



Consumer Acceptance of Contactless Payments in India: Extension to TAM

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ABSTRACT: Contactless payment is arguably the fastest growing payment methods across the globe. The purpose of this article is to do a study of the consumer acceptance of contactless payments in India using a survey sample of 165 respondents from Chennai. While technology acceptance model (TAM) has been normally used, the proposed model make use of seven variables (perceived usefulness, perceived ease of use, perceived risk, engagement, compatibility, trust and hedonic motivation) taking into consideration the customer, service provider and the technology eco system. Findings of the study indicates that perceived ease of use, compatibility and perceived usefulness were the main factors influencing contactless payment acceptance. This study extends the knowledge of consumer's payment-decision making and provides insights into how to promote contactless payments.

KEYWORDS: Contactless Payment, Consumer Acceptance, Compatibility, Engagement, NFC

INTRODUCTION

It wouldn't be wrong to say that Govt. of India's decision to go for demonetization way back on Nov. 2016 has provided the desired impetus for the country's march towards digitisation. The digital revolution is taking the world by storm, and no other area we can say for sure has witnessed a metamorphosis similar to what has been seen on the payments and settlement systems. This has resulted in an increased digital option for the common man. Depending on the situation, the consumer can use the payment mode which suits his purpose, contactless payments being one of the options that is increasingly available.

Contactless payments involve technology which helps to make low value transactions possible. This can be done by waving smartphones, key fobs or bank cards near payment terminals in order to make instant purchases (Turkmen & Degerli, 2015). The technology behind this payment mechanism, makes use of Near Field Communication (NFC) wherein communication happens between the NFC chips and the NFC enabled payment terminals which emit an electromagnetic field that can exchange data with NFC chips. It should be noted that the distance between the sender (NFC chips) and the receiver (NFC enabled terminal) should be within 4-5 centimetres for the payment to materialise (Azhari, 2014; Turkmen & Degerli, 2015). This to a great extent addresses the security concerns around fraud and misuse.

Globally there has been a rise in the share of contactless payments when compared with other payment mechanisms. The key reasons that can be cited for this include reduction in the overall transaction time, operational efficiency improvement and minimized operating costs apart from mobility.

BCG report 2020 predicts that countries like India, Thailand, Indonesia and some other emerging markets in Asia would be seeing the fastest payments revenue growth over the next five years. This has been attributed to their projected payment infrastructure maturity and increased financial inclusion during this period. Also, as per the vision 2021 of Reserve Bank of India, there is a plan for increased deployment of card acceptance infrastructure across the country including at smaller centres with a substantial portion of the infrastructure taking care of processing contactless card payments. This makes it a useful study to understand the consumer perspective in terms of acceptance of Contactless payments in India.

The primary goal of this article is to increase our current understanding of the factors that impact the consumer acceptance of contactless payment, in light of Technology Acceptance Model. To be more precise, the contactless payment acceptance in Indian context will be studied from the information systems acceptance point of view.

This article has been divided into four parts: first part contains literature review on consumer acceptance of contactless payments. The second part talks about the research methodology used in this work. The third part comprises of the results and analysis. In this

part the data is analysed using factor, regression and correlation analysis. The final part wraps up with conclusions and practical implication of the research.

LITERATURE REVIEW

Contactless payment acceptance studies

The growth in the contactless payment market is attributed mainly to the rapid and secured transactions, real time transaction processing, and reduced time for executing payments apart from other benefits provided by contactless payment option. In terms of region wise distribution, the contactless payments market was dominated by Europe in 2019 (Allied Market Research 2020). The key factors that drove the growth in this region include early adoption among end users and rise in government initiatives for increasing the usage of contactless payment modes.

While there has been a number of research work done on consumer acceptance of contactless payments in various countries of Asia pacific, North America, Europe and Latin America, only a few papers could be found on the contactless payment acceptance in India (e.g. Banerjee, Rao & Gupta, 2016) while there are many papers which deals with acceptance of mobile banking and internet banking – for example Safeena et al., 2012 used TAM model to study the Technology Adoption and Indian consumers for Mobile Banking and Kaur & Malik, 2019 examined factors influencing Indian consumers intention and adoption of Internet banking by extending TAM with electronic service quality.

As evidenced by the literature review, enough studies have not been undertaken to understand from customer point of view regarding their acceptance / non acceptance of Contactless payments in Indian context. This research intends to address this gap and proposes a research framework to identify the factors that impact the consumer acceptance of contactless payment in India using TAM model with the integration of Trust (Kim & Forsythe, 2009) and perceived risk (Yang, Li & Yu 2015, Featherman & Pavlou, 2003) to explain the adoption process.

Technology Acceptance Model (TAM)

To assess the end user’s acceptance behaviour, Technology Acceptance Model (TAM) proposed by Davis (1989) is widely used. Compared with its competing models TAM is believed to be more predictive and robust (Venkatesh & Davis, 2000). Fundamentally, TAM is based on social psychology theory in general and the Theory of Reasoned Action (TRA) in particular (Fishbein & Azjen, 1975). As per TRA beliefs, attitudes, intentions and behaviour are related. Belief influences attitude, which in turn leads to intentions that generate behaviour. Davis further refined his conceptual model to propose TAM as per the figure below:

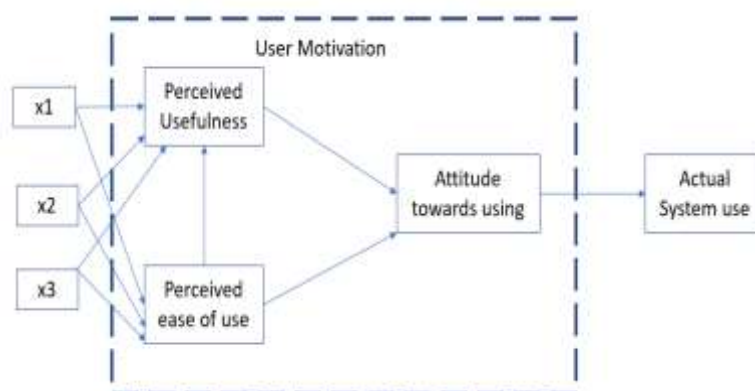


Fig 1: Original TAM proposed by Fred Davis (Davis, 1986; p.24)

David (1985) suggested that there could be three factors that could be used to explain user’s motivation namely: Perceived Ease of Use, Perceived usefulness, and Attitude towards using the system. He hypothesized that a major determinant of whether the user will actually use or reject the system depends on the attitude of a user towards a system. In turn two major beliefs influence attitude namely perceived usefulness and perceived ease of use.

According to Pantano & Pietro, 2012 trust is a psychological state involving intention to accept vulnerability of a positive expectations of another behaviour.

Yang, Li & Yu 2015, Feather & Pavlou, 2003 looks at perceived risks as the major attributes and type of customers as the classification categories in their study covering samples from China, Taiwan and Japan. The study revealed that Performance risk and Security risk were the most important attributes that formed the constructs among the three countries.

Proposed Model

Based on the literature review and focus group interview with business professionals from the banking sector the below mentioned model on acceptance of contactless payments in India was developed (Fig.2). The proposed model considers factors like perceived usefulness, perceived ease of use, perceived risk, hedonic motivation, engagement, trust and compatibility as the independent variables and intention to use as the dependent variable. Demographic factors being considered are age, gender, occupation, income level and education level. These will act as the moderating variables.

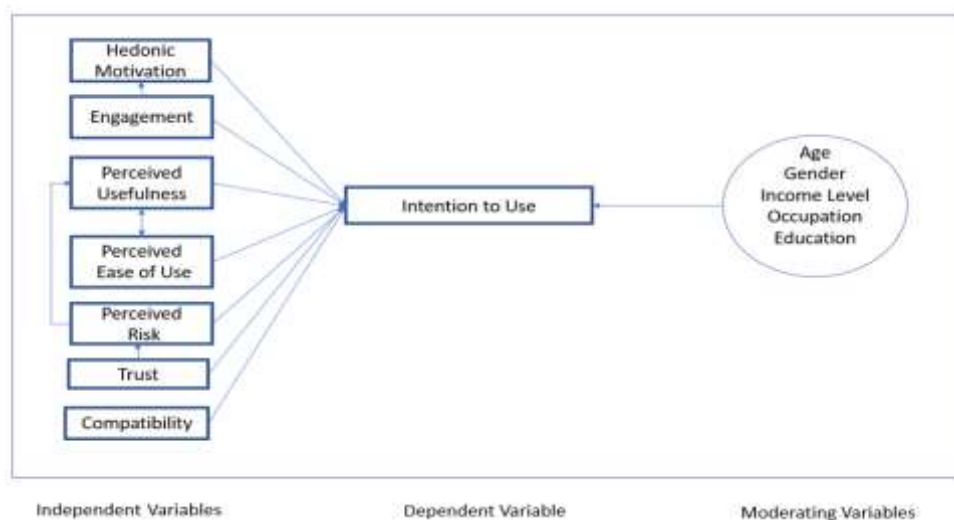


Fig 2: Research Model

Perceived usefulness (PU) and Perceived ease of use (PEOU)

PU is a significant factor that affects acceptance of an information system (Davis *et.al.*1989). Davis defined PU as “the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989). On the other hand, PEOU is defined by TAM as “the degree to which a person believes that using a particular system would be free of effort” (Davis, 1989). This would mean that a system which the user perceives to be easier to use than another is more likely to be accepted by them. By applying these into the context of Contactless payments we hypothesize:

- H1. Perceived usefulness (PU) has a positive effect on consumer acceptance of Contactless payments
- H2. Perceived ease of use (PEOU) has a positive effect on consumer acceptance of Contactless payments

Perceived Risk (PR)

Perceived risk is the expectation of losses related to purchase and it is one of the major barriers discouraging consumers from making a purchase (Zhou, 2011; Wong *et al.*,2012). Broadly, perceived risk is defined in terms of the consumer’s perception of the uncertainty and potential adverse consequences of buying a product or service (Littler & Melanthiou, 2006). We also explore the relationship between the consumer’s perception around risk and the usefulness of the system. Following hypothesis is proposed in light of the above definition:

- H3. PR has a significant relationship towards customer’s adoption of contactless payments.
- H4. PR has a significant relationship towards PU of using contactless payments

Trust

From a functional point of view, trust can be seen as a mechanism that reduces the complexity of human conduct in situations of uncertainty (Luhmann, 1989). Trust is a key factor in any transaction, whether conducted offline or online. However, trust is even more important in an online situation (Gefen *et al.*2003; Gefen ad Straub, 2004) as the degree of uncertainty is higher. The



relationship between trust and attitude is drawn on the notion of perceived consequences (Pavlou & Fygenson, 2006). Whether the trust has a relationship with the risk perceived by the consumer in using this specific payment system is also to be explored. Hence it is proposed:

H5. Trust positively influences the consumers acceptance of Contactless payments.

H6. Trust has a significant relationship with perceived risk in the context of acceptance of contactless payments.

Compatibility (CMP)

In Information system field, compatibility is considered as one of the fundamental antecedent to user adoption of technology or application (Mutahar, Daud, Ramayah, Putit & Isaac, 2017; Cheng, 2015; Ozturk et al., 2016). Rogers (1995) defines compatibility as the degree to which an innovation is perceived as being consistent with the existing values, needs and past experiences of potential adopters. This leads to the below hypothesis:

H7. Compatibility has a significant relationship with customer's intention to adopt Contactless payments.

Engagement (ENG)

Customer engagement pertains to emotional attachment that a customer experience during the repeated and ongoing interactions. Engagement occurs through satisfaction, loyalty and excitement of the brand. Forrester Consulting (2008) defines customer engagement as "creating deep connections with customers that drive purchase decisions, interaction, and participation over time". It is proposed

H8. Engagement has a positive relationship with customer's intention to adopt Contactless payments.

Hedonic Motivation (HM)

Hedonic motivation is the willingness to initiate behaviours that enhance positive experience (pleasant or good) and behaviours that decrease negative experience (Kim-Prieto et al. 2005). The relationship between engagement and hedonic motivation is also to be explored. Considering that we are looking at the acceptance at the individual level, it is proposed:

H9. Hedonic Motivation has a positive relationship with customer's intention to adopt Contactless payments.

H10. Engagement has a positive effect on Hedonic Motivation.

RESEARCH METHODOLOGY

Primary data is planned to be collected from 5 cities across India, the pilot study is planned on a sample of 165 respondents from Chennai. Considering the pandemic period, the data has been collected using convenience sampling. Questionnaire with 52 questions were created in google forms were delivered to 200 respondents of which 165 people responded. Since the forms had validations in place, all the 165 forms were included for the analysis purpose as there was no missing information to be addressed. The questionnaire consisted of questions that were related to background of the respondent, possible factors affecting acceptance and use of contactless payments. The questionnaire was shared in the form of link which could be accessed both using the desktop/laptop and also via mobile. Likert five points scales ranging from "strongly disagree" to "strongly agree" were used as a basis of questions. Additionally, "Neutral" option was allowed in almost all questions. The questionnaire was developed and tested with a focus group consisting of professionals from the banking sector. The focus group evaluated and finally verified that the hypothesis developed might be affective factors explaining contactless payments. Based on this the questionnaire was finalized. The intention to use the contactless payment was chosen as the dependent variable in the model.

RESULTS

The average age of the respondents was 26-35 years. Close to 65 percent of the respondents were male. In terms of income level 44 percent belonged to the bracket of up to Rs. 25,000 per month, followed by 21 Percent in the Rs. 25001 – 50000 category and 19 % in the Rs. 50001 – 100000 category. In terms of education 49% were postgraduates, 37 percent were graduates and 14% had completed secondary education. More than half of the sample, around 60 percent, was from the private sector.

Normality

Statistical methods are based on various underlying assumptions. One of the common assumptions is that a random variable is normally distributed. However, assumption of normality without empirical evidence or test impacts the interpretation and inference



derived from the data. Kolmogorov-Smirnov and Shapiro-Wilk are the two methods usually used for testing normality. Since the sample size is greater than 30, Kolmogorov-Smirnov method was used. It was found the significance level $p < 0.01$ for both independent and dependant variables. Hence the distribution is not normal.

Reliability

Cronbach’s alpha was used for measuring the internal consistency (homogeneity) of the test items. It was found that all the factors had an alpha greater than 0.90 which showed good reliability.

Scale	Cronbach's Alpha	N of Items
Engagement	0.913	7
Trust	0.934	6
Perceived Risk	0.915	5
Perceived Usefulness	0.915	4
Perceived Ease of Use	0.919	4
Hedonic Motivation	0.936	3
Compatibility	0.913	4

Fig 3: Cronbach Alpha

Factor Analysis

Factor analysis with SPSS was conducted on the seven independent variables of perceived usefulness, perceived ease of use, perceived risk, engagement, trust, hedonic motivation and compatibility. The number of items as per the scale for each of the seven independent variables are as given below:

Factor	Engagement	Trust	Perceived Risk	Compatibility	Perceived Ease of Use	Perceived Usefulness	Hedonic Motivation
Items	7	6	5	4	4	4	3

Principal Component Analysis with varimax rotation as an extraction method (Nummenmaa *et al.*, 1996, p.244; Aczel, 1999, p.814-18, Hai *et al.*1998, pp.87-120) was conducted using SPSS. Rotated component matrix comprising of all the seven variables are given below and it has been found that all of them fit into the factor model.

	Component						
	1	2	3	4	5	6	7
ENG_3	.795						
ENG_5	.772						
ENG_1	.795						
ENG_2	.753						
ENG_4	.748						
ENG_7	.725						
ENG_6	.684						
TRUST_5		.693					
TRUST_6		.797					
TRUST_3		.797					
TRUST_4		.785					
TRUST_2		.793					
TRUST_1		.751					
PR_3			.892				
PR_1			.664				
PR_5			.845				
PR_4			.848				
PR_2			.836				
COMP_2				.843			
COMP_3				.838			
COMP_4				.792			
COMP_1				.758			
PEOU_3					.815		
PEOU_4					.808		
PEOU_7					.793		
PEOU_1					.757		
PU_4						.794	
PU_2						.764	
PU_1						.750	
PU_3						.740	
HM_1							.893
HM_2							.855
HM_3							.836

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.
 a. Rotation converged in 7 iterations.

Fig 4: Rotated Component Matrix using SPSS



For validating the use of factor analysis, Bartlett’s test of sphericity and Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was used. Fig 4 indicates the value of KMO as meritorious as per Kaiser (i.e., between 0.80 to 0.89) and Bartlett’s test of sphericity is significant ($P < 0.05$) suggesting that factor analysis can be conducted (Kaiser 1974). While different authors have given different values for retention of items based on the value of factor loadings varying from 0.35 to 0.50 (Hair et al. 1998). However, in this study, loadings of 0.50 or more are considered practically significant.

KMO and Bartlett’s Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.837
Bartlett's Test of Sphericity	Approx. Chi-Square	373.114
	df	21
	Sig.	.000

Fig 5: KMO and Bartlett’s Test of Sphericity

VALIDITY

Confirmatory Factor Analysis (CFA) was conducted for checking the model fit on the items comprising engagement, trust, perceived risk, compatibility, perceived ease of use, perceived usefulness and hedonic motivation.

Three measures are looked at (Bollen and Long, 1993) namely GFI, RMSEA and CFI for validity of the entire model. The GFI, which checks for sample size effects was found to be .092 (should be more than .090), the RMSEA, which measures population discrepancy per degree of freedom was found to be 0.076 (should be below 0.080) and CFI, which checks for non-normal distributions was at .901 (should exceed 0.90) as per Murtha, Lenway & Bagozzi, 1998; Bollen, 1989).

The Bartlett’s test of sphericity confirmed that the variables within factors are correlated. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy showed a practical level of common variance (KMO=0.837). Thereby, it can be deduced that the factor analysis was appropriate, and the model has been found to be valid.

Regression

Regression analysis was conducted to reveal how various factors impact the usage of contactless payments.

A multi regression equation was formed. Of the independent variables perceived usefulness PU ($t=2.723, p < 0.01$), Perceived Ease of Use PEOU ($t=4.837, p < 0.01$) and Compatibility ($t=4.412, p < 0.01$) were statistically significant, the overall model was statistically significant ($R \text{ square} = 0.556, p < 0.01$). In terms of the order of predictive relationship, between the independent variables and the Intention to use, we have perceived ease of use PEOU which has the highest standard coefficient followed by compatibility, perceived usefulness, engagement, perceived risk, hedonic motivation and finally trust. The beta of trust in fact has been found to be negative (-.055) but is not significant ($p > 0.05$). The results of the regression analysis and regression equation formulated is as follows:

$$ITU = 0.060 + 0.041(ENG) - 0.035(Trust) + 0.058(PR) + 0.158(PU) + 0.268(PEOU) + 0.017(HM) + 0.231(CMP)$$

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.746 ^a	.556	.536	1.915

a. Predictors: (Constant), Compatibility, Perceived Risk, Engagement, Hedonic Motivation, Perceived Ease of Use, Trust, Perceived Usefulness

b. Dependent Variable: Intention to Use



ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	721.126	7	103.018	28.086	.000 ^b
	Residual	575.867	157	3.668		
	Total	1296.994	164			

a. Dependent Variable: Intention to Use

b. Predictors: (Constant), Compatibility, Perceived Risk, Engagement, Hedonic Motivation, Perceived Ease of Use, Trust, Perceived Usefulness

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	0.060	0.890		0.067	0.947		
Engagement	0.041	0.032	0.088	1.250	0.213	0.566	1.766
Trust	-.0350	0.045	-0.055	-0.768	0.444	0.548	1.826
Perceived Risk	0.058	0.038	0.086	1.527	0.129	0.899	1.113
Perceived Usefulness	0.158	0.058	0.207	2.723	0.007	0.488	2.051
Perceived Ease of Use	0.268	0.055	0.350	4.837	0.000	0.539	1.855
Hedonic Motivation	0.017	0.064	0.018	0.268	0.789	0.634	1.577
Compatibility	0.231	0.052	0.306	4.412	0.000	0.589	1.698

Fig 6: Multiple Regression Analysis

Correlation

While correlation quantifies the strength of the linear relationship between a pair of variables, regression expresses the relationship in the form of equation as shown above. Spearman rank correlation coefficient calculation shows significant relationship between all the seven independent variables and the dependent variable - Intention to use (Fig. 7).

Correlations

		Intention to Use	Engagement	Trust	Perceived Risk	Perceived Usefulness	Perceived Ease of Use	Hedonic Motivation	Compatibility
Spearman's rho	Intention to Use	Correlation Coefficient	1.000						
		Sig (2-tailed)							
		N	165						
	Engagement	Correlation Coefficient	.437**	1.000					
		Sig (2-tailed)	0.000						
		N	165	165					
	Trust	Correlation Coefficient	.440**	.555**	1.000				
		Sig (2-tailed)	0.000	0.000					
		N	165	165	165				
Perceived Risk	Correlation Coefficient	.203**	0.035	0.107	1.000				
	Sig (2-tailed)	0.009	0.658	0.170					
	N	165	165	165	165				
Perceived Usefulness	Correlation Coefficient	0.641**	.463**	.455**	.187*	1.000			
	Sig (2-tailed)	0.000	0.000	0.000	0.016				
	N	165	165	165	165	165			
Perceived Ease of Use	Correlation Coefficient	.597**	.533**	.468**	0.066	.548**	1.000		
	Sig (2-tailed)	0.000	0.000	0.000	0.397	0.000			
	N	165	165	165	165	165	165		
Hedonic Motivation	Correlation Coefficient	.477**	.378**	.344**	0.062	.436**	.430**	1.000	
	Sig (2-tailed)	0.000	0.000	0.000	0.432	0.000	0.000		
	N	165	165	165	165	165	165	165	
Compatibility	Correlation Coefficient	.487**	.342**	.355**	.166*	.490**	.304**	.463**	1.000
	Sig (2-tailed)	0.000	0.000	0.000	0.033	0.000	0.000	0.000	
	N	165	165	165	165	165	165	165	165

**Correlation significant at the 0.01 level (2-tailed)

*Correlation significant at the 0.05 level (2-tailed)

Fig 7: Spearman Rank Correlation Coefficient



Using chi square test, the results of the hypothesis formulated has their null hypothesis rejected and the result as significant.

SUMMARY AND CONCLUSIONS

The primary objective of the study was to study the consumer acceptance of contactless payments in India in the light of the technology acceptance model (TAM). The model developed proposed that contactless payment acceptance can be modelled with the variables, perceived usefulness, perceived ease of use, perceived risk, hedonic motivation, compatibility, trust and engagement. The model was tested with 165 consumers from Chennai (India) and the results presented. Using the factor analysis, all the seven factors were deemed showing impact on the acceptance of contactless payments. Hence there was no need to remove any factor from the hypothesized model.

The results from the regression analysis conducted on the independent variables (seven factors) found perceived ease of use (PEOU), compatibility (CMP) and perceived usefulness (PU) to be the most influential factors explaining the acceptance of contactless payments. Infact perceived ease of use (PEOU) had a higher impact than of perceived usefulness (PU) which is different from the findings in TAM studies (e.g., Davis, 1989; Davis *et al.*, 1989) which found PEOU had less impact on technology acceptance than PU. The findings in the current model could be attributed to the fact that people are more technology conversant today than before and the widespread penetration of the mobile phones and other online payment modes has further added to the perception of usefulness of technology by the people. With more and more option in the payments area, the model seem to indicate the ease of use to be the major criteria for people to opt for contactless payments. Thus, in this particular scenario we can look at ease of use as antecedent and use as an outcome.

Compatibility is another variable which has come out to be significant in the model. This is in line with the previous studies on adoption of mobile payment services (L. Chen,2008; Mallat & Tuunainen, 2008; Phontanukitithaworn *et.al.*, 2015,2016; Schierz *et.al.*,2010; Wu & Wang,2005) which point out to the fact the adoption is higher when people find that using such services is compatible with their lifestyle and social image.

In terms of hypothesis conclusion, we can see above that all the null hypothesis has been rejected and the alternate hypothesis has been accepted and there is a moderate to strong correlation between the components considered for hypothesis.

THEORETICAL CONTRIBUTION

From a theoretical standpoint, the results presented contributed to the existing literature in a number of ways. First, the article makes a contribution to the contactless payment literature by providing insights on the factors that seem to affect contactless payment acceptance. The results hint that information about contactless payments and its benefit is a critical factor influencing the acceptance. Surprisingly security and privacy were found to have a relatively weak relationship with the acceptance. This is contrary to many of the studies conducted in the past. Article also contributes to the technology acceptance literature by suggesting that compatibility is also an important factor when it comes to technology adoption. Furthermore, we found that PEOU was more influential than PU in explaining technology acceptance in this scenario.

LIMITATIONS AND FURTHER RESEARCH

Although the results can be considered statistically significant in most parts, the sample size is comparatively small and has an effect on the generalization of the findings. The other limitation that we can highlight is the value of R squared in the regression section which indicates that there could be many other significant factors that influence the adoption. One of them could be the impact of subjective norms and cognitive instrumental processes on perceived usefulness and intentions to adopt (Venkatesh & Morris,2000). These limitations pave the way to future studies. Further study could be on the various modes of the contactless payments and their acceptance taking cue from innovation theory and the theory of planned behaviour.

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