ADOPTION LIFE CYCLE OF M-PAYMENTS: A STUDY OF PRE-ADOPTION AND POST-ADOPTION PHASES

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ABSTRACT

Mobile payments (or m-payments) are the financial transactions done through any electronic device connected to the cellular mobile internet or wireless technology (Liébana-Cabanillas & Lara-Rubio, 2017). Users adopt m-payments to conduct payments for the purchase of various goods and services and also to reduce the burden of carrying change. M-payments enhance speed in financial transactions and prevent the counting of cash (Mallat, Ondrus, Zmijewska, & Dahlberg, 2008).

This work explores the pre-adoption and the post-adoption phases of m-payments along with the adoption life cycle of m-payments. Users rarely using the m-payment application (Dhanorkar, 2017) and are still exploring it are the *potential adopters* of the m-payment application. The m-payment application is in its *pre-adoption phase* for such users (Yang, Lu, Gupta, Cao, & Zhang, 2012). Users using a m-payment application more frequently to make payments are the *current users* of the m-payment application. The m-payment application is in its *post-adoption phase* for such users. In the *pre-adoption phase*, m-payment service providers push users to use their m-payment applications for making payments whereas, in the *post-adoption phase*, they try retaining the users attained after the successful *pre-adoption phase*. Though post-adoption is the final aim of any m-payment adoption, it goes through the pre-adoption phase first, and the successful pre-adoption phase will enable the post-adoption of m-payments. This transition of the m-payment application from the pre-adoption phase to the post-adoption phase is the *adoption life cycle of m-payments*. Limited research has been done to study the temporal evolution of the determinants of the pre-adoption phase to the final determinants of the post-adoption phase of Information Systems usage over time (Limayem et al., 2003; Karahanna et al., 1999; Yang et al., 2012). Therefore, the study of this *adoption life cycle* of m-payments from the pre-adoption to the post-adoption is important

with respect to the identification of the variables or factors of pre and post-adoption along with their linkages.

Network externalities exist in the m-payment network as the entire business model of m-payments is dependent on the m-payment users' network. Trust facilitators are required in m-payments as financial transactions are involved, and Delone and McLean Information Systems success model helps in establishing an end-to-end system performance in m-payments. Therefore, this study explores and tests the pre and post-adoption models of m-payments on the grounds of network externalities, trust facilitators, and the Information Systems success model. The network externalities consist of direct and indirect externalities and is said that the value that a member of the network obtains with the usage of a service or a good grows proportionally with the number of other members utilizing the same service or the same good. Direct externalities consist of the number of members or users. If the number of users of the m-payment platform increases, more number of users would be interested in performing the m-payment transaction. Indirect externalities consist of compatibility and complementarity constructs (Katz & Shapiro, 1985).

Compatibility means that two brands of hardware can run the same m-payment application whereas complementarity talks about the extra services made available to the m-payment users (Chiu, Cheng, Huang, & Chen, 2013; Zhou & Lu, 2011). Trust facilitators consist of structural assurance followed by ubiquitous connection, and then contextual offering. Structural assurance refers to the proper technological and legal infrastructure of an m-payment application that helps in building users' trust in the system by assuring the security of their data stored in the m-payment applications' servers like credit card details and financial transaction records. Ubiquitous connection enables users to access m-payment anytime and anywhere (Zhou, 2013b). Contextual offering refers to the real-time information provided to users by m-payment service providers by accessing their Global Positioning

System (Xu & Gupta, 2009). Information Systems success model states that system quality, service quality, and information quality affect user satisfaction along with their usage leading to an organizational and an individual impact (Delone & Mclean, 2004). In our study, system quality contemplates the ease of use and the access speed of the m-payment application. An imperfect system quality cannot satisfy a user. Service quality talks about the responsiveness of the services provided and their reliability to the users. The m-payment service provider is said to be more reliable when it provides services promptly. Responsiveness refers to the service providers' prompt responses to users' queries. Information quality refers to relevant and accurate information coming on time. Most users use m-payment applications to make their bill payments on time and attain their financial transaction information anywhere and at anytime. If this information turns out to be out of date or incorrect, the users will lose their faith (or trust) in the m-payment service providers.

Through our study, we have tried to explore and identify the theory of network externalities in the context of m-payments. This relationship between the network externalities and the m-payments is unlike in other technology-based adoption models' contexts. We have also integrated the trust facilitators and the DeLone and McLean IS Success model along with the network externalities in the context of m-payments. The results of this study sufficiently provide invaluable information on the adoption behaviors of the potential adopters and the current users of the m-payment system.

The results after the hypotheses testing suggest that the compatibility of m-payment application and the value of the transaction are significantly important factors once must look into while talking about the adoption of m-payments. An interesting finding is that how the effect of the number of members on usefulness, the effect of service quality on satisfaction, the effect of information quality on determining the usage intention or the continued intention to use, and the effect of ubiquitous connection on trust are significant in the post-adoption

phase but not in the pre-adoption phase whereas the effect of contextual offering on flow, and the effect of trust on usefulness are significant in the pre-adoption phase but not in the post-adoption phase. Another interesting finding from this study is that the difference in the strength of the effect of the variable number of members on the variable usefulness in the pre-adoption model versus in the post-adoption model is significant. Similarly, the difference in the strength of the effect of the variable contextual offering on the variable information quality in the pre-adoption model versus in the post-adoption model is significant. This research primarily contributes towards the identification of pre and post-adoption variables of m-payments along with the linkage of the pre-adoption phase to the post-adoption phase. Finally, we identify the change in the significance of the variables from the pre-adoption phase to the post-adoption phase in m-payments along with the difference in the strength of the paths of the proposed pre-adoption model versus the strength of the corresponding paths of the proposed post-adoption model.

Keywords: pre-adoption; post-adoption; adoption life-cycle; m-payments

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Appendix 1: Literature Review Summary Table

Serial Number	Authors	Title	Journal Name	Citation
1	Chu-Bing Zhang, Yi-Na Li, Bo Wu and Dong-Jin Li	How WeChat can retain users: Roles of network externalities, social interaction ties, and perceived values in building continuance intention	Computers in Human Behavior	(Zhang et al., 2017)
2	Kuan-Yu Lin and Hsi-Peng Lu	Why people use social networking sites: An empirical study integrating network externalities and motivation theory	Computers in Human Behavior	(Lin & Lu, 2011)
3	Yoris A. Au and Robert J. Kauffman	The economics of mobile payments: Understanding stakeholder issues for an emerging financial technology application	Electronic Commerce Research and Applications	(Au & Kauffman, 2008)
4	Malavika Nair and Nicolás Cachanosky	Bitcoin and entrepreneurship: breaking the network effect	The Review of Austrian Economics	(Nair & Cachanosky, 2017)
5	Xuexin Xu, Xiaodong Yang, Junhua Lu, Ji Lan, Tai-Quan Peng, Yingcai Wu and Wei Chen	Examining the effects of network externalities, density, and closure on in-game currency price in online games	Internet Research	(Xu et al., 2017)
6	Tao Zhou and Yaobin Lu	Examining mobile instant messaging user loyalty from the perspectives of network externalities and flow experience	Computers in Human Behavior	(Zhou & Lu, 2011)
7	Kunpeng Zhang,	Large-scale network analysis for online	MIS Quarterly	(Zhang, Bhattacharyya,

	Siddhartha Bhattacharyya and Sudha Ram	social brand advertising		& Ram, 2016)
8	Chao-Min Chiu, Hsiang-Lan Cheng, Hsin-Yi Huang and Chieh-Fan Chen	Exploring individuals' subjective well-being and loyalty towards social network sites from the perspective of network externalities: The Facebook case	International Journal of Information Management	(Chiu et al., 2013)
9	Mani R. Subramani and Balaji Rajagopalan	Knowledge-Sharing and Influence in Online Social Networks via Viral Marketing	Communications of the ACM	(Subramani & Rajagopalan, 2003)
10	Lingling Gao and Xuesong Bai	An empirical study on continuance intention of mobile social networking services: Integrating the IS success model, network externalities and flow theory	Asia Pacific Journal of Marketing and Logistics	(Gao & Bai, 2014)
11	Tao Zhou	An empirical examination of continuance intention of mobile payment services	Decision Support Systems	(Zhou, 2013a)
12	Tao Zhou	Examining the critical success factors of mobile website adoption	Online Information Review	(Zhou, 2011a)
13	Tao Zhou	An empirical examination of the determinants of mobile purchase	Personal and Ubiquitous Computing	(Zhou, 2013b)
14	Tao Zhou	The effect of initial trust on user adoption of mobile payment	Information Development	(Zhou, 2011b)
15	William H. DeLone and Ephraim R. McLean	Measuring e-Commerce Success: Applying the DeLone & McLean Information Systems Success Model	International Journal of Electronic Commerce	(Delone & Mclean, 2004)

16	Ying-Feng Kuo and Shieh-Neng Yen	Towards an understanding of the behavioral intention to use 3G mobile value-added services	Computers in Human Behavior	(Kuo & Yen, 2009)
17	Tao Zhou	Examining mobile banking user adoption from the perspectives of trust and flow experience	Information Technology and Management	(Zhou, 2012)
18	Tao Zhou	Understanding the effect of flow on user adoption of mobile games	Personal and ubiquitous computing	(Zhou, 2013d)
19	Tao Zhou	The effect of flow experience on user adoption of mobile TV	Behaviour and Information Technology	(Zhou, 2013c)
20	Tao Zhou, Yaobin Lu and Bin Wang	Integrating TTF and UTAUT to explain mobile banking user adoption	Computers in Human Behavior	(Zhou, Lu, et al., 2010)
21	Tao Zhou	Understanding mobile Internet continuance usage from the perspectives of UTAUT and flow	Information Development	(Zhou, 2011c)
22	Tao Zhou, Hongxiu Li and Yong Liu	The effect of flow experience on mobile SNS users' loyalty	Industrial Management & Data Systems	(Zhou, Li, et al., 2010)
23	Ming-Chi Lee	Explaining and predicting users' continuance intention toward e-learning: An extension of the expectation–confirmation model	Computers & Education	(Lee, 2010)
24	Shuiqing Yang, Yaobin Lu, Sumeet Gupta, Yuzhi Cao and Rui Zhang	Mobile payment services adoption across time: An empirical study of the effects of behavioral beliefs, social influences, and personal traits	Computers in Human Behavior	(Yang et al., 2012)

25	Moez Limayem, Christy Cheung and Gloria Chan	Explaining Information Systems Adoption and Post-Adoption: Toward an Integrative Model	ICIS 2003 Proceedings	(Limayem et al., 2003)
26	Elena Karahanna, Detmar W. Straub and Norman L. Chervany	Information Technology Adoption Across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs	MIS Quarterly	(Karahanna et al., 1999)
27	Siu-Man LUI	Usage Discontinuance in the Context of Mobile Service	Full Proceedings of the 2nd International Conference on Information Management and Business (IMB2006) Sydney, Australia	(LUI, 2006)
28	Muhammad Mustafa Kamal, Ray Hackney and Maged Ali	Facilitating enterprise application integration adoption: An empirical analysis of UK local government authorities	International Journal of Information Management	(Kamal et al., 2013)
29	Khawaja A. Saeed, Sue Abdinnour, Mark L. Lengnick-Hall and Cynthia A. Lengnick-Hall	Examining the Impact of Pre-Implementation Expectations on Post-Implementation Use of Enterprise Systems: A Longitudinal Study	Decision Sciences	(Saeed et al., 2010)
30	Jai-Yeol Son and Izak Benbasat	Organizational Buyers' Adoption and Use of B2B Electronic Marketplaces: Efficiency- and Legitimacy-Oriented Perspectives	Journal of Management Information Systems	(Son & Benbasat, 2007)
31	Changsu Kim, Mirsobit Mirusmonov and In Lee	An empirical examination of factors influencing the intention to use mobile payment	Computers in Human Behavior	(Kim et al., 2010)
32	Viswanath Venkatesh,	Consumer Acceptance and Use of	MIS Quarterly	(Venkatesh, Thong, &

	James Y. L. Thong and Xin Xu	Information Technology: Extending the Unified Theory of Acceptance and Use of Technology		Xu, 2012)
33	Chanchai Phonthanukitithaworn, Carmine Sellitto and Michelle W. L. Fong	A Comparative Study of Current and Potential Users of Mobile Payment Services	Sage Open	(Phonthanukitithaworn et al., 2016)

Appendix 2: Variables used in our study

Theory	Variables	Definition
Network Externalities	Number of members	If more number of users is already using m-payment application, it is feasible and easier for a user to adopt the application as the user can make a swift transaction to others using the m-payment application (Katz & Shapiro, 1985).
	Perceived Compatibility	Compatibility means that two brands of hardware can run the same m-payment application. Compatibility of m-payment applications ensures that a user can make m-payments even through his old handset without the need for the purchase of a new one (Chiu et al., 2013; Zhou & Lu, 2011).
	Perceived Complementarity	Complementarity means the extra services made available to the m-payment users. At present, m-payment applications provide other complementary services such as m-commerce and flight bookings. It is like One-Stop-Shop model where a user can get multiple services along with m-payment services (Gao & Bai, 2014; Katz & Shapiro, 1985; Lin & Lu, 2011).

Theory	Variables	Definition
Trust Facilitators	Structural Assurance	Structural assurance refers to the proper technological and legal infrastructure of a m-payment application that helps in building users' trust in the system by assuring the security of their data stored in the m-payment application like credit card details and transactions records (Srivastava et al., 2010). Improper certification and inadequate technological infrastructure can increase the users' perceived risk in the usage of m-payments.
	Ubiquitous Connection	The ubiquitous connection enables users to access m-payment anytime and anywhere (Zhou, 2013b). Proper ubiquity by a m-payment service provider will develop users' trust in their m-payment service provider (T. Lee, 2005). The reliable ubiquitous connection will increase the service quality of a m-payment application.
	Contextual Offering	Contextual offering refers to the relevant real-time information provided to users by m-payment service providers by accessing the users' Global Positioning System data (Xu & Gupta, 2009).

Theory	Variables	Definition
Delone and McLean Information Systems (IS) success model	System Quality	System quality reflects the ease of use and the access speed of the m-payment application. A poor system quality cannot satisfy a user. If the m-payment systems have a poor technological infrastructure, users will feel that service providers have lesser integrity in providing quality services and will not take a step forward towards using the application (Zhou, 2013a).
	Service Quality	Better service quality such as timely updates and faster query resolutions of the issues faced by the users while using the m-payment application will satisfy the end users even more which will lead to the adoption or re-use of the m-payment application (Delone & Mclean, 2004).
	Information Quality	Information quality refers to relevant and accurate information coming in a timely manner. Most users use m-payment applications to make their bill payments on time and attain their payment information anytime and anywhere. So, if this information is inaccurate or out of date, users will lose their trust in the m-payment service providers (Cenfetelli et al., 2008; Gefen, 2002).

Trust	Trust is the users' expectations from a m-payment service provider about its future conduct. It consists of ability, integrity, and benevolence (Zhou, Li, et al., 2010). Trust plays a significant role in sustaining the satisfaction of the user. It affects current users' satisfaction with m-commerce systems (Lin & Wang, 2006). Also, previous research has shown the effect of trust in perceived usefulness (Sun, 2010) and flow experience (Zhou, Li, et al., 2010).
Satisfaction	The effect of satisfaction on users' behavior has been found in many studies. Increasing the satisfaction of a user will increase the willingness to adopt or re-use the m-payment application (Deng et al., 2010).
Flow	Flow is the immersive user experience felt by the users when they act with total involvement. When in flow, a user gets absorbed in the activity. For example, A user gets absorbed in the activity while playing a mobile game. Good user experience improves the evaluations on the utility of m-payments (Agarwal & Karahanna, 2000).
Value of the Transaction	Sirdeshmukh et al. (2002) stated that the value of the transaction in terms of money, time, and effort has a considerable impact on the users' behavior. Providing a constant good value of the transaction will increase the adoption or the re-use of the m-payment application.
Usefulness	Usefulness is a significant variable affecting directly or indirectly the users' usage intention or the continued intention to use the m-payment application. Based on the expectation-confirmation theory,

	usefulness affects user satisfaction in the adoption of a system (Bhattacherjee, 2001).
Usage Intention	According to the theory of reasoned action, a person's behavior is influenced by his or her intention to take action. This intention is determined by the person's attitudes and subjective feelings towards the technological system (Venkatesh, Morris, Davis, & Davis, 2003). An increase in usage intention will lead to an increase in the user base.
Continued Intention to Use	Continued intention to use is a key variable in determining subsequent use behavior. Also known as re-use, this dependent variable is important for mobile service providers to retain their user base (Deng et al., 2010).

Appendix 3: Measurement scales used for pre-adoption

Variables	Items		References
Number of members (NOM)	NOM1	I think most people are using these m-payment applications.	(Pae & Hyun, 2002)
	NOM2	I believe that the number of people using these m-payment applications will increase the utility (or usage) of my mobile phone.	
	NOM3	I think many people will use these m-payment applications in the future.	
Perceived Compatibility (COMPAT)	COMPAT1	I think that these m-payment applications are highly compatible with my mobile handset (i.e., these m-payment applications run smoothly on my current mobile handset).	(Chiu et al., 2013; Lin et al., 2011; Moore & Benbasat, 1991)
	COMPAT2	I think that these m-payment applications are highly compatible with the current cashless modes of payments accepted by the shopkeepers and merchants.	
	COMPAT3	I think that using these m-payment applications fits accurately with the way people like to make mobile payments and other financial transactions using their mobile handsets.	
	COMPAT4	I think that using these m-payment applications gets along with the present lifestyle.	
Perceived Complementarity (PC)	PC1	A wide range of payment facilities is available in these m-payment applications (e.g., a user to user	(Lin & Bhattacherjee, 2008; Lin et al.,

		transfer, wallet to a bank transfer, UPI payments).	2011; Lin & Lu, 2011)
	PC2	A wide range of support services is available in these m-payment applications (e.g., Bus ticket booking, train, and flight ticket booking, movie tickets, mobile recharge, electricity, and gas bill payment, etc.).	
	PC3	A wide range of online activities can be performed in these m-payment applications (e.g., Online shopping, playing online games, reading online news updates).	
	PC4	Messaging services or chat facilities are available in these m-payment applications (e.g., Chat and Pay).	
Structural Assurance (STA)	STA1	I believe that security encryption and other technological features for these m-payment applications make it safe for me to use mobile payments.	(McKnight et al., 2002; Zhou, 2012)
	STA2	I believe that the legal laws and the back-end of these m-payment applications adequately protect me from payment problems while using these m-payment applications.	
	STA3	I believe that these m-payment applications provide a robust and safe environment for making mobile payments and other financial transactions.	
	STA4	I believe that these m-payment applications can verify users' identity to ensure payment security.	

Ubiquitous Connection (UC)	UC1	I can make mobile payments (or other financial transactions) from any location using these m-payment applications.	(Lee, 2005)
	UC2	I can make mobile payments (or other financial transactions) at any time using these m-payment applications.	
	UC3	Whenever I need to make mobile payments, I can easily use these m-payment applications irrespective of the time and my location.	
	UC4	These m-payment applications can help me to order an online product or use a complementary service (such as bus or flight ticket booking) anywhere at anytime.	
Contextual Offering (CO)	CO1	These m-payment applications can offer me timely updates related to on-going schemes (like cashbacks & promo codes).	(Lee, 2005; Zhou, 2013b)
	CO2	These m-payment applications can offer me location-specific information. (For Example, Push notifications about cashbacks or discounts on the sale of pizzas as soon as I enter Domino's Pizza)	
	CO3	These m-payment applications can provide optimally and contextually relevant information to me based on my customized interests and my current location. (For Example, This m-payment application would provide me with discounts for my favorite	

		store located at my current location)	
System Quality (SYSQ)	SYSQ1 SYSQ2 SYSQ3	I believe that these m-payment applications are reliable and easy to use. I believe that these m-payment applications run smoothly and the service providers provide fast responses to my inquiries. I believe that these m-payment applications provide a good user interface (Ex. Most details are on the application home screen).	(Gao & Bai, 2014)
Service Quality (SERQ)	SERQ1 SERQ2 SERQ3	I believe that these m-payment applications provide me with on-time services. I believe that these m-payment applications provide me with prompt responses to my usage queries (Ex. Responses to Frequently Asked Questions). I believe that these m-payment applications provide me with personalized and professional services.	(Zhou, 2011a)
Information Quality (IQ)	IQ1 IQ2	These m-payment applications provide me with sufficient information to make a financial transaction or make an online purchase. (Example: Displays the details of the payee before the payment transaction or displays the full description of service) These m-payment applications provide me with accurate information about	(Gao & Bai, 2014; Zhou, 2011a)

		various coupons and discount offers relevant to my needs.	
	IQ3	These m-payment applications provide me with up-to-date information about cashbacks, promo codes, and other complementary services.	
Trust (T)	T1	I believe that these m-payment applications are trustworthy.	(Lee, 2005)
	T2	According to me, these m-payment applications will keep their promises. (For Example, promise to provide proper customer support in case an issue occurs related to a transaction).	
	T3	I believe that these m-payment applications' service providers will keep their users' interests in mind, not just their benefits.	
Satisfaction (SAT)	SAT1	I believe that I would be satisfied and contented with the services of these m-payment applications.	(Bhattacherjee, 2001)
	SAT2	I believe that I would be pleased with the experience of using these m-payment applications.	
	SAT3	I believe that I would do the right thing by using these m-payment applications.	
Usefulness (U)	U1	I think that using these m-payment applications improves my overall work productivity as now I carry less cash.	(Agarwal & Karahanna, 2000; Koufaris, 2002; Zhou, 2011b)
	U2	I think that using these m-payment applications improves my overall work performance as mobile payment	

		enables me to conduct payments quickly.	
	U3	I think that using these m-payment applications improves my overall work efficiency as it solves the issue of giving the exact change for making a purchase.	
	U4	I think that these m-payment applications are very useful for making payments.	
Flow	Attention Focus	I believe that my attention is intensely absorbed in the activity while using these m-payment applications. (For example: While shopping online or booking a flight through the m-payment application, my attention is completely engrossed on the activity.)	(Lee et al., 2007; Zhou, 2011c, 2013b)
		I believe that my attention is focussed on the activity while using these m-payment applications.	
		I believe that I can concentrate fully while using these m-payment applications.	
		I believe that I would be deeply engrossed while using these m-payment applications.	
	Perceived Control	I believe that I would be calm while using these m-payment applications.	

	Perceived Enjoyment	I believe that I have confidence and full control in operating these m-payment applications. I believe that I would get confused while operating these m-payment applications. (reverse coded) I believe that using these m-payment applications is fun. I believe that using these m-payment applications is exciting. I believe that using these m-payment applications is enjoyable as one can do online shopping for discounted goods. I believe that using these m-payment applications is interesting as a lot of cashbacks are provided.	
Value of the Transaction (VT)	VT1 VT2	The cashbacks I would receive or the transaction costs which would be incurred while making a mobile payment (or any other financial transaction like online shopping) through these m-payment applications are reasonable. The time I would spend to make a mobile payment (or any other financial transaction like booking flights) through these m-payment applications is reasonable.	(Sirdeshmukh et al., 2002)

	VT3	The effort I would put to make a mobile payment (or any other financial transaction like buying a movie ticket) through these m-payment applications is worthwhile.	
	VT4	I would have a good overall experience in using these m-payment applications.	
Usage Intention (UI)	UI1	I have intentions to use these m-payment applications.	(Hong & Tam, 2006; Zhou, 2013b, 2013c)
	UI2	I expect that I would use these m-payment applications in the future.	
	UI3	If I have chances to use mobile payment, I may use these m-payment applications more frequently in the future	
	UI4	If I could, I would never use these m-payment applications. (reverse coded).	

Appendix 4: Measurement scales used for post-adoption

Variables	Items		References
Number of members (NOM)	NOM1	According to me, most people are using these m-payment applications.	(Pae & Hyun, 2002)
	NOM2	I believe that the number of people using these m-payment applications will increase the utility (or usage) of my mobile phone.	
	NOM3	I think many people will use these m-payment applications in the future.	
Perceived Compatibility (COMPAT)	COMPAT1	These m-payment applications are highly compatible with my mobile handset (i.e., these m-payment applications run smoothly on my current mobile handset).	(Chiu et al., 2013; Lin et al., 2011; Moore & Benbasat, 1991)
	COMPAT2	These m-payment applications are highly compatible with the current cashless modes of payments accepted by the shopkeepers and merchants.	
	COMPAT3	Using these m-payment applications fits accurately with the way people like to make mobile payments and other financial transactions using their mobile handsets.	
	COMPAT4	Using these m-payment applications gets along with the present lifestyle.	
Perceived Complementarity (PC)	PC1	A wide range of payment facilities is available in these m-payment applications (e.g., a user to user transfer, wallet to a bank transfer, UPI payments).	(Lin & Bhattacherjee, 2008; Lin et al., 2011; Lin & Lu, 2011)
	PC2	A wide range of support services is	

		available in these m-payment applications (e.g., Bus ticket booking, train, and flight ticket booking, movie tickets, mobile recharge, electricity, and gas bill payment, etc.).	
	PC3	A wide range of online activities can be performed in these m-payment applications (e.g., Online shopping, playing online games, reading online news updates).	
	PC4 (dropped)	Messaging services or chat facilities are available in these m-payment applications (e.g., Chat and Pay). (dropped)	
Structural Assurance (STA)	STA1	I feel confident that the security encryption and other technological features for these m-payment applications make it safe for me to use mobile payments.	(McKnight et al., 2002; Zhou, 2012)
	STA2	I feel assured that the legal laws and the back-end of the m-payment applications adequately protect me from payment problems while using these m-payment applications.	
	STA3	These m-payment applications provide a robust and safe environment for making mobile payments and other financial transactions.	
	STA4	These m-payment applications verify users' identity to ensure payment security.	
Ubiquitous Connection	UC1	I make mobile payments (or other financial transactions) from any	(Lee, 2005)

(UC)		location using these m-payment applications.	
	UC2	I make mobile payments (or other financial transactions) at any time using these m-payment applications.	
	UC3	Whenever I need to make mobile payments, I easily use these m-payment applications irrespective of the time and my location.	
	UC4	These m-payment applications help me to order an online product or use a complementary service (such as bus or flight ticket booking) anywhere at anytime.	
Contextual Offering (CO)	CO1	These m-payment applications offer me timely updates related to on-going schemes (like cashbacks & promo codes).	(Lee, 2005; Zhou, 2013b)
	CO2	These m-payment applications offer me location-specific information. (For Example, Push notifications about cashbacks or discounts on the sale of pizzas as soon as I enter Domino's Pizza)	
	CO3	These m-payment applications provide optimally and contextually relevant information to me based on my customized interests and my current location. (For Example, This m-payment application provides me with discounts for my favorite store located at my current location)	
System Quality	SYSQ1	According to me, these m-payment	

(SYSQ)		applications are reliable and easy to use.	(Gao & Bai, 2014)
	SYSQ2	According to me, these m-payment applications run smoothly and the service providers provide fast responses to my inquiries.	
	SYSQ3	These m-payment applications provide a good user interface (Ex. Most details are on the application home screen)	
Service Quality (SERQ)	SERQ1	I have experienced that these m-payment applications provide me with on-time services.	(Zhou, 2011a)
	SERQ2	I have experienced that these m-payment applications provide me with prompt responses to my queries (Ex. Responses to Frequently Asked Questions).	
	SERQ3	I have experienced that these m-payment applications provide me with personalized and professional services.	
Information Quality (IQ)	IQ1	These m-payment applications provide me with sufficient information to make a financial transaction or make an online purchase. (Example: Displays the details of the payee before the payment transaction or displays the full description of service)	(Gao & Bai, 2014; Zhou, 2011a)
	IQ2	These m-payment applications provide me with accurate information about various coupons and discount offers relevant to my needs.	
	IQ3	These m-payment applications provide	

		me with up-to-date information about cashbacks, promo codes, and other complementary services.	
Trust (T)	T1 T2 T3	I find these m-payment applications trustworthy. According to me, these m-payment applications keep their promises. (For Example, Promise to provide proper customer support in case an issue occurs related to a transaction). I have experienced that these m-payment applications' service providers keep their users' interests in mind, not just their benefits.	(Lee, 2005; Zhou, 2013a)
Satisfaction (SAT)	SAT1 SAT2 SAT3	I am satisfied and content with the services of these m-payment applications. I am pleased with the experience of using these m-payment applications. I am doing the right thing by using these m-payment applications.	(Bhattacherjee, 2001; Chiu et al., 2013; Lee, 2010; Zhou, 2011c)
Usefulness (U)	U1 U2 U3	Using these m-payment applications improves my overall work productivity as now I carry less cash. Using these m-payment applications improves my overall work performance as mobile payment enables me to conduct payments quickly. Using these m-payment applications improves my overall work efficiency as it solves the issue of giving the exact change for making a purchase.	(Agarwal & Karahanna, 2000; Koufaris, 2002; Zhou, 2011b)

	U4	These m-payment applications are very useful for making payments.	
Flow	Attention Focus	My attention is intensely absorbed in the activity while using these m-payment applications. (For example: While shopping online or booking a flight through the m-payment application, my attention is completely engrossed on the activity)	(Lee et al., 2007; Zhou, 2011c, 2013b)
		My attention is focussed on the activity while using these m-payment applications.	
		I concentrate fully while using these m-payment applications.	
		I am deeply engrossed while using these m-payment applications.	
	Perceived Control	I feel calm while using these m-payment applications.	
		I feel confident and in full control, while operating these m-payment applications.	
		I get confused while operating these m-payment applications. (reverse coded)	
	Perceived Enjoyment	I feel that using these m-payment applications is fun.	

		I feel that using these m-payment applications is exciting. I feel that using these m-payment applications is enjoyable as one can do online shopping for discounted goods. I feel that using these m-payment applications is interesting as a lot of cashbacks are provided.	
Value of the Transaction (VT)	VT1 VT2 VT3 VT4	The cashbacks I receive or the transaction costs incurred while making a mobile payment (or any other financial transaction like online shopping) through these m-payment applications are reasonable. The time I spend to make a mobile payment (or any other financial transaction like booking flights) through these m-payment applications is reasonable. The effort I put to make a mobile payment (or any other financial transaction like buying a movie ticket) through these m-payment applications is worthwhile. I have a good overall experience in using these m-payment applications.	(Sirdeshmukh et al., 2002)
Continued Intention to Use (CIU)	CIU1 CIU2	I intend to continue using these m-payment applications rather than discontinue their use. I intend to continue using these m-	(Bhattacherjee, 2001; Gao & Bai, 2014; Lin & Lu, 2011)

		payment applications rather than use any alternative means.	
	CIU3	I will also recommend my friends to use these m-payment applications.	
	CIU4	If I could, I would like to discontinue my use of these m-payment applications. (reverse coded)	

Appendix 5

	CO	UI	FLOW	IQ	NOM	COMPAT	PC	SAT	SERQ	STA	SYSQ	T	UC	U	VT
CO1	**0.842**	0.254	0.270	0.533	0.276	0.347	0.314	0.302	0.330	0.325	0.360	0.294	0.281	0.357	0.311
CO2	**0.853**	0.157	0.228	0.390	0.224	0.222	0.248	0.165	0.317	0.114	0.261	0.248	0.254	0.207	0.176
CO3	**0.830**	0.143	0.313	0.441	0.170	0.163	0.217	0.165	0.314	0.190	0.294	0.189	0.185	0.235	0.142
UI1	0.225	**0.905**	0.446	0.331	0.323	0.390	0.353	0.546	0.344	0.413	0.500	0.405	0.349	0.623	0.556
UI2	0.272	**0.940**	0.452	0.359	0.307	0.369	0.357	0.535	0.353	0.418	0.511	0.378	0.380	0.601	0.552
UI3	0.207	**0.928**	0.477	0.353	0.283	0.364	0.304	0.582	0.381	0.420	0.526	0.432	0.376	0.612	0.576
UI4	0.087	**0.798**	0.358	0.236	0.211	0.354	0.231	0.444	0.217	0.346	0.408	0.332	0.319	0.502	0.489
Attention Focus	0.218	0.329	**0.690**	0.345	0.111	0.247	0.132	0.500	0.239	0.375	0.328	0.283	0.227	0.389	0.409
Perceived Control	0.108	0.379	**0.757**	0.302	0.122	0.223	0.099	0.537	0.328	0.382	0.435	0.442	0.281	0.455	0.464
Perceived Enjoyment	0.388	0.385	**0.798**	0.473	0.238	0.372	0.279	0.546	0.422	0.387	0.398	0.499	0.256	0.480	0.506
IQ1	0.271	0.361	0.412	**0.754**	0.163	0.306	0.263	0.467	0.433	0.377	0.512	0.382	0.248	0.417	0.435
IQ2	0.525	0.303	0.458	**0.891**	0.290	0.358	0.293	0.434	0.457	0.357	0.501	0.420	0.211	0.333	0.380

IQ3	0.556	0.241	0.380	**0.845**	0.298	0.351	0.340	0.317	0.459	0.364	0.421	0.302	0.183	0.338	0.300
NOM1	0.202	0.187	0.148	0.272	**0.791**	0.464	0.471	0.245	0.264	0.285	0.333	0.193	0.170	0.128	0.187
NOM2	0.214	0.284	0.162	0.218	**0.794**	0.226	0.267	0.211	0.263	0.200	0.251	0.202	0.163	0.238	0.222
NOM3	0.237	0.290	0.209	0.255	**0.850**	0.350	0.401	0.253	0.186	0.249	0.285	0.197	0.171	0.195	0.212
COMPAT1	0.117	0.296	0.254	0.337	0.299	**0.723**	0.443	0.405	0.265	0.384	0.414	0.258	0.268	0.343	0.366
COMPAT2	0.293	0.340	0.297	0.323	0.357	**0.818**	0.456	0.390	0.326	0.465	0.521	0.310	0.355	0.350	0.361
COMPAT3	0.300	0.370	0.327	0.365	0.339	**0.858**	0.437	0.412	0.305	0.448	0.472	0.359	0.321	0.412	0.423
COMPAT4	0.223	0.290	0.319	0.251	0.333	**0.753**	0.437	0.311	0.244	0.381	0.358	0.263	0.286	0.347	0.314
PC1	0.179	0.337	0.209	0.290	0.395	0.504	**0.804**	0.344	0.160	0.319	0.304	0.194	0.280	0.230	0.352
PC2	0.227	0.314	0.167	0.275	0.385	0.438	**0.835**	0.221	0.197	0.302	0.327	0.205	0.283	0.250	0.283
PC3	0.284	0.211	0.198	0.242	0.345	0.405	**0.759**	0.228	0.195	0.210	0.220	0.152	0.304	0.144	0.149
PC4	0.316	0.138	0.109	0.283	0.237	0.303	**0.590**	0.151	0.211	0.220	0.181	0.129	0.143	0.163	0.089
SAT1	0.182	0.460	0.583	0.440	0.203	0.352	0.265	**0.794**	0.480	0.489	0.545	0.545	0.256	0.414	0.525
SAT2	0.268	0.514	0.613	0.421	0.300	0.439	0.310	**0.903**	0.461	0.537	0.536	0.550	0.336	0.553	0.637
SAT3	0.207	0.537	0.603	0.384	0.237	0.442	0.266	**0.857**	0.404	0.468	0.529	0.555	0.314	0.575	0.594
SERQ1	0.318	0.420	0.462	0.495	0.287	0.389	0.269	0.525	**0.853**	0.386	0.543	0.478	0.365	0.471	0.470
SERQ2	0.275	0.218	0.225	0.356	0.216	0.203	0.090	0.333	**0.784**	0.285	0.370	0.410	0.238	0.139	0.277

SERQ3	0.327	0.150	0.323	0.416	0.158	0.212	0.184	0.334	**0.747**	0.331	0.385	0.448	0.186	0.198	0.263
STA1	0.208	0.411	0.411	0.374	0.241	0.459	0.289	0.518	0.342	**0.858**	0.528	0.518	0.299	0.405	0.440
STA2	0.159	0.370	0.345	0.273	0.198	0.369	0.282	0.439	0.318	**0.815**	0.481	0.462	0.260	0.336	0.386
STA3	0.204	0.395	0.473	0.395	0.264	0.468	0.273	0.530	0.407	**0.860**	0.589	0.556	0.291	0.422	0.452
STA4	0.279	0.259	0.402	0.368	0.262	0.420	0.320	0.386	0.299	**0.689**	0.434	0.402	0.356	0.398	0.353
SYSQ1	0.281	0.517	0.471	0.471	0.330	0.515	0.292	0.579	0.464	0.626	**0.890**	0.574	0.384	0.535	0.528
SYSQ2	0.297	0.365	0.380	0.492	0.268	0.406	0.254	0.478	0.522	0.451	**0.830**	0.496	0.210	0.365	0.424
SYSQ3	0.369	0.500	0.468	0.512	0.304	0.509	0.355	0.547	0.474	0.530	**0.846**	0.478	0.370	0.558	0.489
T1	0.190	0.415	0.477	0.379	0.164	0.277	0.194	0.599	0.445	0.625	0.588	**0.826**	0.275	0.458	0.519
T2	0.266	0.344	0.454	0.348	0.223	0.317	0.167	0.507	0.478	0.442	0.490	**0.845**	0.284	0.385	0.431
T3	0.276	0.290	0.419	0.358	0.219	0.350	0.206	0.459	0.452	0.383	0.379	**0.781**	0.245	0.333	0.355
UC1	0.176	0.329	0.295	0.205	0.151	0.345	0.299	0.282	0.306	0.317	0.310	0.267	**0.872**	0.320	0.376
UC2	0.216	0.348	0.281	0.169	0.223	0.349	0.317	0.310	0.293	0.312	0.315	0.285	**0.877**	0.339	0.364
UC3	0.236	0.314	0.282	0.179	0.139	0.253	0.163	0.294	0.276	0.327	0.322	0.305	**0.855**	0.291	0.308
UC4	0.341	0.350	0.285	0.307	0.182	0.364	0.373	0.310	0.308	0.286	0.346	0.248	**0.753**	0.328	0.356
U1	0.276	0.617	0.508	0.389	0.226	0.337	0.225	0.531	0.334	0.397	0.514	0.401	0.293	**0.871**	0.537
U2	0.339	0.601	0.540	0.400	0.240	0.410	0.214	0.543	0.388	0.429	0.563	0.468	0.366	**0.918**	0.575

U3	0.275	0.505	0.506	0.346	0.236	0.392	0.208	0.492	0.290	0.437	0.451	0.395	0.284	**0.875**	0.492
U4	0.251	0.580	0.521	0.381	0.125	0.476	0.290	0.561	0.331	0.436	0.497	0.438	0.386	**0.853**	0.601
VT1	0.315	0.242	0.394	0.333	0.205	0.194	0.141	0.406	0.296	0.246	0.340	0.381	0.215	0.290	**0.581**
VT1	0.197	0.418	0.457	0.354	0.168	0.435	0.282	0.499	0.376	0.393	0.428	0.400	0.360	0.453	**0.844**
VT3	0.183	0.537	0.511	0.355	0.228	0.428	0.287	0.534	0.336	0.472	0.463	0.445	0.382	0.563	**0.868**
VT4	0.201	0.616	0.569	0.388	0.221	0.377	0.265	0.690	0.419	0.445	0.531	0.488	0.343	0.599	**0.846**

Table A1: Cross-loading matrix for the potential adopters of m-payment applications (pre-adoption phase).

Appendix 6

	CO	CIU	FLOW	IQ	NOM	COMPAT	PC	SAT	SERQ	STA	SYSQ	T	UC	U	VT
CO1	**0.830**	0.117	0.265	0.651	0.142	0.183	0.257	0.254	0.402	0.210	0.285	0.272	0.259	0.115	0.220
CO2	**0.836**	0.094	0.075	0.437	-0.007	-0.010	0.126	0.023	0.366	0.049	0.160	0.180	0.168	0.056	0.016
CO3	**0.783**	0.008	0.095	0.470	-0.003	0.009	0.091	0.087	0.287	0.087	0.209	0.139	0.077	0.001	0.093
CIU1	0.052	**0.871**	0.556	0.196	0.403	0.446	0.349	0.553	0.302	0.396	0.502	0.406	0.400	0.620	0.535
CIU2	0.033	**0.881**	0.523	0.180	0.358	0.471	0.352	0.569	0.256	0.349	0.422	0.386	0.350	0.547	0.490
CIU3	0.041	**0.847**	0.517	0.153	0.395	0.503	0.366	0.549	0.280	0.392	0.371	0.369	0.411	0.574	0.532
CIU4	0.025	**0.729**	0.355	0.045	0.280	0.401	0.238	0.423	0.195	0.341	0.287	0.296	0.300	0.410	0.419
Attention Focus	0.161	0.255	**0.490**	0.141	0.258	0.198	0.198	0.283	0.159	0.168	0.136	0.175	0.215	0.287	0.238
Perceived Control	0.062	0.529	**0.862**	0.213	0.206	0.406	0.306	0.634	0.372	0.469	0.515	0.588	0.420	0.443	0.476
Perceived Enjoyment	0.257	0.504	**0.859**	0.357	0.297	0.366	0.311	0.546	0.420	0.447	0.524	0.570	0.373	0.485	0.516
IQ1	0.301	0.335	0.380	**0.668**	0.133	0.268	0.243	0.367	0.410	0.300	0.496	0.415	0.336	0.275	0.342
IQ2	0.620	0.110	0.259	**0.884**	0.109	0.100	0.192	0.287	0.357	0.219	0.360	0.350	0.220	0.136	0.255

IQ3	0.641	0.041	0.186	**0.869**	0.111	0.125	0.216	0.229	0.390	0.173	0.307	0.252	0.189	0.048	0.154
NOM1	0.054	0.271	0.179	0.009	**0.722**	0.323	0.247	0.269	0.038	0.160	0.165	0.100	0.208	0.267	0.154
NOM2	0.155	0.135	0.150	0.098	**0.621**	0.223	0.237	0.156	0.139	0.132	0.033	0.105	0.192	0.198	0.110
NOM3	0.086	0.473	0.338	0.193	**0.900**	0.381	0.437	0.393	0.243	0.308	0.269	0.260	0.348	0.461	0.337
COMPAT1	0.029	0.401	0.390	0.124	0.322	**0.717**	0.428	0.420	0.267	0.392	0.349	0.341	0.269	0.349	0.373
COMPAT2	0.132	0.323	0.298	0.178	0.244	**0.746**	0.333	0.320	0.279	0.353	0.351	0.264	0.303	0.310	0.276
COMPAT3	0.098	0.443	0.326	0.181	0.296	**0.815**	0.365	0.410	0.310	0.426	0.392	0.265	0.325	0.346	0.365
COMPAT4	0.050	0.497	0.343	0.102	0.415	**0.795**	0.373	0.359	0.190	0.355	0.314	0.193	0.349	0.399	0.325
PC1	0.103	0.439	0.386	0.182	0.437	0.526	**0.912**	0.446	0.290	0.377	0.317	0.334	0.431	0.426	0.400
PC2	0.256	0.231	0.216	0.255	0.319	0.316	**0.796**	0.273	0.289	0.224	0.196	0.204	0.397	0.187	0.162
PC3	0.275	0.097	0.150	0.257	0.117	0.130	**0.554**	0.149	0.220	0.135	0.131	0.236	0.158	0.090	0.161
PC4 (Dropped)	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
SAT1	0.152	0.438	0.527	0.323	0.308	0.390	0.266	**0.770**	0.417	0.513	0.569	0.556	0.332	0.446	0.462
SAT2	0.208	0.539	0.592	0.349	0.293	0.410	0.387	**0.872**	0.487	0.472	0.517	0.575	0.418	0.476	0.550
SAT3	0.070	0.581	0.549	0.201	0.362	0.422	0.391	**0.830**	0.361	0.514	0.423	0.485	0.361	0.504	0.509
SERQ1	0.310	0.326	0.390	0.320	0.190	0.419	0.350	0.478	**0.832**	0.434	0.456	0.406	0.362	0.294	0.330

SERQ2	0.389	0.235	0.322	0.424	0.163	0.227	0.207	0.399	**0.841**	0.375	0.462	0.459	0.278	0.251	0.260
SERQ3	0.396	0.166	0.370	0.427	0.125	0.110	0.247	0.343	**0.760**	0.319	0.403	0.463	0.180	0.145	0.197
STA1	0.093	0.396	0.472	0.159	0.203	0.436	0.279	0.526	0.327	**0.863**	0.463	0.565	0.317	0.326	0.353
STA2	0.116	0.353	0.409	0.170	0.206	0.415	0.247	0.451	0.378	**0.882**	0.414	0.544	0.234	0.288	0.351
STA3	0.143	0.385	0.423	0.279	0.307	0.407	0.289	0.541	0.419	**0.845**	0.450	0.513	0.313	0.309	0.311
STA4	0.177	0.288	0.334	0.299	0.218	0.344	0.362	0.427	0.418	**0.616**	0.402	0.399	0.307	0.209	0.321
SYSQ1	0.260	0.380	0.448	0.381	0.207	0.396	0.285	0.512	0.481	0.486	**0.839**	0.568	0.371	0.358	0.382
SYSQ2	0.255	0.300	0.435	0.395	0.158	0.302	0.193	0.475	0.467	0.437	**0.825**	0.495	0.344	0.302	0.340
SYSQ3	0.197	0.515	0.537	0.390	0.235	0.446	0.289	0.541	0.431	0.431	**0.862**	0.533	0.358	0.441	0.413
T1	0.162	0.393	0.530	0.298	0.256	0.376	0.317	0.592	0.439	0.671	0.584	**0.840**	0.349	0.378	0.422
T2	0.216	0.352	0.528	0.359	0.180	0.245	0.305	0.543	0.509	0.494	0.517	**0.855**	0.294	0.345	0.423
T3	0.270	0.351	0.535	0.364	0.119	0.229	0.221	0.485	0.390	0.384	0.470	**0.803**	0.334	0.314	0.369
UC1	0.156	0.387	0.369	0.208	0.261	0.353	0.393	0.305	0.233	0.311	0.315	0.288	**0.843**	0.267	0.256
UC2	0.123	0.387	0.403	0.212	0.335	0.354	0.377	0.376	0.257	0.316	0.350	0.344	**0.880**	0.319	0.289
UC3	0.137	0.364	0.359	0.208	0.269	0.374	0.350	0.397	0.291	0.318	0.375	0.322	**0.858**	0.361	0.266
UC4	0.306	0.334	0.395	0.335	0.285	0.278	0.412	0.409	0.379	0.261	0.371	0.345	**0.759**	0.296	0.239
U1	0.031	0.542	0.474	0.115	0.344	0.347	0.294	0.522	0.249	0.355	0.398	0.415	0.310	**0.842**	0.449

U2	0.036	0.535	0.456	0.151	0.387	0.391	0.326	0.497	0.252	0.295	0.358	0.372	0.327	**0.898**	0.472
U3	0.021	0.470	0.449	0.121	0.390	0.339	0.260	0.417	0.235	0.227	0.285	0.280	0.247	**0.817**	0.455
U4	0.051	0.616	0.431	0.191	0.350	0.449	0.345	0.476	0.250	0.295	0.418	0.313	0.356	**0.768**	0.459
VT1	0.241	0.173	0.304	0.293	0.137	0.222	0.166	0.325	0.271	0.280	0.252	0.307	0.184	0.198	**0.561**
VT1	0.093	0.387	0.380	0.171	0.130	0.323	0.259	0.369	0.232	0.242	0.302	0.271	0.178	0.366	**0.775**
VT3	0.134	0.445	0.458	0.230	0.326	0.369	0.299	0.496	0.250	0.309	0.320	0.344	0.255	0.466	**0.834**
VT4	0.102	0.625	0.523	0.261	0.265	0.384	0.318	0.602	0.294	0.406	0.448	0.510	0.309	0.526	**0.838**

Table A2: Cross-loading matrix for the current users of m-payment applications (post-adoption phase).

Appendix 7

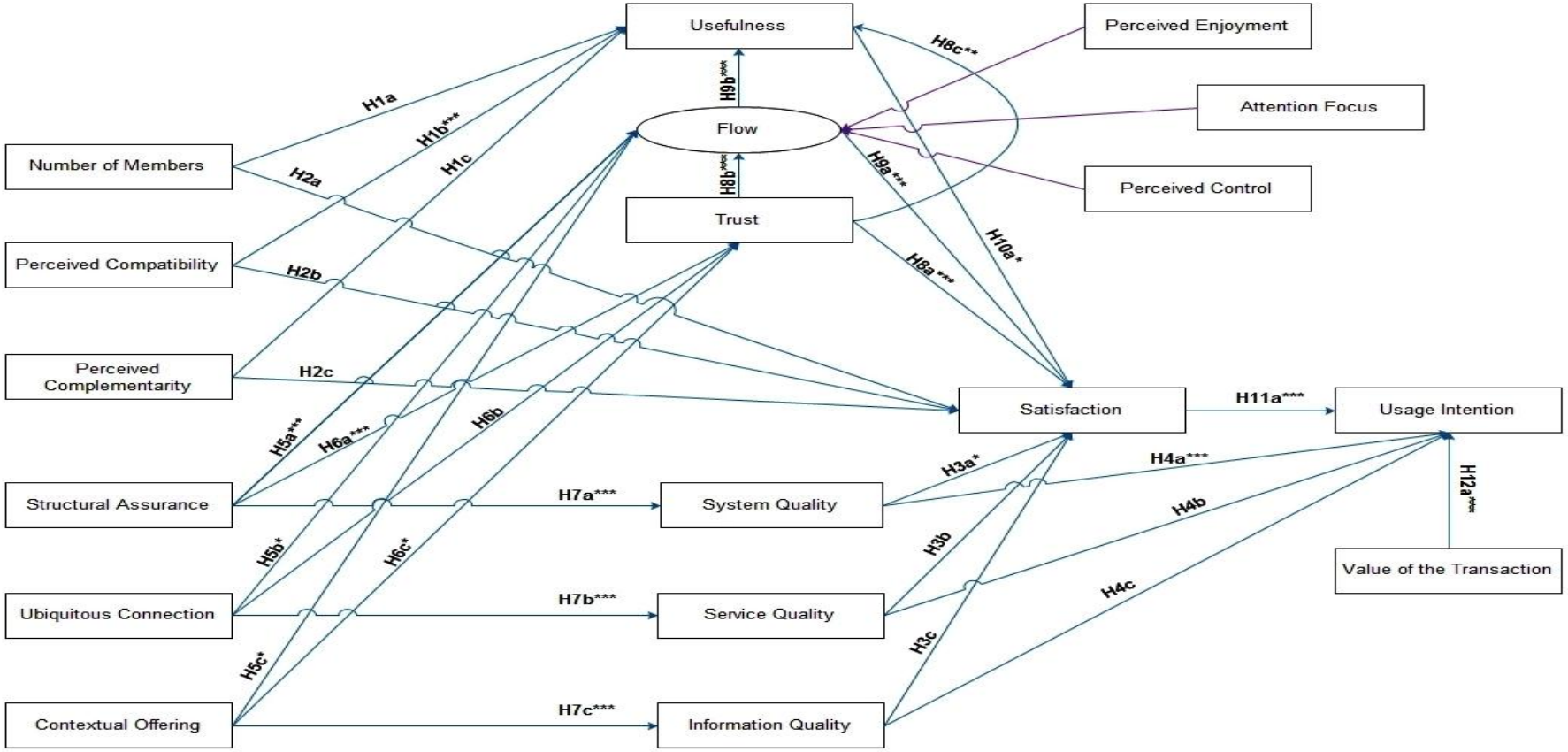

Figure A1: Tested hypothesized block diagram of pre-adoption model of m-payments. * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.

Appendix 8

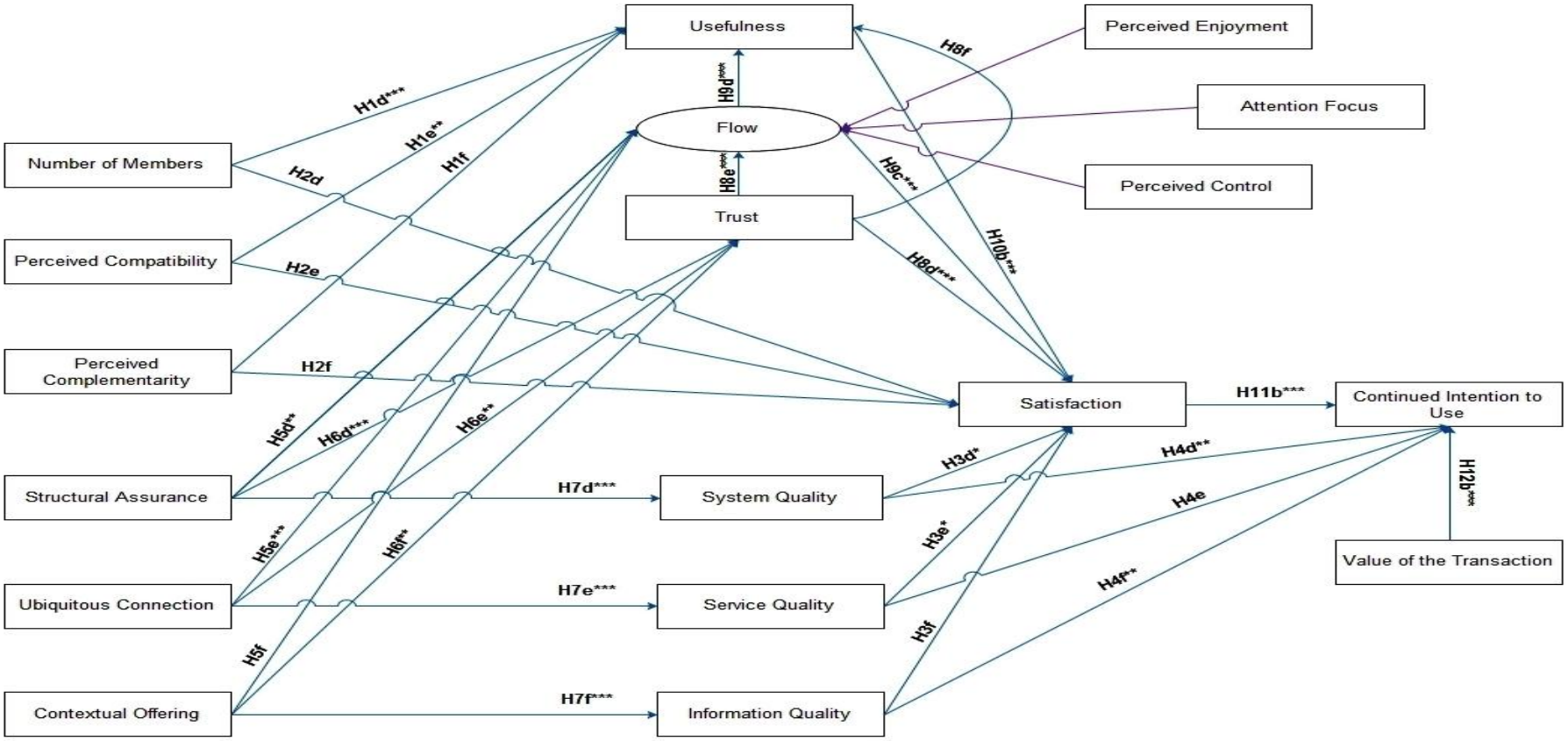

Figure A2: Tested hypothesized block diagram of post-adoption model of m-payments. * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$.