness and perceived ease of use directly impact on behavioural intention, therefore they argued to discard attitude construct from the model. Figure 3 shows the resultant amended model.

The limitation of the TAM model was given by Lee et al. (2003). In a study where they used students as participants in a controlled environment which weakens scope to generalize the findings. Yang and Yoo (2003) added two variables for attitude ie, affective and cognitive and replicated TAM. Statistically interpreting the data they proposed that cognitive attitude is statistically significant but affective attitude is not significant statistically.

Technology Acceptance Model is the only model that seeks maximum attention of the Information Systems researcher, Chuttur (2009). An historical overview of the Technology Acceptance Model (TAM) was given by the author. He gave the evolution, its applications, limitations, and criticisms of TAM in various published articles. Current observations too is in sync with Chuttur's observation. But some researchers consider TAM to lacks sufficient rigor and significance. To comprehend the role of perceived convenience as a factor in predicting students' perceptions about the acceptance and use of Moodle, an open source e-learning system, Hsu and Yu (2013) used TAM model. According to them Perceived ease of use, perceived convenience, and perceived usefulness had significant positive impacts on attitude toward using Moodle.

Davis and Venkatesh (2000) proposed modified TAM model and called as TAM 2 as they have observed few limitations in explaining the reasons for which a person would perceive the given system acceptable or unacceptable so they proposed an additional variable treated as a forerunner of perceived usefulness variable in TAM. Venkatesh (2000) further modified the TAM model by including the construct for perceived ease of use, for this variable construct would be grouped into two anchors and adjustments. Anchors include common notion about computers and its usage whereas adjustments focus on direct experience with the system. Perceived ease of use and perceived usefulness as predictor variables were not considered in their study of Intention to use the mobile wallet and it was suggested that further research may be conducted to include these variables (Kumar et al, 2017)

OBJECTIVES OF THE STUDY

The study aims to analyze the usage intention of consumer towards digital wallets. Extended Technology Acceptance Model (TAM) has been considered as the base model. It also aims to establish relationships among the TAM constructs when applied to a bigger Indian sample. The research questions mentioned below are proposed:

1. Is TAM an efficient model to explain consumer's intention to use the digital wallet?
2. What significant relationships are there amongst the constructs of TAM in explaining consumer's intention to use digital wallet?

METHODOLOGY

The descriptive research design was used to find out the actual usage intention of E-Wallets by Indian Customers. For this, a questionnaire was created using the same constructs of Extended TAM ((Venkatesh, Davis 1996, pg.453) was used. The tool used was a pre-validated tool. Confirmatory Factor Analysis was performed to verify models by Structural Equation Models.

The data was collected from 227 respondents in North India. All the rows with the incomplete response and the rows with wrong entry were deleted, thus the actual usable data for analysis remained 207.

To find the dispersion of data Descriptive statistics is being used (Table 1). The values clearly indicate that since standard Deviation is less than the mean the sample data is consistent.

Further, the description of the demographics of the sample is provided in Table 2.

Data Analysis

Model Fit Assessment

For studying complex variable set Structural Equation Modelling (SEM) is used. This technique reveals the underlying associations among the variables and also the latent variables being researched upon. This has been considered a good tool to prove how the theoretical model is supported by sample data. For estimating relationships between the main constructs SEM has been considered an ideal tool according to Sugawara and MacCallum (1993), Ding et al. (1995), and Schermelleh-Engel and Moosbrugger (2003),

In the current study, a model was hypothesized as elaborated in Figure 6. According to the model **External Variables** like **Risk, Cost and Compatibility** predicts Perception of the customer which has been categorized as **Perceived Ease of Use** and **Perceived Usefulness**. Further **Perceived Usefulness** is predicted by **Perceived Ease of Use**. it has also been hypothesized that perception builds up **Behavioural Intension** and which further leads **To Actual Usage** of the system or product or service.

For analyzing the Model fit Amos was used as a tool. Firstly it was evaluated whether the data fit the theoretical model. Confirmatory factor analysis (CFA) was used for the same. In order to check the model the following parameters were considered:-Chi-square/degrees of freedom (χ^2/df), CFI, GFI, AGFI, TLI, IFI, PGFI, RMSEA, and PGFI (Table 3).

Though GFI and AGFI show a moderate value the model is a good fit as per the ranges suggested for good fit model.

Nulls Hypothesis H0: The hypothesized model is not a good fit: **Thus rejected**

Table 1. Descriptive Statistics

	(Gender)	(Age)	(Education)	(Monthly_Income)	(Use_Cell_phone)	(Familiar_Cell_phone)
Mean	1.623	2.97	2.75	2.96	4.62	4.23
Median	2.000	3.00	3.00	3.00	5.00	5.00
Mode	2.0	2	3	2	5	5
Std. Deviation	.4858	.997	.474	1.422	.811	1.105
Variance	.236	.994	.224	2.023	.658	1.221
Skewness	-.512	.456	-1.707	.145	-2.481	-1.592
Std. Error of Skewness	.169	.169	.169	.169	.169	.169
Kurtosis	-1.755	-1.040	2.081	-1.264	6.239	1.633
Std. Error of Kurtosis	.337	.337	.337	.337	.337	.337

Table 2. Demographic

Gender	Female 78			Male 129			
Age	<20 1	20-29 89		29-30 4	30-39 43	40-49 56	>40 14
Education	Ug 4	Grad 43		Pg156		Other 4	
Monthly_Income	<20000	20001-35000	35001-50000	50001-65000		>65000	
	39	48	48	25		47	
Use_Cell_phone	No Phone	In Urgent Need	Casually	Convenience Only		Frequently	
	3	4	14	25		161	
Familiar_Cell_phone	Unfamiliar	Little Familiar	Average	Familiar		Very Familiar	
	8	20	3	66		110	

Figure 5. Hypothesized Model

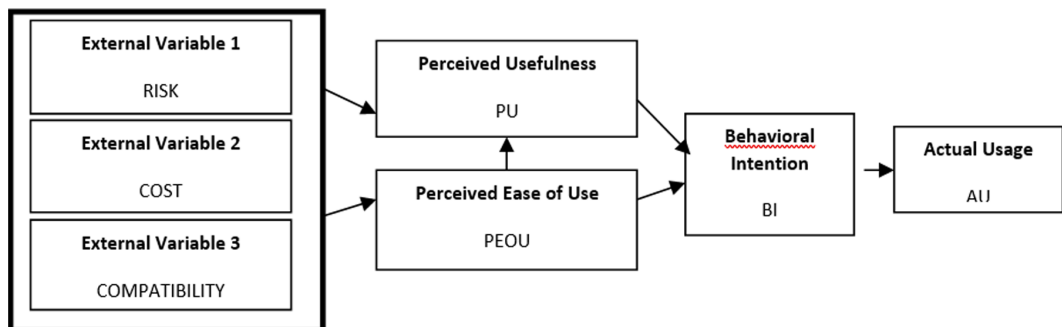


Table 3. Model fit indices

Fit Indices	Results	Suggested Values	Studies
Chi-square/DF	2.072	≤ 5	Hair et al, 1998
Comparative index fit (CFI)	.936	$> .90$	Hu and Bentler, 1999
Adjusted Goodness of fit (AGFI)	.796	$\geq .90$	
Normated Fit Index (NFI)	.885	$\geq .90$	
Incremental Fit Index (IFI)	.937	Towards 1	
Tucker Lewis Index (TLI)	.924	$\geq .90$	Hair et al, 1998
Root mean square error of approximation (RMSEA)	.072	$< .08$	Hair et al, 2006

Path Model Fit

For testing the hypotheses structural equation modelling (SEM) was used. The model thus obtained is shown in Figure 7. SEM path model shows the hypotheses to be tested and relates to the prototype of underlying structure. Which in turn links the variables that construes the construct of Actual Usage. As displayed Actual Usage is predicted by Behavioural Intension, which in turn is predicted by Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). PU and PEOU are being predicted by the external variables. Education Age, Gender and Monthly Income have been taken as control Variables. Running SEM till the model fits best gave the final model as shown in Figure 8.

Assessing Structural Model Fitness

For forming a model in SEM a set pattern of guidelines are followed. Covariance matrix is estimated using SEM which totally varies from the measurement model. It grounds to presumption that all constructs of the measurement model are correlated. But realism is that the relationships between some constructs are presumed to be zero structural model (Table 4).

The model fit indices also provide a realistic model fit for the structural model. Therefore it is deduced that the proposed model for research fits the data logically.

Research model exhibited a good fit with the observed data as mentioned above.

All hypothesized paths are significant (p-value < 0.05), and hence supported. The unstandardized regression weights of the output and result of the hypotheses testing providing support for hypotheses H1 through H5 are presented in Table 5.

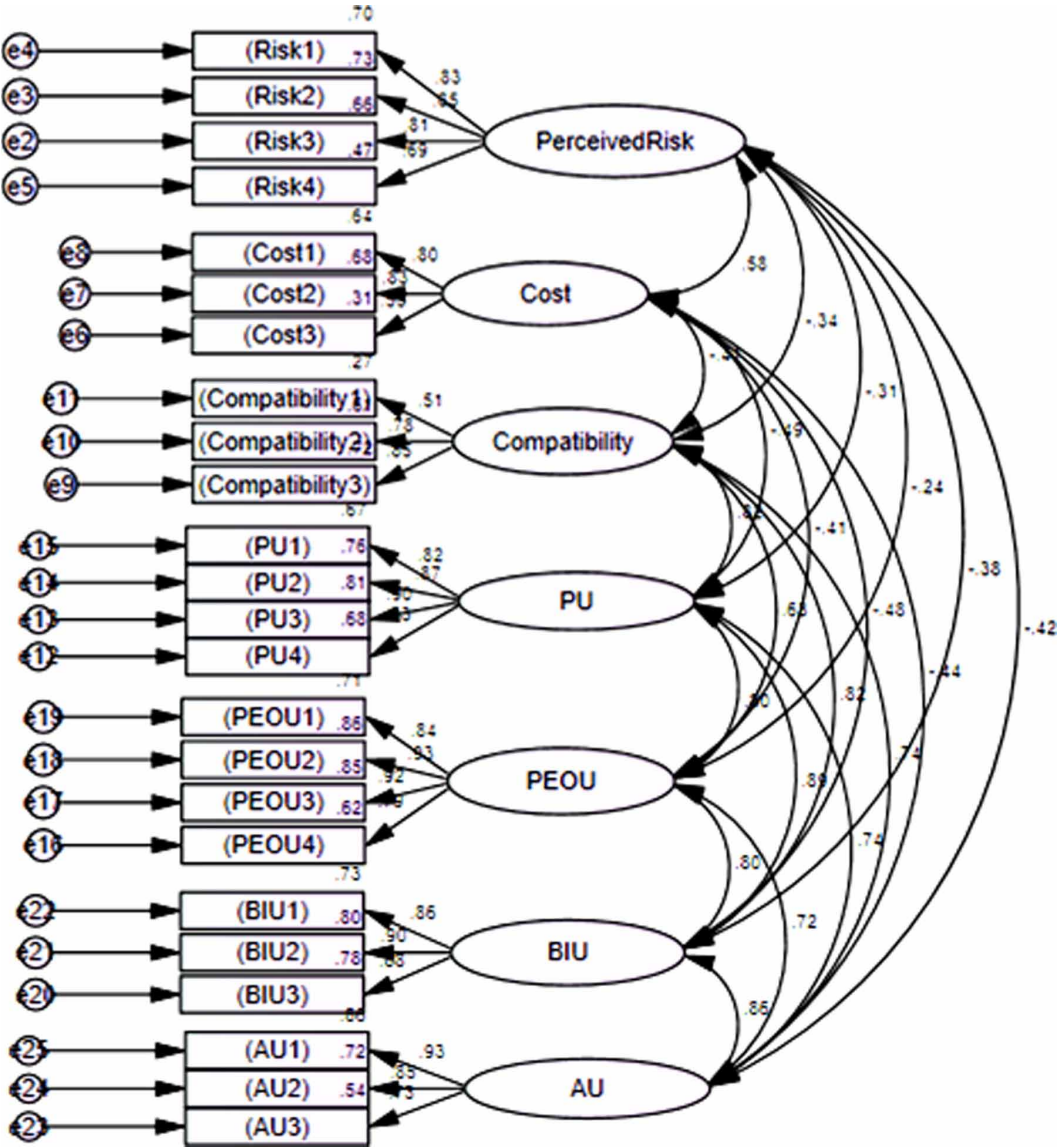
Based on the significance value H1 is partially accepted as during testing the model only Compatibility could predict **PU** ($p = .000$) as compared to the hypothesized model that the entire external factor predicts **PU** and **PEOU**. H2 (**PEOU** $\rightarrow$ **PU**, $p = .000$), H3 (**PU** $\rightarrow$ **BIU**, $p = .002$), H4 (**PEOU** $\rightarrow$ **BIU**, $p = .000$), H5 (**BIU** $\rightarrow$ **AU**, $p = .000$) is fully accepted.

In addition to this, a new construct has also been traced out (as shown in Figure 8). Perceived **Risk** $\rightarrow$ **BIU** (instead of **PU** or **PEOU** according to the hypothesized model), **Compatibility** $\rightarrow$ **BIU** (including **PU** which was earlier hypothesized). Further, it is only **Age** which moderated the **Actual Usage** and not **Income**, **Education**, and **Gender** as mentioned in the literature review.

Findings and Implications

Results show that behavioral Intension has the direct impact on actual usage. This implies that BIU is an important determinant of wallet usage. Further, BIU is directly impacted by perceived usefulness and perceived ease of usage. The risk is inversely predicting BIU, the reason may be that users by their previous unpleasant experiences of online transaction and preconceived notion of online threat

Figure 6. Structural Model -Confirmatory Factor Analysis



feel a threat. Thus higher the perceived risk lower the behavioral intention and lower will be the usage of e-wallets. Compatibility predicts Perceived usefulness and indirectly BIU. It can be implied by the fact that if the user feels that the system to be used is compatible then the usefulness factor and behavioral intention increases. Interestingly cost, which is considered one main predictor of BIU has been found to be insignificant in the study. The main reason behind this could be that Indian customer(sample under consideration) might not feel the importance of cost of using the system and the only threat they feel is the risk associated with it.

This suggestion for the e-wallet service providers for Indian customers is that they should provide the following three features for maximum usage.

1. Compatibility

Figure 7. Hypothesised model

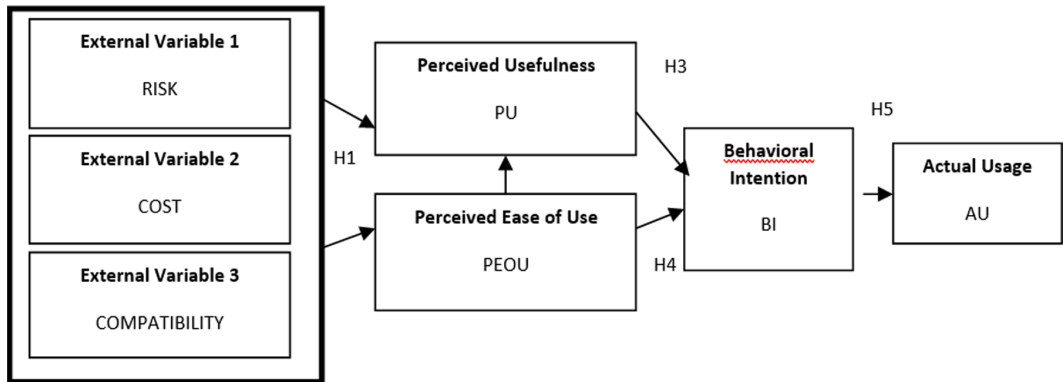


Table 4. Select Fit Indices of the structural model

Fit Indices	Results
Chi-square	763.152
Chi-square/DF	2.271
Comparative index fit (CFI)	.892
The goodness of fit (GFI)	.793
Adjusted Goodness of fit (AGFI)	.750
Normal Fit Index (NFI)	.823
Incremental Fit Index (IFI)	.893
Tucker Lewis Index (TLI)	.878
Parsimony goodness of fit index (PGFI)	.657
Parsimony Comparative index fit (PCFI)	.793
Root mean square error of approximation (RMSEA)	.079

2. Features associated with zero risks in transactions
3. c Usefulness and ease of use of the system with user-friendly interface and easy payment options.

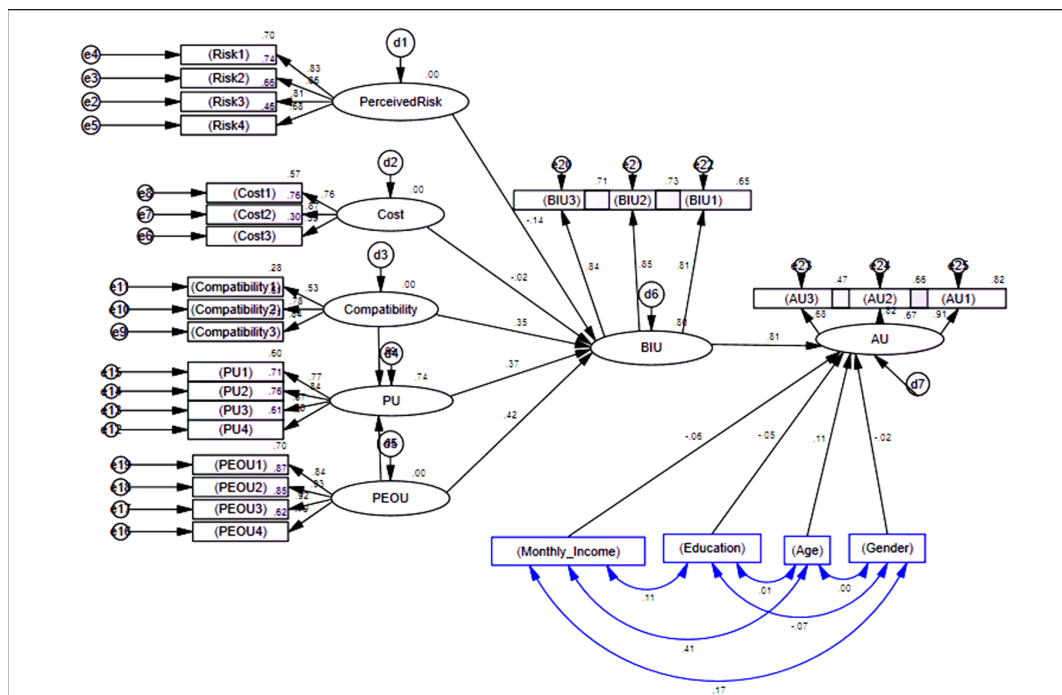
RESEARCH LIMITATIONS

Since the data was collected from the only the northern part of India. The study can be extended to other parts of India as well to find out if the original hypothesized model fits true. Some other control variables apart from the ones in the study can be incorporated to find how and why they control the actual usage. A longitudinal study can be done on the same survey instrument to find out what additional features a customer looks for who is already using an e-wallet.

Table 5. Regression Weights

			Estimate	S.E.	C.R.	P
PU	<---	Compatibility	.515	.060	8.507	***
PU	<---	PEOU	.655	.071	9.163	***
BIU	<---	Perceived Risk	-.121	.039	-3.118	.002
BIU	<---	Cost	-.020	.051	-.401	.689
BIU	<---	Compatibility	.308	.080	3.829	***
BIU	<---	PU	.364	.115	3.164	.002
BIU	<---	PEOU	.432	.093	4.633	***
AU	<---	BIU	.817	.089	9.158	***
AU	<---	Monthly_Income	-.033	.032	-1.050	.294
AU	<---	Education	-.087	.086	-1.018	.308
AU	<---	Age	.091	.045	2.025	.043
AU	<---	Gender	-.026	.086	-.306	.760

Figure 8. The Structural Model



Conflicts of Interest

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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