

Younger Persons are More Likely to Adopt the Mobile Wallet than Older Persons, or are they? The Moderating Role of Age.

Full Paper

Norman Shaw

Ryerson University, Toronto, Canada
norman.shaw@ryerson.ca

Abstract

Smartphones, when loaded with a secure software application, can act as a mobile wallet. When face-to-face in a retail store, consumers are able to swipe their phone over the terminal and complete payment without having to produce the physical card. The number of terminals that accept contactless payments in the USA is growing as the country moves to the adoption of the 'chip and pin' standard. Consumers can choose from wallet providers such as Google, PayPal and ApplePay. This research seeks to explain the factors that influence adoption. Data from an empirical study of US consumers is analyzed with PLS and the influence of trust, word of mouth and facilitating conditions are determined to be significant. After segmenting the data into two groups based on age and with the help of multigroup analysis, age is determined not to be a moderating factor for owners of smartphones.

Keywords

Technology acceptance, trust, word of mouth, mobile wallet, age, moderation, PLS.

Introduction

At the end of 2014, it is estimated that 70% of the subscribers in North America owned smartphones and although the highest penetration (86%) was in the 25-34 age group, 60% of the 55-64 age group also owned smartphones (IDC 2014; Nielsen 2014). With the ability to run software applications (apps) and connect to the Internet (Carayannis et al. 2013), these phones provide their owners with the ability to store personal and payment data in a 'mobile wallet' that be can be used 'to initiate, authorize and confirm an exchange of financial value in return for goods and services' (Rajan 2012, p. 2). They can substitute for the physical payment card so that payment transactions can be completed in face-to-face situations, such as the point-of-sale in a retail store (Shin 2009).

Payment with plastic cards started in the USA with Diners Club (Woolsey and Gerson 2009) and became more competitive in the 1970s with MasterCard and Visa (Evans 2004). The mobile wallet now offers an alternative that has become viable with the combination of the smartphone and the Internet. New ecosystems have been created, consisting of software developers, smartphone manufacturers and mobile network providers (Kemp 2013). As examples, Google Wallet is a partnership with Sprint and Citi MasterCard (Ross 2012) and Isis Mobile Wallet is a partnership between the US wireless companies, Verizon, T-Mobile and AT&T (Ross 2012). These companies and their competitors need to invest in the infrastructure and they therefore seek to understand the factors that influence adoption of the mobile wallet and whether these factors vary by the age of the consumer.

When payments are involved, consumers need to be confident that the infrastructure is in place to complete the transaction correctly and that the parties involved will secure the payment data. We therefore add the constructs of facilitating conditions and trust. Consumers are introduced to the mobile

wallet by word of mouth and that too is included in the model. Finally, in the empirical study, we collect the participant's age so that we are able to determine if age has a moderating role.

This paper is organized as follows. The next section is the literature review, where we develop our hypotheses and illustrate them with our research model. The third section is the research methods where we provide more background on each construct and introduce the scales by which they will be measured. The fourth section is the analysis of the results. In the fifth section we discuss the results and include the limitations of the current research and suggestions for future research. We present our conclusions in the final section.

Literature Review

Venkatesh et al. (2003) reviewed eight models of technology acceptance and unified them into a single theory, Unified Theory of Acceptance and Use of Technology (UTAUT), with four independent variables: performance expectancy, effort expectancy, social influence and facilitating conditions. We adopt this theory as our foundation, modify some of the constructs and generate a new theoretical model to include word of mouth.

Technology Acceptance

The Technology Acceptance Model (TAM) (Davis 1989) has been used in many studies (King and He 2006; Legris et al. 2003). It is parsimonious with the dependent variable, intention to use, being predicted by two independent variables, perceived ease of use (PEOU) and perceived usefulness (PU). In order to provide more guidance to both academics and practitioners, Venkatesh and Davis (2000) suggested that more emphasis should be placed on the antecedents of PEOU and PU. By analyzing the variables in eight theories of acceptance, UTAUT was proposed, in which common meanings of the various constructs were grouped together (Venkatesh et al. 2003). Two of the predicting constructs are effort expectancy (EE) and performance expectancy (PE). EE, which is similar to PEOU, represents the belief that use of a given system would be free of effort. PE reflects the relative advantage of an innovation, which is the extent to which it is perceived to be better than its predecessor (Rogers 1995); Davis (1989) captured this concept as perceived usefulness.

Meta analysis of empirical studies of UTAUT supports the significant relationships between the constructs and the dependent variable (Dwivedi et al. 2011). In the case of smartphone users, they may be motivated to adopt the mobile wallet due to its relative advantage over the physical wallet: for example, multiple credit cards can easily be stored and digital receipts can help organize purchase expenditures. There is also minimal effort in using the mobile wallet: it is easy to wave the smartphone in front of the payment terminal. We therefore hypothesize:

- Hypothesis 1: Performance expectancy (PE) positively influences intention to use the mobile wallet.
- Hypothesis 2: Effort expectancy (EE) positively influences intention to use the mobile wallet.

Facilitating Conditions

Facilitating conditions are defined as the beliefs of an individual that the support structure is in place to support a technological innovation (Lu et al. 2004; Venkatesh et al. 2003). Users expect the innovation to work reliably; they also expect a level of support to be available to assist them when they are learning and to provide help when something does not function as it should (Triandis 1979). For mobile commerce, consumers' confidence in the conditions are enhanced by the reliability of the Internet connectivity, the common standards and processes that are in place for all payment transactions and the level of security guaranteed by the financial institutions (Lu et al. 2004; Patnasingam et al. 2005; Pavlou et al. 2003). These factors comprise the facilitating conditions and we therefore propose:

- Hypothesis 3: Facilitating conditions positively influence EE.
- Hypothesis 4: Facilitating conditions positively influence PE.

Trust

The data that is transferred between consumers and retailers in a payment transaction include personal financial data, such as credit card numbers. Consumers trust that the correct amount will be debited from their account, the funds will flow to the correct retailer and that data will not be compromised and shared with inappropriate parties (Ganguly et al. 2010; Gefen et al. 2003; Pavlou and Gefen 2004). Trust is an important factor for consumers when engaged in online shopping (Chellappa and Pavlou 2002; Dahlberg et al. 2003) and we follow the recommendation of Dahlberg et al. (2003) and add trust to our model.

- Hypothesis 5: Trust positively influences EE.
- Hypothesis 6: Trust positively influences PE.

Word of mouth as a substitute for social influence

Social influence refers to the influence that important others have on the individual's decision to adopt an innovation (Venkatesh et al. 2003). Today users have a number of channels by which they can be informed about a new technology (Risselada et al. 2014). Owners of smartphones are able to find out about new apps through word of mouth (WOM), which has been substituted for social influence (East et al. 2014; Pousttchi and Goeke 2011). WOM can be decomposed into personal word of mouth (PWOM), virtual word of mouth (VWOM) and written word of mouth (WWOM). PWOM refers to the personal interaction with friends, family and colleagues (Cheung et al. 2012). VWOM refers to consumers learning via the virtual world, from postings on websites or blogs by experts (Ulmanen 2011). WWOM refers to the gathering of information via articles published in magazines and newspapers (Kawakami and Parry 2013; Parry et al. 2012). We define word of mouth as a second order construct, comprised of PWOM, VWOM and WWOM as the first order constructs. Our first hypothesis is:

- Hypothesis 7: Word of mouth positively influences trust.

In their grounded theory study of mobile users, Palka et al. (2009) proposed that WOM influences attitudes towards facilitating conditions. We therefore add:

- Hypothesis 8: Word of mouth positively influences facilitating conditions.

Age as a moderator

The empirical data reported in the original article on UTAUT confirmed the moderating influence of age (Venkatesh et al. 2003). Older users are more driven by the utilitarian value of an innovation compared to younger users who place more weight on the hedonic value (Childers et al. 2001; Phang et al. 2006). In a study of mobile payment over the Internet, age was shown to be a moderator (Liébana-Cabanillas et al. 2014). When faced with the choice of self-scanning at the checkout, older consumers were less likely to use the automated option (Dean 2008). These studies would support the hypothesis that age would be a moderator and that younger consumers would be more willing to accept a mobile wallet than older ones. We follow Baron and Kenny's guidelines that "a moderator is a qualitative or quantitative variable that affects the strength of the relation between predictor variables and a dependent variable" (Baron and Kenny 1986, p. 1174). We divide age into two groups of younger and older consumers by adding hypothesis 9:

- Hypothesis 9: Age is a moderator, with the expectation that younger consumers are more likely to adopt the mobile wallet than older consumers.

Research Model

The research model is shown in Figure 1.

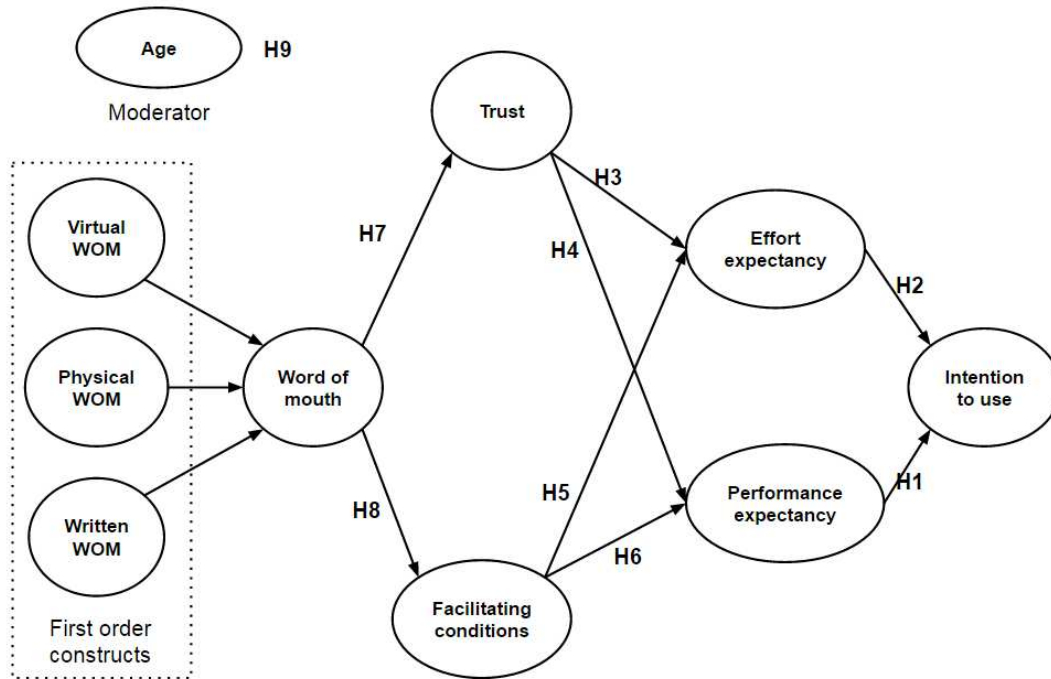


Figure 1: Research Model for Acceptance of Mobile Wallet

Research Methods

Design

Indicators were selected from extant literature to measure the constructs in the model. EE and PE were adapted from Venkatesh et al. (2003). Facilitating conditions were adapted from a study of online banking (Zhou et al. 2010). When buying products over the Internet, consumers are concerned about trust in a similar manner to their concerns when using a smartphone for proximity payments (Chandra et al. 2010). Parry et al. (2012) added word of mouth to TAM and we adapt his scale in our study.

Data was collected via an online survey, which was validated with the help of subject matter experts. The survey was sent to a panel of 1,000 participants who had been recruited by a company that specializes in engaging individuals who are willing to respond to such surveys. Prior to sending the survey to all the participants, it was sent to a random group of one hundred and the measurement model was analyzed with SmartPLS. A few indicators were non-convergent on their construct and they were dropped. The questionnaire was finalized and sent to the remainder of the panel and the responses were checked for completeness. The final number of valid responses was 597. These were sorted by age into three groups of approximately the same size. The younger group consisted of 206 samples and the older group had 205 samples. The middle group was not included in the analysis in order to have a clear separation between the two age samples.

Data Analysis

The data collected was analyzed with PLS, which enables both the measurement model and the structural model to be evaluated (Gefen et al. 2000; Hair et al. 2014). The rule of thumb for minimum sample size is ten times the largest number of structural paths directed at a particular construct model (Hair et al. 2014). In our model, the largest number is two. Each of our two age groups comfortably exceeds the minimum of twenty.

We first evaluated the measurement model (Hair et al. 2014) for internal consistency and discriminant validity. Tests of convergence and discriminant validity were applied to the first order constructs of word of mouth to confirm that they reflected the second order construct. Cronbach’s alpha, composite reliability and average variance extracted were compared against statistical rules of thumb. Constructs were tested for discriminant validity by ensuring that their outer loadings were greater than their cross-loadings on all other constructs. In addition, the Fornell-Larcker criterion was used to test the discriminant validity of all the constructs in the model.

Next we evaluated the structural model (Hair et al. 2014). The second order constructs for word of mouth were added to the PLS model by adopting the repeated indicators approach (Wetzels et al. 2009). The coefficients of determination (R^2) were calculated for all endogenous variables and the coefficients for each path were calculated and their significance determined by bootstrapping. Effect size, f^2 , was calculated where each predicting variable was excluded in turn from the model to find the excluded value of R^2 . To test the role of age as a moderator, the PLS model was run for each age group and the path coefficients and their significance were compared via multigroup analysis.

Results

Descriptive Statistics

Because we are postulating that age is a moderator, we treat it is a dichotomous variable (Baron and Kenny 1986) rather than a continuous variable. The total sample of 597 participants was split into three groups of approximately equal size. Only the younger and older groups were included for further analysis. By omitting the middle group, we make a clear distinction between the two groups. Table 1 shows the number of responses by age group.

<i>Ages</i>	<i>Group</i>	<i>Number of responses</i>	<i>Included/Excluded</i>
18 to 35	Younger	206	
47 to 75	Older	205	
Total		411	Included for analysis
36 to 46	Middle	186	Excluded

Table 1: Age groups included in sample

Participants were also asked how many physical cards they carried in their wallet, by type of card: credit, debit, loyalty or pre-paid. The mobile wallet provides an advantage for consumers who carry multiple cards, as all the card numbers can be stored electronically. Table 2 shows the distribution with the average number of cards held by age group and type of card. Older consumers carry more credit cards, but less pre-paid cards.

No of cards	Credit cards		Debit cards		Loyalty cards		Pre-paid cards	
	Younger	Older	Younger	Older	Younger	Older	Younger	Older
0	37	17	31	32	67	70	141	171
1	80	69	129	143	38	33	38	24
2	53	57	39	23	23	23	17	8
3	22	33	3	5	19	19	6	2
4	8	20	2	2	13	24	2	0
5	6	2	1	0	17	16	1	0
6	0	4	0	0	8	5	0	0
7	0	2	0	0	5	1	0	0
8	0	0	0	0	3	3	0	0
Avege no.	1.5	2.0	1.1	1.0	2.0	1.9	0.5	0.2

Table 2: Number of cards in wallet by age group

The Measurement Model

The cross loadings of the measurement model were calculated by the SmartPLS software and the indicators were shown to be collinear. All correlation coefficients were greater than the threshold value of 0.708 (Henseler et al. 2009). By running a bootstrap within SmartPLS with 5,000 samples using the replacement method, the t statistic for each cross loading was calculated and in every case, the significance was $p < 0.001$. Tests for reliability were conducted by calculating Cronbach’s alpha, composite reliability and the Average Variance Extracted (AVE) for each construct. The model tested positive for reliability: Cronbach’s alpha was above 0.8 (Cronbach and Meehl 1955); Average Variance Extracted (AVE) for each construct was above the guideline of 0.5; and Composite Reliability was above the guideline of 0.6 (Henseler et al. 2009). See Table 3.

Construct	Abbrev.	AVE	Composite Reliability	Cronbach's Alpha
Facilitating conditions	FC	0.698	0.902	0.855
Intention to use	ITU	0.845	0.956	0.939
Effort expectancy	EE	0.899	0.947	0.888
Performance expectancy	PU	0.77	0.943	0.925
Personal WOM	PWOM	0.765	0.942	0.923
Trust	Trust	0.871	0.964	0.951
Virtual WOM	VWOM	0.718	0.939	0.922
Word of mouth	WOM	0.516	0.944	0.937
Written WOM	WWOM	0.776	0.945	0.927

Table 3: Reliability statistics

Discriminant validity was tested using the Fornell-Larcker score, where the AVE must be greater than the square of the correlations (Fornell and Larcker 1981). The results satisfied these criteria, with the exception of word of mouth due to it being a higher order construct. Table 4 shows the correlations with the square root of AVE (shown in italic bold along the diagonal).

Construct	FC	ITU	EE	PU	PWOM	Trust	VWOM	WOM	WWOM
Facilitating conditions	0.835								
Intention to use	0.606	0.919							
Effort expectancy	0.729	0.639	0.948						
Performance expectancy	0.682	0.771	0.729	0.877					
Personal WOM	0.346	0.384	0.353	0.382	0.875				
Trust	0.639	0.754	0.666	0.728	0.303	0.933			
Virtual WOM	0.44	0.438	0.441	0.443	0.472	0.39	0.848		
WOM	0.482	0.478	0.484	0.502	0.722	0.428	0.894	0.718	
Written WOM	0.4	0.362	0.396	0.417	0.423	0.361	0.672	0.855	0.881

Note: the bold value along the diagonal is the square root of the AVE

Table 4: Values for Fornell Larcker test

The Structural Model

The SmartPLS algorithm calculated the R² measures for each endogenous variable and the path coefficients for each path within the model. R² for intention to use was 0.607, which is considered moderate (Hair et al. 2011). The significance of each path coefficient was calculated by bootstrapping with 5,000 samples using the replacement method. All hypotheses were supported. Results for both age groups combined are shown in Figure 2.

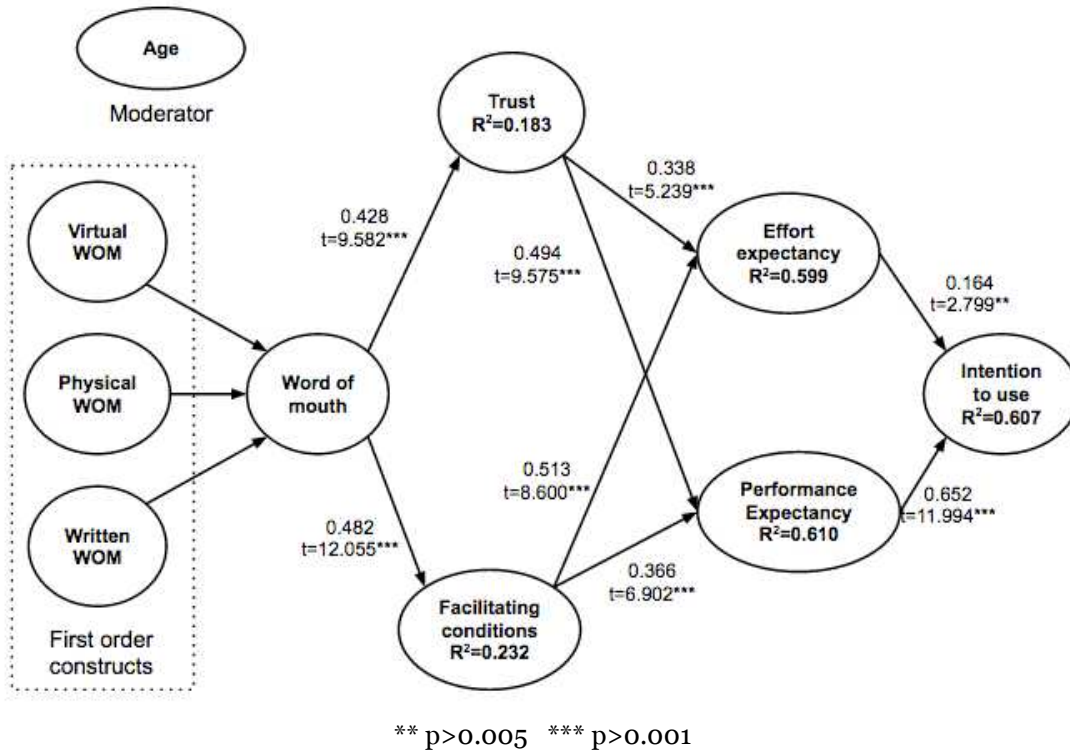


Figure 2: Results of analysis of structural model for both age groups combined

The effect size was calculated in a series of steps, where each exogenous variable was removed from the model in turn and the new R squared calculated. The effect size is represented by f squared, where values between 0.02 and 0.14 are small, between 0.15 and 0.34 are medium and 0.35 and above are large (Henseler et al. 2009). Table 5 shows the effect size of the exogenous variables on intention to use. PE has a large effect size and EE has a small effect size. The other constructs, trust, facilitating conditions and word of mouth had no significant effect (f squared was less than 0.02). Table 6 shows the effect size of trust, facilitating conditions and word of mouth on effort expectancy and performance expectancy. Trust has a large effect and facilitating conditions had a medium effect.

	<i>R</i> ²	<i>f</i> ²	<i>Effect size</i>
All constructs	0.607		
PE excluded	0.408	0.51	Large
EE excluded	0.595	0.03	Small
Trust excluded	0.606	0.00	
FC excluded	0.608	(0.00)	
WOM excluded	0.607	-	

Table 5: Effect Size on intention to use

	Effect on EE			Effect on PE		
	R ²	f ²	Effect size	R ²	f ²	Effect size
<i>All constructs R2 included</i>	0.599			0.61		
<i>Trust excluded</i>	0.531	0.17	Medium	0.467	0.37	Large
<i>FC excluded</i>	0.444	0.39	Large	0.532	0.20	Medium
<i>WOM excluded</i>	0.6	(0.00)		0.61	-	

Table 6: Effect Size on effort expectancy and performance expectancy

Age as a moderator

The analysis of the previous section confirmed that the hypotheses 1 to 8 were supported irrespective of age. In order to determine the moderating effect of age, each group was then run separately and the results compared. Table 7 shows the differences in the R² for each age group. Table 8 shows the path coefficients for each age group. The values of the path coefficients are compared and with the help of multigroup analysis the t value and significance are calculated. All differences are non-significant. Age is not a moderating variable. Hypothesis 9 is not supported.

<i>Construct</i>	<i>Both groups (411 samples)</i>	<i>Group 1: Age 18 to 35 (206 samples)</i>	<i>Group 2: Age 47 to 75 (205 samples)</i>
Intention to use	0.607	0.577	0.628
Facilitating conditions	0.232	0.247	0.228
Effort expectancy	0.599	0.609	0.593
Performance expectancy	0.610	0.644	0.589
Trust	0.183	0.186	0.159

Table 7: Comparison of R² for Age Groups

Path	Coeff (p1)	SE (p1)	Coeff (p2)	SE (p2)	p1-p2	t value	Significance
PE -> ITU	0.677	0.068	0.618	0.068	0.059	0.615	NS
EE -> ITU	0.159	0.072	0.168	0.072	-0.009	0.089	NS
FC -> PU	0.271	0.073	0.465	0.073	-0.194	1.884	NS
FC -> EE	0.529	0.085	0.545	0.085	-0.016	0.133	NS
Trust -> PU	0.556	0.068	0.435	0.068	0.121	1.261	NS
Trust -> EE	0.304	0.09	0.323	0.09	-0.019	0.396	NS
WOM -> Trust	0.399	0.064	0.431	0.064	-0.032	0.354	NS
WOM -> FC	0.477	0.056	0.497	0.056	-0.02	0.253	NS

NS = not significant

Table 8: Comparison of differences of path coefficients and their significance

Support of Hypotheses

Table 9: Support of hypotheses

Hypothesis 1: Performance expectancy (PE) positively influences intention to use the mobile wallet.	Supported
Hypothesis 2: Effort expectancy (EE) positively influences intention to use the mobile wallet.	Supported
Hypothesis 3: Facilitating conditions positively influence EE.	Supported
Hypothesis 4: Facilitating conditions positively influence PE.	Supported
Hypothesis 5: Trust positively influences EE	Supported
Hypothesis 6: Trust positively influences PE.	Supported
Hypothesis 7: Word of mouth positively influences	Supported
Hypothesis 8: Word of mouth positively influences facilitating conditions.	Supported
Hypothesis 9: Age is a moderator, with the expectation that younger consumers are more likely to adopt the mobile wallet than older consumers.	Not supported

Discussion

The main influencing factor is PE, which has a large effect on intention to use. This is consistent with other studies of UTAUT (Slade et al. 2014; Thakur and Srivastava 2014) and, given the similarity of PE with PU, it is also consistent with the findings from TAM (Legris et al. 2003; Turner et al. 2010). Consumers will use the mobile wallet based on the perceived benefits, such as fewer cards to carry in the wallet, the link to loyalty points and the handling of e-receipts.

In our study, EE only has a small effect. Past studies of PEOU in TAM (Legris et al. 2003) and EE in UTAUT have produced mixed results with some studies showing that EE has no significant effect, while other studies show a small effect (Dwivedi et al. 2011). The small effect in our results can be explained by the similarity of the action of waving a smartphone over a payment terminal to that of waving a payment card. The mobile wallet is simple to use and will require very little training so consumers would not see the need to expend effort to learn about its deployment.

Trust had a large effect on PE, which confirms past studies of mobile payment (Tang et al. 2014). Paying with a physical credit card is a common occurrence that functions with very few issues. However, the processing of a payment with a mobile wallet involves more organizations: the smartphone manufacturer, the app provider and the mobile network. If consumers have concerns that payments will not be completed correctly, the perceived benefits will not be realized.

Trust had a medium effect on EE. Users who lack trust in the mobile wallet will take more steps to protect their data with more pass codes and, prior to use, they may wish to learn more about the transaction flow. Consequently effort will increase as trust decreases.

Facilitating conditions had a large effect on EE. A technical infrastructure that ensures that payments flow correctly and without interruption will mean that consumers experience very few problems. Use of the mobile wallet will be smooth. Many financial institutions guarantee full refund if there are any technical issues and with this support in place, consumers are further reassured. Facilitating conditions had a medium effect on PE.

The path coefficients were different between the younger group and the older group, but the statistical analysis showed that the results were not significant. This is surprising given that other studies have shown that age is a moderator (Oliveira et al. 2014; Yu 2012). One explanation is that the survey was sent to smartphone owners only and because there is a lower penetration of smartphone ownership amongst the older population (Nielsen 2014), the older group who responded to the survey were the early adopters (Rogers 1995) and not representative of the general population.

Theoretical Contribution

Many studies have evaluated the use of mobile technology to access the Internet to make purchases and seek specific information about a product prior to purchase (Amoroso 2013; Holmes et al. 2013; Hong et al. 2006), but there have been limited studies of the acceptance of the mobile wallet to be used at the point-of-sale. UTAUT has been the theoretical foundation of a number of studies of mobile commerce, defined as the use of mobile devices to conduct an array of business services, such as mobile ticketing, location based marketing and mobile banking (Martins et al. 2014; Zhang et al. 2012). Our theoretical contribution is the extension of UTAUT to the context of consumer acceptance of the use of the smartphone to effect proximity payment.

Our model examines the influence of trust and facilitating conditions on PE and EE, which is an extension of the research by Patnasingam et al. (2005). Smartphone users become aware of the many apps available to them through word of mouth: they see their friends using the app (an example of personal word of mouth, PWOM), they read a review from a trusted source (an example of virtual word of mouth, VWOM) or a written source (written word of mouth, WWOM). We combine the first order constructs of PWOM, VWOM and WWOM into a higher order construct, word of mouth and evaluate its influence on trust and facilitating conditions.

Finally we analyze the moderating role of age. Although a number of studies have shown that age moderates the adoption of technology (Morris and Venkatesh 2000), the results are not conclusive because of the size of the samples and other confounding factors (Sun and Zhang 2006). In our study, we conclude that amongst owners of smartphones, there is no significant difference between a younger age group and an older age group in their intention to use a mobile wallet.

A further contribution to theory is the comparison of the influence of PE to that of EE. Meta-analysis of the TAM and UTAUT literature has indicated that PE has a stronger influence than EE (Dwivedi et al. 2011; Legris et al. 2003). In our study of mobile wallet adoption, EE has a small effect. This confirms the findings of Gefen and Straub (Gefen and Straub 2000), who proposed that EE relates to the 'intrinsic

characteristics of the IT artifact...whilst PE is a response to user assessment of its extrinsic outcomes' (Gefen and Straub 2000, p. 3).

Limitations and Future Research

We purchased survey participation from an organization that recruits individuals who are willing to take surveys for a small reward. Consequently our results may not be generalizable to the broader population. The research was conducted with consumers who reside in the USA, and are therefore familiar with the payment offerings in that country. Financial institutions in other countries may have different offerings and the cultural disposition of the population may be different than that of the USA. Furthermore, the sample was only smartphone owners and we are only testing the moderating role of age amongst smartphone owners.

Future researchers will be able to extend our research in a number of areas. Other moderating factors could be examined such as income or education. Data collection could be expanded to collect responses from individuals whether or not they own a smartphone. This would further our understanding of the moderating role of age. Security and privacy are concerns when payments are made over the Internet and they warrant further study. Finally, because offerings and infrastructure vary by country, comparing acceptance in different countries could further extend research, thereby evaluating the influence of cultural differences. Future research should also evaluate the bias of participants.

Conclusion

Many consumers carry multiple payment cards in their wallet in order to shop at the merchants who offer the convenience of electronic payment instead of cash. Because of the introduction in the USA of the 'chip and pin' standard to reduce credit card fraud, retailers are upgrading their payment terminals, which, in many cases, makes contactless payments feasible. Not only plastic cards with a chip can be waved near the terminal but also smartphones with a mobile wallet can be used for payments. In order to support the growth of the smartphone wallet, additional infrastructure is required by the smartphone manufacturers, the app developers, the mobile phone network providers and financial institutions.

Prior to making these investment decisions, these organizations need to understand the factors that influence consumer adoption of the mobile wallet. Our research, based on extending UTAUT, shows that the key predicting factor is performance expectancy. Consumers will adopt the mobile wallet if they perceive a relative advantage over the physical wallet. Benefits include: carrying less cards, because they can be stored electronically; linking loyalty cards to payment so that points are easily earned and redeemed; and replacing the paper trail of receipts with organized e-receipts. Providers of the mobile wallet need to ensure that the facilitating conditions are in place so that the ecosystem functions smoothly and the consumer rarely has problems. Transactions must be processed accurately for both payer and payee so that all users trust the system. Consumers can be educated about the benefits of the mobile wallet by word of mouth. The results of our empirical study indicate that there is no significant difference between younger consumers and older consumers in their intention to use a mobile wallet.

The academic community can further refine this research building on the model presented here. Practitioners should continue to enhance the infrastructure, engender trust and communicate via word of mouth. When consumers are offered additional services such as proximity payment for public transit, vending machines and parking the adoption of the mobile wallet will be accelerated.

REFERENCES

Amoroso, D. L. 2013. "The Importance of Institution-Based Trust in Mobile Adoption with Online Shopping Applications," *International Journal of Technology Diffusion (IJTD)* (4:4), pp. 1-26.

- Baron, R. M., and Kenny, D. A. 1986. "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations," *Journal of Personality and Social Psychology* (51:6), pp. 1173-1182.
- Carayannis, E. G., Clark, S. C., and Valvi, D. E. 2013. "Smartphone Affordance: Achieving Better Business through Innovation," *Journal of the Knowledge Economy* (4:4), pp. 444-472.
- Chandra, S., Srivastava, S. C., and Theng, Y.-L. 2010. "Evaluating the Role of Trust in Consumer Adoption of Mobile Payment Systems: An Empirical Analysis," *Communications of the Association for Information Systems* (27:1), pp. 561-588.
- Chellappa, R. K., and Pavlou, P. A. 2002. "Perceived Information Security, Financial Liability and Consumer Trust in Electronic Commerce Transactions," *Logistics Information Management* (15:5/6), pp. 358-368.
- Cheung, C. M., Xiao, B., and Liu, I. L. 2012. "The Impact of Observational Learning and Electronic Word of Mouth on Consumer Purchase Decisions: The Moderating Role of Consumer Expertise and Consumer Involvement," *System Science (HICSS), 2012 45th Hawaii International Conference on System Sciences: IEEE*, pp. 3228-3237.
- Childers, T. L., Carr, C. L., Peck, J., and Carson, S. 2001. "Hedonic and Utilitarian Motivations for Online Retail Shopping Behavior," *Journal of Retailing* (77:4), pp. 511-535.
- Cronbach, L. J., and Meehl, P. E. 1955. "Construct Validity in Psychological Tests," *Psychological Bulletin* (52:4), pp. 281-302.
- Dahlberg, T., Mallat, N., and Öörni, A. 2003. "Trust Enhanced Technology Acceptance Model - Consumer Acceptance of Mobile Payment Solutions Tentative Evidence," in: *Stockholm Mobility Roundtable*. Citeseer.
- Davis, F. D. 1989. "Perceived Usefulness, Perceived Ease of Use, and User Acceptance," *MIS Quarterly* (13:3), pp. 319-340.
- Dean, D. H. 2008. "Shopper Age and the Use of Self-Service Technologies," *Managing Service Quality: An International Journal* (18:3), pp. 225-238.
- Dwivedi, Y. K., Rana, N. P., Chen, H., and Williams, M. D. 2011. "A Meta-Analysis of the Unified Theory of Acceptance and Use of Technology (Utaut)," in *Governance and Sustainability in Information Systems. Managing the Transfer and Diffusion of It*. Springer, pp. 155-170.
- East, R., Uncles, M. D., and Lomax, W. 2014. "Hear Nothing, Do Nothing: The Role of Word of Mouth in the Decision-Making of Older Consumers," *Journal of Marketing Management* (30:7-8), pp. 786-801.
- Evans, D. S. 2004. "More Than Money: The Development of a Competitive Electronic Payments Industry in the United States," *Payment Card Economics Review* (2), pp. 1-27.
- Fornell, C., and Larcker, D. F. 1981. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error," *Journal of Marketing Research*, pp. 39-50.
- Ganguly, B., Dash, S. B., Cyr, D., and Head, M. 2010. "The Effects of Website Design on Purchase Intention in Online Shopping: The Mediating Role of Trust and the Moderating Role of Culture," *International Journal of Electronic Business* (8:4), pp. 302-330.
- Gefen, D., Karahanna, E., and Straub, D. W. 2003. "Trust and Tam in Online Shopping: An Integrated Model," *MIS Quarterly* (27:1), p. 51.
- Gefen, D., and Straub, D. W. 2000. "The Relative Importance of Perceived Ease of Use in Is Adoption: A Study of E-Commerce Adoption," *J. AIS* (1).
- Gefen, D., Straub, D. W., and Boudreau, M. C. 2000. "Structural Equation Modeling and Regression: Guidelines for Research Practice," *Communications of AIS* (4:7), pp. 1-77.
- Hair, J. F., Hult, G. T. M., Ringle, C. M., and Sarstedt, M. 2014. *A Primer on Partial Least Squares Structural Equations Modeling (Pls-Sem)*. SAGE Publications.
- Hair, J. F., Ringle, C. M., and Sarstedt, M. 2011. "PLS-SME: Indeed a Silver Bullet," *The Journal of Marketing Theory and Practice* (19:2), pp. 139-152.
- Henseler, J., Ringle, C. M., and Sinkovics, R. R. 2009. "The Use of Partial Least Squares Path Modeling in International Marketing," *Advances in International Marketing* (20), pp. 277-319.
- Holmes, A., Byrne, A., and Rowley, J. 2013. "Mobile Shopping Behaviour: Insights into Attitudes, Shopping Process Involvement and Location," *International Journal of Retail & Distribution Management* (42:1), pp. 25-39.
- Hong, S. J., Thong, J. Y. L., and Tam, K. Y. 2006. "Understanding Continued Information Technology Usage Behavior: A Comparison of Three Models in the Context of Mobile Internet," *Decision Support Systems* (42:3), pp. 1819-1834.

- IDC. 2014. "Despite a Strong 2013, Worldwide Smartphone Growth Expected to Slow to Single Digits by 2017, According to IDC." from <http://www.idc.com/getdoc.jsp?containerId=prUS24701614>
- Kawakami, T., and Parry, M. E. 2013. "The Impact of Word of Mouth Sources on the Perceived Usefulness of an Innovation," *Journal of Product Innovation Management* (30:6), pp. 1112-1127.
- Kemp, R. 2013. "Mobile Payments: Current and Emerging Regulatory and Contracting Issues," *Computer Law & Security Review* (29:2), pp. 175-179.
- King, W. R., and He, J. 2006. "A Meta-Analysis of the Technology Acceptance Model," *Information & Management* (43:6), pp. 740-755.
- Legris, P., Ingham, J., and Colletette, P. 2003. "Why Do People Use Information Technology? A Critical Review of the Technology Acceptance Model," *Information & Management* (40:3), pp. 191-204.
- Liébana-Cabanillas, F., Sánchez-Fernández, J., and Muñoz-Leiva, F. 2014. "Antecedents of the Adoption of the New Mobile Payment Systems: The Moderating Effect of Age," *Computers in Human Behavior* (35), pp. 464-478.
- Lu, J., Yu, C., and Liu, C. 2004. "Facilitating Conditions, Wireless Trust and Adoption Intention," *Journal of Computer Information Systems* (46:1), pp. 17-24.
- Martins, C., Oliveira, T., and Popovič, A. 2014. "Understanding the Internet Banking Adoption: A Unified Theory of Acceptance and Use of Technology and Perceived Risk Application," *International Journal of Information Management* (34:1), pp. 1-13.
- Morris, M. G., and Venkatesh, V. 2000. "Age Differences in Technology Adoption Decisions: Implications for a Changing Work Force," *Personnel psychology* (53:2), pp. 375-403.
- Nielsen. 2014. "Smartphone Penetration Rate by Age Group, in Q2." from <http://www.marketingcharts.com/online/smartphone-penetration-rate-by-age-group-in-q2-45774/>
- Oliveira, T., Faria, M., Thomas, M. A., and Popovič, A. 2014. "Extending the Understanding of Mobile Banking Adoption: When Utatut Meets Ttf and Itm," *International Journal of Information Management* (34:5), pp. 689-703.
- Palka, W., Pousttchi, K., and Wiedemann, D. G. 2009. "Mobile Word-of-Mouth—a Grounded Theory of Mobile Viral Marketing," *Journal of Information Technology* (24:2), pp. 172-185.
- Parry, M. E., Kawakami, T., and Kishiya, K. 2012. "The Effect of Personal and Virtual Word-of-Mouth on Technology Acceptance," *Journal of Product Innovation Management* (29:6), pp. 952-966.
- Patnasingam, P., Gefen, D., and Pavlou, P. A. 2005. "The Role of Facilitating Conditions and Institutional Trust in Electronic Marketplaces," *Journal of Electronic Commerce in Organizations (JECO)* (3:3), pp. 69-82.
- Pavlou, P. A., and Gefen, D. 2004. "Building Effective Online Marketplaces with Institution-Based Trust," *Information Systems Research* (15:1), pp. 37-59.
- Pavlou, P. A., Tan, Y.-H., and Gefen, D. 2003. "Institutional Trust and Familiarity in Online Interorganizational Relationships," *Proceedings of the European Conference on Information Systems (ICIS) Naples, Italy*.
- Phang, C. W., Sutanto, J., Kankanhalli, A., Li, Y., Tan, B. C., and Teo, H.-H. 2006. "Senior Citizens' Acceptance of Information Systems: A Study in the Context of E-Government Services," *Engineering Management, IEEE Transactions on* (53:4), pp. 555-569.
- Pousttchi, K., and Goeke, L. 2011. "Determinants of Customer Acceptance for Mobile Data Services: An Empirical Analysis with Formative Constructs," *International Journal of Electronic Business* (9:1/2).
- Rajan, M. A. 2012. "The Future of Wallets: A Look at the Privacy Implications of Mobile Payments," *CommLaw Conspectus* (20), pp. 445-471.
- Risselada, H., Verhoef, P. C., and Bijmolt, T. H. 2014. "Dynamic Effects of Social Influence and Direct Marketing on the Adoption of High-Technology Products," *Journal of Marketing* (78:2), pp. 52-68.
- Rogers, E. M. 1995. *Diffusion of Innovations*. New York: London Free Press.
- Ross, P. E. 2012. "Phone-Y Money," *Spectrum, IEEE* (49:6), pp. 60-63.
- Shin, D. 2009. "Towards an Understanding of the Consumer Acceptance of Mobile Wallet," *Computers in Human Behavior* (25:6), pp. 1343-1354.
- Slade, E., Williams, M., Dwivedi, Y., and Piercy, N. 2014. "Exploring Consumer Adoption of Proximity Mobile Payments," *Journal of Strategic Marketing: ahead-of-print*, pp. 1-15.
- Sun, H., and Zhang, P. 2006. "The Role of Moderating Factors in User Technology Acceptance," *International Journal of Human-Computer Studies* (64:2), pp. 53-78.
- Tang, C. Y., Lai, C. C., Law, C. W., Liew, M. C., and Phua, V. V. 2014. "Examining Key Determinants of Mobile Wallet Adoption Intention in Malaysia: An Empirical Study Using the Unified Theory of Acceptance and

- Use of Technology 2 Model," *International Journal of Modelling in Operations Management* (4:3), pp. 248-265.
- Thakur, R., and Srivastava, M. 2014. "Adoption Readiness, Personal Innovativeness, Perceived Risk and Usage Intention across Customer Groups for Mobile Payment Services in India," *Internet Research* (24:3), pp. 369-392.
- Triandis, H. C. 1979. *Values, Attitudes, and Interpersonal Behavior*. University of Nebraska Press, Lincoln, NE.
- Turner, M., Kitchenham, B., Brereton, P., Charters, S., and Budgen, D. 2010. "Does the Technology Acceptance Model Predict Actual Use? A Systematic Literature Review," *Information and Software Technology* (52:5), pp. 463-479.
- Ulmanen, H. 2011. "Antecedents of and Their Effect on Trust in Online Word-of-Mouth: Case Finnish Discussion Forums,"
- Venkatesh, V., and Davis, F. D. 2000. "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies," *Management Science* (46:2), pp. 186-204.
- Venkatesh, V., Morris, M. G., Davis, G. B., and Davis, F. D. 2003. "User Acceptance of Information Technology: Toward a Unified View1," *MIS Quarterly* (27:3), pp. 425-278.
- Wetzels, M., Odekerken-Schröder, G., and Van Oppen, C. 2009. "Using Pls Path Modeling for Assessing Hierarchical Construct Models: Guidelines and Empirical Illustration," *MIS Quarterly* (33:1), pp. 177-195.
- Woolsey, B., and Gerson, E. S. 2009. "The History of Credit Cards." from <http://www.creditcards.com/credit-card-news/credit-cards-history-1264.php>
- Yu, C.-S. 2012. "Factors Affecting Individuals to Adopt Mobile Banking: Empirical Evidence from the Utaut Model," *Journal of Electronic Commerce Research* (13:2), pp. 104-121.
- Zhang, L., Zhu, J., and Liu, Q. 2012. "A Meta-Analysis of Mobile Commerce Adoption and the Moderating Effect of Culture," *Computers in Human Behavior* (28:5), pp. 1902-1911.
- Zhou, T., Lu, Y., and Wang, B. 2010. "Integrating Ttf and Utaut to Explain Mobile Banking User Adoption," *Computers in Human Behavior* (26:4), pp. 760-767.