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Published in:
Journal of Retailing and Consumer Services

DOI:
10.1016/j.jretconser.2020.102091

Published: 01/09/2020

Document Version
Publisher's PDF, also known as Version of record

Journal of Retailing and Consumer Services 56 (2020) 102091

Contents lists available at ScienceDirect

Journal of Retailing and Consumer Services

journal homepage: http://www.elsevier.com/locate/jretconser

Why do people use and recommend m-wallets?

Puneet Kaur [a,b], Amandeep Dhir [b,c,*], Rahul Bodhi [d], Tripti Singh [d], Mohammad Almotairi [e]

[a] Department of Industrial Engineering and Management, Aalto University, Finland
[b] Optentia Research Focus Area, North-West University, Vanderbijlpark, South Africa
[c] School of Business and Management, Lappeenranta University of Technology, Lappeenranta, Finland
[d] School of Management Studies, Motilal Nehru National Institute of Technology, Allahabad, India
[e] College of Business Administration, King Saud University, Kingdom of Saudi Arabia

ARTICLE INFO

Keywords:
Diffusion of innovation (DOI)
Emerging markets
m-wallet
Intentions to recommend
Intentions to use

ABSTRACT

In recent years, mobile wallets (m-wallets), a special form of mobile payment, have garnered much attention in various emerging markets. M-wallets were designed to offer customers swiftness, ease of use, efficiency, effectiveness, transparency, and accessibility. Despite these benefits, usage intentions and adoption of m-wallets in most emerging markets have been low, and they have not received widespread acceptance. Notably, existing research related to intentions to use (IUs) mobile payments has largely focused on developed economies and mobile payments in general. Additionally, few studies have examined intentions to recommend (ITRs), even though researchers have recognized that word-of-mouth is an important driver of consumer behavior. In the present study, we addressed the lack of specific findings on use and recommendation intentions in the context of m-wallets by conducting a large cross-sectional survey of 1256 smartphone users based on diffusion of innovation theory (DOI). Results revealed that relative advantage, compatibility, complexity, and observability were significantly associated with participants' intentions toward m-wallets. However, trialability had no association with participants' intentions to use and recommend m-wallets to others.

1. Introduction

The use of mobile phones to undertake financial transactions has resulted in the development of a variety of mobile payment systems (MPSs), which use the Internet to process payments for products and services (Di Pietro et al., 2015). MPSs have offered consumers benefits in terms of time, economy, versatility, cashless and traceable transactions, and so on (Liebana-Cabanillas et al., 2014). Although mobile payments have been used for online shopping for quite some time (Dahlberg et al., 2008), a special form of MPS, the mobile wallet (m-wallet), has been brought to market as a relatively new and more versatile way of processing payments through the Internet. Shin (2009) argued that the m-wallet is more versatile than other MPSs, because in addition to processing transactions, it allows consumers to save their card details and personal information, such as insurance policies. Scholars have argued that m-wallets are more advantageous for organizations and individuals than other payment options, such as those offered at the point of sale (Liébana Cabanillas et al., 2014). Although m-wallets have been in the market for more than a decade, they have not experienced widespread adoption, except for a few early adopters (Zhou, 2012). Researchers have argued that m-wallets are not readily accepted despite the benefits they provide to users and their capacity for making lives easier (Wu et al., 2017) and that lower acceptability may be due to issues with trust, security, awareness, and incomplete development from the perspective of available features (Zhou, 2012; Wu et al., 2017).

Despite the obvious benefits and affordances of m-wallets, their low use, low acceptance, and lack of mass adoption has led to a variety of empirical studies. In this context, most researchers have focused on developed countries, such as the United States (for example, Khalilzadeh et al., 2017; Johnson et al., 2018), Australia (Gao and Waechter, 2015), and Germany (Wirth and Maier, 2017). Only a limited number of studies have focused on emerging markets like India (Singh et al., 2017) and China (Wang and Gu, 2017). The lack of studies in emerging geographies has created a gap in the body of knowledge that must be addressed. When planning this study, we believed that understanding issues related to m-wallet adoption in these countries was critical, as such payments methods can promote their economic development. Financial institutions in these countries have been constrained by size,

* Corresponding author.
E-mail addresses: puneet.kaur@aalto.fi (P. Kaur), amandeep.dhir@lut.fi (A. Dhir), bodhi43@gmail.com (R. Bodhi), tripti.singh70@gmail.com (T. Singh), mohalmotairi@ksu.edu.sa (M. Almotairi).

https://doi.org/10.1016/j.jretconser.2020.102091
Received 13 September 2018; Received in revised form 23 January 2020; Accepted 4 March 2020
Available online 11 June 2020

structure, volatility, and poor governance (Beck and Cull, 2013). These have made financial services and transactions challenging. Aron (2018) suggested that in such instances, m-wallets can provide solutions to problems arising from the cost of delivering banking services and weak institutional infrastructure, in addition to transforming transactions for small accounts (Veniard and Melinda, 2010). The economic utility of mobile payment and high economic growth shown by some emerging economies (Ferreira Ribeiro et al., 2014) have raised important questions about how m-wallets are perceived by users. Furthermore, researchers have suggested that consumers in emerging markets drive global growth (Wroughton, 2018), which has resulted in a call for more studies focused on their behavior, including those investigating factors that can contribute to positive intentions toward m-wallets.

In the present study, we examined variables influencing the diffusion of m-wallets in India, a key emerging economy. In this regard, we investigated participants' intention to use (IU) and intention to recommend (ITR) m-wallets in India, thereby expanding the geographical scope of extant findings, in which developed geographies have been overrepresented. We answered two research questions (**RQs**), which were as follows: **RQ1**. What are the drivers of participants' IU and ITR m-wallets? **RQ2**. Are the key drivers of participants' IU and ITR m-wallets different? To answer these questions, we conducted a large cross-sectional study with young-adult m-wallet users from India. We utilized the theoretical framework of diffusion of innovation theory (DOI; Rogers, 1995) to propose the key drivers of participants' IU and ITR m-wallets. DOI has been cited as a well-known theoretical framework that is appropriate for understanding the diffusion of innovations in social settings (Yates, 2001). Information Systems (IS) scholars have argued that DOI is a suitable framework for understanding innovation diffusion across different types of users irrespective of their background (Johnson et al., 2018). Prior studies utilizing DOI in the context of m-wallets and other mobile commerce areas have found it one of the most appropriate theories for investigating the adoption of m-wallets (Johnson et al., 2018).

Our results suggested that relative advantage, compatibility, complexity, and observability were key drivers of participants' IU and ITR m-wallets. Trialability had no association with participants' IU and ITR m-wallets. We have contributed to theory through this study by providing an understanding of the antecedents of participants' IU and ITR m-wallets and differences in the predictors of the two dependent variables. Through our study, we confirmed the suitability of DOI for examining consumer intentions toward mobile payments. We have also contributed to m-wallet research, which has been sparse in emerging geographies to date. This is an important contribution, because existing research has recommended investigating intentions regarding m-payment in different social and cultural contexts (Amoroso and Magnier-Wantanalle, 2012). Scholars have argued that the diffusion of mobile payments may vary from one cultural context to another and may depend on various social, cultural, economic, demographic, and technological factors (Amoroso and Magnier Wantanalle, 2012). Above all, through this study, we have offered service providers practical insights for developing strategies to influence the participants' IU and ITR m-wallets in developing counteries.

2. Theoretical background

2.1. Diffusion of innovation theory (DOI)

DOI has been considered a landmark theory, because it was designed to understand how a product or service originates, gains momentum, and diffuses across society (Johnson et al., 2018; Rogers, 2003). Rogers (2003) defined diffusion as a process through which an innovation propagates in a social system over time. Rogers (2003) suggested that innovations offering compatible, simple, triable, relatively advantageous, and observable solutions were likely to be adopted quickly. In addition, researchers have used DOI to examine consumers' adoption behavior in different contexts such as online shopping (Bigne-Alcaniz et al., 2008), multimedia messaging services (Hsu et al., 2007), and mobile commerce and mobile banking (Van der Boor et al., 2014). Notably, recent studies have also applied DOI to m-wallets (e.g., Di Pietro et al., 2015; Johnson et al., 2018). Consequently, we utilized DOI as foundation for understanding drivers influencing the diffusion of m-wallets.

2.2. DOI and m-wallets

In the present study, we used DOI to investigate participants' IU and ITR m-wallets. During our literature review, we found 16 empirical studies that examined one or more components of DOI as applied to m-wallets (see Table 1). These studies were published between 2014 and 2018, and five of them were published in the last two years. This suggested that research on m-wallets has been popular among scholars worldwide.

In previous literature, researchers have utilized various theoretical frameworks in addition to DOI to understand different aspects of user behavior regarding m-wallets. These include the technology acceptance model (TAM), technology acceptance model 2 (TAM2), the unified theory of acceptance and use of technology (UTAUT), the integrated model on mobile payment acceptance (IMMPA), the theory of planned behavior (TPB), the theory of reasoned action (TRA), and the unified theory of acceptance and use of technology 2 (UTAUT2). Among the 16 empirical studies, only two focused on DOI alone (Johnson et al., 2018; Longyara and Van, 2015). However, many prior empirical studies (a total of eight) utilized DOI in combination with other theories (see Arvidsson, 2014; Thakur and Srivastava, 2014). The remaining six utilized TAM (see Wu et al., 2017; Mehrad and Mohammadi, 2017) and TAM2 (see Sun et al., 2017; Fischer et al., 2017). We have included studies based on TAM and TAM2 in Table 1, because two main DOI components, relative advantage and complexity, were similar to "perceived usefulness" and "perceived ease of use," the two important components of TAM and TAM2.

Most existing literature has examined users in developed countries, such as the United States (Johnson et al., 2018), Portugal (Oliveira et al., 2016), and Sweden (Arvidsson, 2014). Scholars have also studied countries like China (Wu et al., 2017; Sun et al., 2017; Zeng and Ma, 2016), Thailand (Longyara and Van, 2015), Malaysia (Tan et al., 2014) as well as the Middle Eastern region (Williams et al., 2017). Only two empirical studies have been carried out with reference to India (Upadhyay and Jahanyan, 2016; Thakur and Srivastava, 2014). Both studies were conducted before November 2016, when the Indian government withdrew currency notes of a certain denomination from use as legal tender in a drive toward de-monetization. At that time, the Indian consumers had not adopted m-wallets extensively. In comparison, the Indian market has witnessed a spurt in the use and adoption of m-wallets like Paytm since the demonetization drive, which has presented a critical opportunity to investigate the drivers of Indian users' IU and ITR m-wallets.

2.3. Research model and hypotheses development

We developed our research model based on DOI to investigate how its five main components, namely relative advantage, compatibility, complexity, trialability, and observability, are associated with participants' IU and ITR m-wallets (see Fig. 1). A description of the different components of DOI is presented in Table 2, and a review of prior literature examining the association of DOI components with IU and ITR respectively is presented in Table 3.

2.4. Relative advantage, intentions to use (IU), and intentions to recommend (ITR)

Previous research has suggested a significant positive relationship

Table 1
Prior literature on DOI and mobile payments

Author(s), Year	Sample	Theory	Measures
Johnson et al. (2018)	270 respondents from the United States (51.9% males) aged 24-64 years	DOI	RA, EoU, TR, VS, PR, PS, UQ, IU
Wu, Liu, & Huang (2017)	Two groups of Chinese users* aged 18 to 45 years. Group 1: N = 187 (50.3% males), Group 2: N = 297 (50.8% females)	TAM	PR, PU, PEO, AI, DS
Williams et al. (2017)	237 respondents* from Middle East/Africa (76.6% males) aged 18 to 35 years	DOI & TAM	PU, PEoU, IU, COMP, T, PR, IU, FR
Sun et al. (2017)	424 Chinese users* (52.1% males) aged 20 to 50 years	TAM	SA, UQ, IQ, PSAT, PEoU, IT, EP
Fischer et al. (2017)	262 respondents$ (40.8% males) aged 16 to 71 years (mean age 32 years)	TAM 2	PU, PEoU, PS, AT
Mehrad & Mohammadi (2016)	384 users* from Iran (40.89% females) aged 20 to 29 years	TAM	WOM, AT, IU, T, SNO, PEoU, PU
Oliveira et al. (2016)	301 users from Portugal (60% females) aged 18 to 66 years (mean age 29 years)	UTAUT2 & DOI	INN, CPT, PTS, PE, EE, SI, FC, HM, PV, IU
Zeng & Ma (2016)	402 Chinese users* (68% males) aged less than 25 years	UTAUT, TAM & DOI	PU, PEoU, SI, IIN, PR, IU
Upadhyay & Jahanyan (2016)	180 Indian users* (77% females) aged less than 30 years	DOI, TAM & TRA	PU, PEoU, SAV, SA, MV, CN, PI, AC, DT, IU, TTF, AC, DT
Aydin & Burnaz (2016)	1305 participants* from Turkey (63% males) aged 18 to 47 years. 639 were users and 666 were non-users of mobile payment	DOI, TAM, TPB	AT, PEoU, PI, PS, SI, PU, RW
Di Pietro et al. (2015)	30 users*$ (60% males) aged 16 to 35 years	TAM, DOI, UTAUT, IMMPA	PU, AT, COMP, SY, UB, IU
Longyara & Van (2015)	300 users*#@ from Thailand & Korea	DOI	AT, PSB, COMP, CPT, RA
Tan et al. (2014)	156 Malaysian users* (42.3% males) aged 21 to 35 years	TAM	PU, PEoU, SI, IIN, PFC, PR, IU
Thakur & Srivastava (2014)	774 Indian respondents* (69% males) aged 20 to 40 years	TAM, DOI & UTAUT	AR, IU, PR, INN, FC, SI
Arvidsson (2014)	169 users* from Sweden (81% males) aged less than 40 years	DOI & TAM	AT, RA, COMP, EoU, NE, T, PSR
Jaradat & Faqih (2014)	366 users*@ from Jordan (50.81% females)	TAM2	SN, SE, PU, PEoU, IU, IM, RD, OQ

Note: @ = age range not mentioned, $=Country name not mentioned, # = gender distribution not mentioned, * = Mean age not mentioned
Measures: Absorptive capacity = AC, Acceptance intention = AI, Adoption readiness = AR, Attitude = AT, Compatibility = COMP, Complexity = CPT, Connectivity = CN, Costs = CT, Diffusion stages = DS, Discomfort = DT, Ease of use = EoU, Effort expectancy = EE, Experience perception = EP, Facilitating conditions = FC, Financial risk = FR, Hedonic motivation = HM, Image = IM, Individual innovativeness = IIN, Information quality = IQ, Initial trust = INT, Intention to use = IU, Monetary value = MV, Network externalities = NE, Output quality= OQ, Perceived ease of use = PEoU, Perceived financial cost = PFC, Perceived satisfaction = PSAT, Perceived security = PS, Perceived security risks = PSR, Perceived status benefits = PSB, Perceived usefulness = PU, Performance expectancy = PE, Positive emotion = PEO, Price value = PV, Privacy risk = PR, Relative advantage = RA, Result demonstrability = RD, Rewards = RW, Security = SY, Self-efficacy = SE, Social influence = SI, Social norms = SNO, Structural assurances = SA, Subjective norm = SN, System availability = SAV, Task-technology fit = TTF, Trialability = TR, Trust = T, Ubiquity = UQ, Users behavior = UB Visibility = VS, Word of mouth = WOM
Theories: Diffusion of Innovation = DOI, IMMPA = Integrated Model on Mobile Payment Acceptance, Modified TAM = TAM 2, TAM = Technology Acceptance Model, TPB = Theory of planned behavior, TRA = Theory of reasoned action, UTAUT = Unified Theory of Acceptance and Use of Technology

between relative advantage and intentions to use a product or service. Yang et al. (2012) found that relative advantage had an influential role in predicting Chinese users' adoption-related intentions with regard to their use of mobile payment. Researchers have argued that relative advantage equates to the popular measure of perceived usefulness, which is part of the TAM (Longyara and Van, 2015). Chung et al. (2015) found a positive correlation between relative advantage (i.e., perceived usefulness in the TAM world) and intentions to use English mobile learning app. Cigdem and Topcu (2015) revealed that perceived usefulness was a significant positive predictor of usage intentions of Turkish learning management system users. In addition, scholars have found a significant positive association between perceived usefulness (or relative advantage) and intentions to use in relation to products and services such as e-learning systems (Agudo-Peregrina et al., 2014), mobile learning (Tan et al., 2014), mobile coupons (Agarwal and Karim, 2015), and mobile entertainment (Leong et al., 2013). As m-wallets are also mobile-based, we anticipated that relative advantage would be positively associated with IU, as it was when studied in relation to the mobile-based services and products discussed above. We believed that one of the main attractions of m-wallets is the advantage they offer over other modes of payment. Thus, we expected that the relative advantage of m-wallets over the Internet or cash payment in terms of convenience, effectiveness, and efficiency would be associated with IU. Hence, we proposed:

H1. Relative advantage will be positively associated with participants' intentions to use m-wallets.

Fewer studies have examined the relationship between relative advantage and ITR (or word-of-mouth), and the findings of these studies have not been consistent. For example, Agag and El-Masry (2016) found that relative advantage had an indirect association with Egyptian online travel community users' ITR via their attitude. In contrast, Handayani and Arifin (2017) found a direct relationship between ITR and relative advantage among Indonesian online package users. Despite these conflicting findings, we anticipated relationship between relative advantage and ITR for two reasons. First, previous literature confirmed a positive association, and second, researchers have argued that a high usage intention toward a technology is likely to increase users' ITR it (for example, Miltgen et al., 2013; Oliveira et al., 2016). As we anticipated a positive association between IU and relative advantage, we hypothesized the same between relative advantage and ITR:

H2. Relative advantage will be positively associated with participants' intentions to recommend m-wallets.

2.5. Compatibility, IU, and ITR

Researchers have found that compatibility is a predictor of IU in different IS contexts, such as mobile English vocabulary learning resources (Chung et al., 2015), mobile coupons (Agarwal and Karim, 2015), and the online travel community (Agag and El-Masry, 2016). Previous studies have shown that compatibility has a positive association with users' attitude, IU, and the perceived usefulness of a technology in the context of its adoption (Oliveira et al., 2016). Similarly, in the context of mobile payment, scholars have found that compatibility is a strong predictor of users' intentions to adopt mobile payment methods (Yang et al., 2012; Choudrie et al., 2014). We felt that consumers' IU m-wallets would also be dependent on m-wallets' compatibility with their needs, beliefs, values, and experiences. This implied that if m-wallets were compatible with potential users' current needs, choices, lifestyle, and situations, then they would be more likely to have high usage intentions. We took greater compatibility to indicate greater consistency of m-wallets with potential users' beliefs. Hence, we

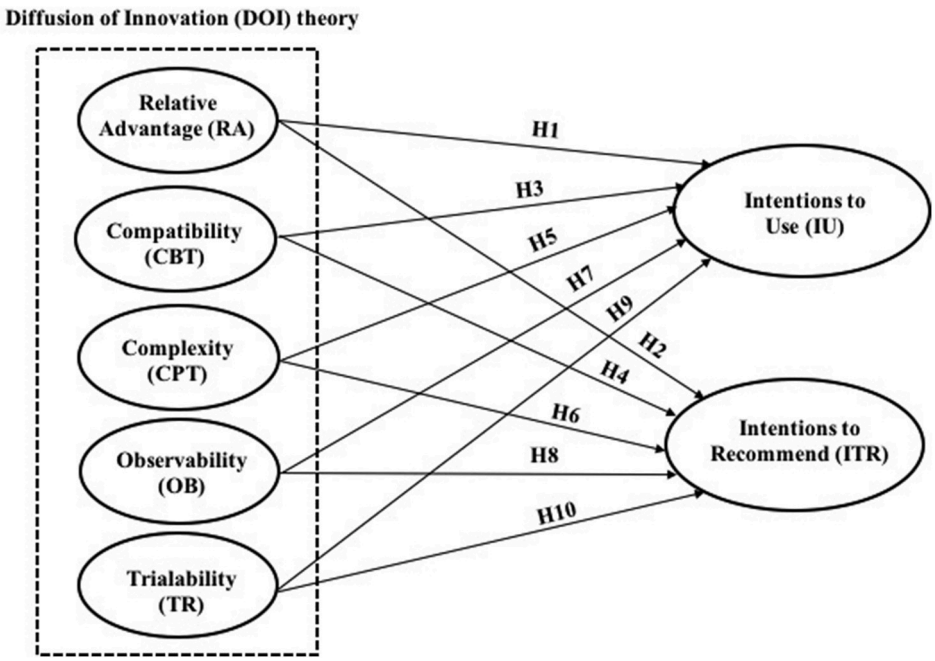

Fig. 1. The research model and proposed hypotheses.

Table 2
Components of DOI

Component	Description
Relative advantage (RA)	Added advantage that the innovation, product, or service under consideration provides compared to its precursors. For example, it may be more economic, more efficient, or manifest a higher degree of status
Compatibility (CBT)	Prospective users' perception of the alignment of the innovation with their needs and beliefs
Complexity (CPT)	Prospective users' perception of the level of difficulty they have in comprehending and using the innovation
Observability (OR)	The extent to which the innovation produces tangible results that would lead to its increased visibility
Trialability (TR)	The extent to which an innovation can be experimented with by the user before making a final decision to adopt it

hypothesized:

H3. Compatibility will be positively associated with participants' intentions to use m-wallets.

ITR has been investigated less often than IU in the context of compatibility. Few empirical studies have examined the relationship between compatibility and intentions to recommend. Agag and El-Masry (2016) found that compatibility had an indirect relationship with intentions to recommend via participation intentions and attitude of users toward online travel community. Although there is a lack of findings directly related to the intentions of users to recommend mobile payment methods, yet researchers have reported that consumers in general recommend products to others, especially in the age of social media (Mahapatra and Mishra, 2017; Mangold and Faulds, 2009). In addition, they have reported that such recommendations can help users' social connections in making adoption decisions (Chu and Kim, 2011). Based on the preceding discussion, we have conjectured that potential users who have an IU m-wallets due to their compatibility would also be likely to recommend them. Hence, we hypothesized:

H4. Compatibility will be positively associated with participants' intentions to recommend m-wallets.

2.6. Complexity, IU, and ITR

We have suggested that complexity is the same as the perceived ease of use (PEoU) measure in TAM, even though they capture the same thing in opposite ways. Longyara and Van (2015) suggested that developers should reduce the complexity of innovations as much as possible to foster successful adoption. Although several studies have examined PEoU and intentions, only a few examined the association between complexity and IU. Previous literature has suggested that PEoU or low complexity is associated with usage intentions toward mobile products, such as coupons (Agarwal and Karim, 2015), learning (Tan et al., 2014), entertainment (Leong et al., 2013), and the online travel community (Agag and El-Masry, 2016). Scholars also found that low complexity or PEoU had either no direct association with participants' IU, as in the case of e-learning systems (Agudo-Peregrina et al., 2014) or had an indirect effect on their IU, as in the case of learning management system (Cigdem and Topcu, 2015). Except for learning management systems, extant findings have confirmed a positive association between PEoU and IU, which implies a negative association between complexity and IU, especially for mobile-based services. As complexity has been said to represent the difficulty level of a technology product (Venkatesh et al., 2003; Shaikh and Karjaluoto, 2015), we expected that if participants perceived m-wallets to be highly complex, they would have lower usage intentions. In the present study, we measured low complexity rather than complexity to ensure ease of interpretation in terms of PEoU. Thus, we anticipated that if potential users felt that m-wallets made it easier for them to complete their purchase by paying quickly and conveniently, then they would have higher IU. Hence, we proposed:

H5. Low complexity will be positively associated with participants' intentions to use m-wallets.

As with other DOI measures, few scholars have examined the relationship between complexity and ITR. Lovett et al. (2013) found a positive relationship between complexity and ITR in an offline context and a negative relationship between complexity and ITR in an online context. We expected complexity to influence recommendation intentions of participants due to two reasons. First, at the time of the present study, m-wallets were still quite new in the Indian market, and their adoption had not reached even a quarter of the country's 1.3

Table 3
Relationship between DOI components, IU and ITR

Author(s), Year	Sample	Context	Study Measures
Handayani & Arifin (2017)	441 Indonesian respondents@#*	Online travel packages	WOM, AT, PBC, T, SN, PR, PRA, IU
Agag & El-Masry (2016)	495 respondents* from Egypt (57% males), aged 20 to 40 years	Online travel community	PRA, COMP, PEoU, PU, AT, T, PION, WOM, IU, R
Cigdem & Topcu (2015)	115 Turkish#* respondents, aged less than 40 years	Learning management system	PU, PEoU, SE, CPT, SN, IU
Chung, Chen, & Kuo (2015)	84 Taiwanese respondents @* (80.95% males)	Mobile English learning	PEoU, PU, SE, COMP, IU
Agarwal & Karim (2015)	197 Indian users* (47% females) aged 18 to 25 years	Mobile coupons	PEoU, PU, PCR, COMP, SI, INN, IU
Agudo-Peregrina, et al. (2014)	Two groups of participants from Spain. Group 1*@ (n = 66, 57.6% males) Group 2*@ (n = 82, 66.7% males)	E-learning systems	SE, CaN, PPL, PIN, FC, PEoU, SN, RFL, PUP, PUF, IU, HA, IU, Self-reported use
Choudrie et al. (2014)	204 respondents* from UK, aged 20 to 40 years. Gender: 68.13% female	Smartphone use	OB, COMP, IU, SI, EE, PE, FC, UB, PEN
Thakur & Srivastava (2014)	774 Indian respondents* (69% males), aged 20 to 40 years	Mobile payments	AR, IU, PR, FC, SI, INN
Tan et al. (2014)	156 Malaysian users* (42.3% males) aged 21 to 35 years	Mobile learning	PEoU, PU, SI, INN, PR, IU
Leong et al. (2013)	572 Malaysian users* (58.2% females) aged 21 to 25 years	Mobile entertainment	PEoU, PU, SI, SE, PEN, IU
Lovett, Peres, & Shachar (2013)	4769 US-based respondents@#*	Brand marketing	Q, D, ITR, VS, EM, EX, SAT, PR, INV, CPT, K
Yang et al. (2012)	Two group of Chinese users (potential versus current users) aged 18 to 39 years. Group 1: n = 483* (54.5% males). Group 2: n = 156* (58.97% males)	Mobile payment services	FEE, COMP, SN, PR, IM, RA, IU, INN
Jamal, Khan, & Tsesmetzi (2012)	193 respondents* from UK, aged 18 years and above (only females)	Cosmetics market	PQ, CI, WOM, PK, BIN
Berger & Schwartz (2011)	109 US based respondents@# with average age 42 years	Product marketing	CF, WOM, ACC, VS, ITR
Im, Mason, & Houston (2007)	296 respondents#$ with mean age 52.72 years	Innovative adoption behavior	WOM, NPAB, PCS, ICI, IBE, UB

Note: @ = age range not mentioned, $=Country name not mentioned, # = gender distribution not mentioned, * = Mean age not mentioned
Measures: Accessibility = ACC, Adoption readiness = AR, Attitude = AT, Intentions to use =IU, Brand innovativeness = BIN, Compatibility = COMP, Complexity/Technological complexity = CPT, Computer anxiety = CaN, Cue frequency = CF, Customer loyalty = CI, Differentiation = D, Effort expectancy = EE, Emotional = EM, Excitement = EX, Facilitating conditions = FC, Favorability = FAV, Habit: H, Image = IM, Innate consumer innovativeness = ICI, Innovative behavior = IBE, Intention to recommended = ITR, Involvement = INV, Knowledge = K, New product (service) adoption behavior = NPAB, Observability = OB, Packaging = PK, Participation intention = PION, Perceived behavioral control = PBC, Perceived compatibility = PCO, Perceived credibility = PCR, Perceived ease of use = PEoU, Perceived enjoyment = PEN, Perceived fee = FEE, Perceived financial resources = PFR, Perceived interaction = PIN, Perceived playfulness = PPL, Perceived quality = PQ, Perceived relative advantages = PRA, Perceived risk = PR, Perceived usefulness = PU, Perceived usefulness flexibility = PUF, Perceived usefulness performance = PUP, Performance expectancy = PE, Personal characteristics = PCS, Innovativeness = INN, Quality = Q, Relative advantage = RA, Relevance for learning = RFL, Religiosity = R, Satisfaction = SAT, Self-efficacy = SE, Social influence = SI, Subjective norm = SN, Trust = T, Users behavior = UB, Visibility = VS, Word of mouth = WOM

billion population. In such a scenario of low diffusion, a method which is perceived to be difficult to use can influence consumers' intentions adversely. Second, we have recognized that m-wallets are used by people from diverse backgrounds, especially in terms of their experience in using technology. Given the differences in the aptitude and experience of prospective users, perceived complexity can have negative impact on their intentions to recommend m-wallets. Furthermore, scholars have argued that a higher usage intention is likely to lead to a higher intention to recommend the technology (Miltgen et al., 2013). Therefore, we expected low complexity to have positive association with ITR as well. Hence, we hypothesized:

H6. Low complexity will be positively associated with participants' intentions to recommend m-wallets.

2.7. Observability, IU, and ITR

Choudrie et al. (2014) found that observability played a key role in influencing usage intentions among people over 50 years of age but had no association among those under 50 years of age. We believed that observability or visibility was a relevant measure in the present study for two reasons. First, we targeted young adult smartphone users. Previous literature on new media has shown that young adults are very much concerned with impression management (Dhir et al., 2015). Thus, we surmised that visibly using the latest technologies, such as m-wallets, would help young adults build a positive self-impression among their social circle. Such an outcome can be expected to positively influence their intentions to use mobile payment methods. We also believed that seeing others use m-wallets may make young adults feel that they should also use m-wallets to make a good impression on others. Second, at the time of study, less than a quarter of the Indian population were using m-wallets. Therefore, we believed that esteem value would be attached to being seen using m-wallets and that seeing others use m-wallets may make non-users feel bad to the extent that they might want to adopt them. Consequently, we expected observability to increase participants' IU m-wallets. Hence, we posited:

H7. Observability will be positively associated with participants' intentions to use m-wallets.

In the context of ITR, Berger and Schwartz (2011) found that observability or visibility positively associated with recommendation intentions immediately as well as over a period of time. Lovett et al. (2013) found that visibility was associated with ITR in both offline and online settings. Thus, most prior literature has confirmed the association between the two. Based on our extensive literature review and our argument that observability, in terms of seeing others use m-wallets, would increase IU, we expected that observability would have a positive association with ITR as well. Hence, we posited:

H8. Observability will be positively associated with participants' intentions to recommend m-wallets.

2.8. Trialability, IU, and ITR

Research has suggested that trialability increases usage intentions by giving potential users a degree of comfort about a product (Rogers, 1983) and that the opportunity to try a product is likely to decrease consumers' fear of using a proposed new technology (Tan and Teo, 2000). Previous literature has suggested that consumers who score highly on personal innovativeness are always willing to try new

innovations (Agarwal and Prasad, 1998; Chang et al., 2005). Therefore, we believed that the trialability dimension would be liked by consumers with a high degree of personal innovativeness. The innovative individuals, who are open to trying new technologies, would be more willing to try a new innovation before adopting it. Prior IS studies have suggested that consumers who score highly on personal innovativeness have more intention to try and use new goods and technologies than those who are low on personal innovativeness (Aydin and Burnaz, 2016; Thakur and Srivastava, 2014). However, only a few existing studies have tested the relationship between trialability or personal innovativeness and IU directly. First, Yang et al. (2012) and Thakur and Srivastava (2014) found that personal innovativeness had an effect on usage intentions toward mobile payments. Conversely, Agudo-Peregrina et al. (2014) found that personal innovativeness had an indirect impact on intentions via PEoU in the context of e-learning systems. Tan et al. (2014) also found an indirect effect of personal innovativeness on intentions to use mobile learning systems. In contrast to all these studies, Agarwal and Karim (2015) found no significant association of personal innovativeness with intentions to use mobile coupons. Based on prior findings, we believed that the personal innovativeness of potential users and the opportunity that m-wallets offer for trial (dummy) transactions were likely to increase potential users' usage intentions. Hence, we proposed:

H9. Trialability will be positively associated with participants' intentions to use m-wallets.

As in the case of constructs discussed above, very few studies have investigated the association of trialability with intentions of users to recommend a product or service. One of the related studies by Jamal et al. (2012) found that brand innovativeness significantly influenced consumers' recommendation intentions. Similarly, Im et al., 2007 revealed the influence of word of mouth on innovative adoption behavior. We believed that despite a lack of prior studies on trialability, it was an influential variable in the context of the present study. Research has suggested that our target user group, the young adults, were willing to use the latest products and services as a way to manage their impression on their social circle. Prior literature suggests that impression management was an important part of their well-being and psychosocial development of young people (Dhir et al., 2015). Based on these findings and the fact that we anticipated a positive association between trialability and IU, we proposed the following hypothesis:

H10. Trialability will be positively associated with participants' intentions to recommend m-wallets.

3. Research method

3.1. Study participants and data collection

We conducted a large cross-sectional survey of 1256 young adult smartphone users studying at various universities and colleges located in three states in India. At the time of study, the majority of educational institutions from this invited pool catered to students majoring in management and engineering. Study participants were aged 19–26 years, and 83% (n = 1043) were male. Male respondents were over-represented in the sample compared to females. This was due to the fact that in India, institutions specializing in engineering and management have more male than female students. During the survey, we revealed the study objectives, outcomes, and research process to the target user group. All participating institutions announced dedicated sessions at which data were collected. First, we carried out a pilot survey with 20 respondents who had the same profile as the target sample. We used the resulting data to determine the clarity of measurement items and to ensure that they were not confusing or misleading and to revise the survey before using it to evaluate the target segment.

3.2. Data analysis

We conducted data analysis using IBM SPSS Statistics 25.0 and IBM AMOS 25.0. We used Anderson and Gerbing (1988)'s recommendation to carry out data analysis using a two-step approach. Herein, we assessed the measurement model by examining the model fit indices using confirmatory factor analysis (CFA). Later, we examined different forms of validity and reliability and evaluated the structural model to test each hypothesis.

4. Results

4.1. Common method bias (CMB)

We investigated CMB using Harman's single factor test (Podsakoff et al., 2003), which confirmed that no significant CMB was found in the data.

4.2. Measurement model

Previous literature has suggested that any given model has a good fit if the chi-square/degree of freedom (X^2/df) $\leq$ 3, comparative fit index (CFI) $\geq$ 0.92, Tucker-Lewis index (TLI) $\geq$ 0.92, and root mean square error of approximation (RMSEA) $\leq$ 0.06 (Hu and Bentler, 1999). We viewed a good model fit as a necessary condition to confirm a good fit between the theoretical model and our empirical data. We have presented factor loadings in Table 4. The measurement model returned a good fit (X^2/df = 3.61, CFI = 0.96, TLI = 0.96, $RMSEA$ = 0.05).

4.3. Validity and reliability

In the current study, we examined four types of instrument validity and reliability in the context of the study measures.

4.3.1. Content validity

We adapted measurement items from validated scales used by researchers in various research settings worldwide.

4.3.2. Face validity

We established face validity through a small pilot study with 20 representatives of the target group. The results guided us in making minor changes to the wording of some measurement items.

4.3.3. Convergent validity

Previous literature has suggested that to confirm the presence of sufficient convergent validity, data should meet the following threshold tests: factor loadings for measurement items should be greater than 0.50, composite reliability (CR) must be greater than 0.70, and average variance extracted (AVE) for all study measures should be greater than 0.50 (Hair et al., 2013). Our data fulfilled all these conditions, confirming convergent validity (see Tables 4 and 5).

4.3.4. Discriminant validity

Research has suggested that to confirm discriminant validity, the correlation between any two measures should be below 0.80, AVEs for study measures should be greater than the corresponding average shared variance (ASV), and maximum shared variance (MSV) value (Sarstedt et al., 2014), and correlation values between measures should be less than the square root of the AVE (Fornell and Bookstein, 1982). As shown in Table 5, our study measures satisfied all three criteria, confirming discriminant validity.

4.4. Structural model

The structural model returned a good model fit (X^2/df = 3.90, CFI = 0.96, TLI = 0.95, $RMSEA$ = 0.05). Further, our results suggested that

Table 4
Study measures and loadings for the measurement and structural model (n = 1256).

Study measures	Measurement items	CFA	SEM
Relative advantage (RA)	RA1: M-wallets have more advantages than internet or cash payment systems.	0.79	0.79
	RA2: M-wallets are more convenient than internet or cash payment systems.	0.82	0.82
	RA3: M-wallets are more efficient than internet or cash payment systems.	0.86	0.86
	RA4: M-wallets are more effective than internet or cash payment systems.	0.81	0.80
Compatibility (CBT)	CBT1: Using an m-wallet is compatible with all aspects of my lifestyle.	0.78	0.77
	CBT2: Using an m-wallet is completely compatible with my current situation.	0.78	0.77
	CBT3: I think that using an m-wallet fits well with the way I like to buy.	0.76	0.76
	CBT4: Using an m-wallet fits into my lifestyle.	0.75	0.75
Complexity (CPT)	CPT1: Using an m-wallet would make it easier to purchase items.	0.75	0.75
	CPT2: Using an m-wallet would enable me to pay for items more quickly.	0.76	0.75
	CPT3: Using an m-wallet would make it more effective for me to pay for items.	0.76	0.76
	CPT4: Using an m-wallet would be more convenient when making purchases.	0.69	0.69
Observability (OB)	OB1: I have seen others using m-wallets.	0.77	0.77
	OB2: I have often seen others using m-wallets.	0.69	0.69
Trialability (TR)	TR1: I know more about new products before other people do.	0.79	0.78
	TR2: I am usually among the first to try new products.	0.69	0.69
Intentions to use (IU)	IU1: I expect my use of m-wallets to increase in the future.	0.76	0.76
	IU2: I intend to use m-wallets in the future.	0.80	0.80
	IU3: If I have an opportunity, then I will use an m-wallet.	0.82	0.81
	IU4: I will always try to use an m-wallet.	0.79	0.79
	IU5: I plan to use m-wallets frequently.	0.70	0.70
Intention to recommend (ITR)	ITR1: I will recommend to my friends to subscribe to m-wallet	0.88	0.87
	ITR2: If I have a good experience with m-wallets, then I will recommend their use to my friends.	0.76	0.77

Note: SEM = Factor loadings structural model, CFA = Factor loadings structural model, m-wallet = PayTm.

most hypotheses were supported at $p < 0.001$ (see Table 6, Fig. 2). Overall, we have shown that compatibility ($\beta = 0.32$, $p < 0.001$), complexity ($\beta = 0.30$, $p < 0.05$), relative advantage ($\beta = 0.26$, $p < 0.001$), and observability/visibility ($\beta = 0.12$, $p < 0.001$) were significant predictors of participants' intentions to use m-wallets. In addition, compatibility ($\beta = 0.50$, $p < 0.001$), complexity ($\beta = 0.24$, $p < 0.001$), relative advantage ($\beta = 0.12$, $p < 0.001$), and observability/visibility ($\beta = 0.10$, $p < 0.05$) were significant predictors of participants' intentions to recommend m-wallets. The structural model explained 63.1% of the variance in participants' intentions to use and 58.6% of the variance in their intentions to recommend m-wallets. In consonance with the recommendations of Hair et al. (2011), we determined that the variance explained values were acceptable from the perspective of consumer behavior studies.

5. Discussion

We used H1 to determine whether relative advantage was associated with greater intention to use m-wallets. Our findings supported the hypothesis, and this was consistent with most prior IS studies (e.g., Chung et al., 2015; Cigdem and Topcu, 2015). Our results suggested that users clearly saw the advantages (e.g., convenience, efficiency, and so on) offered by m-wallets over other modes of payment. We also found that H2 was supported, as our results confirmed that relative advantage was associated with greater intention to recommend m-wallets. This was consistent with recent studies (e.g., Handayani and Arifin, 2017; Agag and El-Masry, 2016). Our findings indicated that the benefits derived from using m-wallets were important factors for making the logical decision to recommend them to others.

We also found support for H3 and H4 in our study results, which suggested that compatibility was associated with participants' intentions to use and recommend m-wallets. With regard to IU, our findings were consistent with IS literature in general (Chung et al., 2015; Agarwal and Karim, 2015; Agag and El-Masry, 2016), including literature on m-wallets (Yang et al., 2012; Choudrie et al., 2014). However, our findings suggested that compatibility was the strongest driver of IU among young adults, which conflicted with Choudrie et al. (2014), who stated that compatibility had low association with the behavior of users below the age of 50. A possible reason for insignificant association of compatibility with IU in the case of Choudrie et al. (2014) was that their study focused on a wide age range rather than specifically focusing on young adults, as was done in the present study. Our study results on ITR were consistent with some prior literature (e.g., Agag and El-Masry, 2016), which suggested an indirect relationship between compatibility and intentions to recommend via attitude. A possible reason for the strong association of compatibility with ITR found in the present study could be that the target user group was technology savvy and inclined towards online shopping and making payments on the go. Our results

Table 6
Confirmation of study hypotheses (n = 1256)

Hypothesis	Path	β	p	Support
H1	RA → IU	**0.26**	**<0.001**	**Yes**
H2	RA → ITR	**0.12**	**<0.001**	**Yes**
H3	CBT → IU	**0.32**	**<0.001**	**Yes**
H4	CBT → ITR	**0.50**	**<0.001**	**Yes**
H5	CPT → IU	**0.30**	**<0.001**	**Yes**
H6	CPT → ITR	**0.24**	**<0.001**	**Yes**
H7	OB → IU	**0.12**	**<0.001**	**Yes**
H8	OB → ITR	**0.10**	**<0.05**	**Yes**
H9	TR → IU	-0.04	*n.s.*	No
H10	TR → ITR	-0.06	*n.s.*	No

n.s. = not supported, β = standardized regression weights, p = probability. $^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$.

Table 5
Mean, standard deviation, convergent and discriminant validity (n = 1256)

Variable	Mean	SD	CR	AVE	MSV	ASV	IU	RA	CBT	TR	CPT	OB	ITR
IU	3.73	0.94	0.88	0.60	0.50	0.36	**0.77**						
RA	3.52	0.99	0.89	0.67	0.39	0.25	0.62	**0.82**					
CBT	3.36	0.90	0.85	0.59	0.48	0.33	0.64	0.50	**0.77**				
TR	3.10	0.97	0.70	0.54	0.32	0.17	0.40	0.38	0.57	**0.74**			
CPT	3.59	0.88	0.83	0.54	0.48	0.34	0.69	0.58	0.60	0.40	**0.74**		
OB	3.70	0.96	0.70	0.53	0.33	0.19	0.50	0.35	0.40	0.27	0.57	**0.73**	
ITR	3.68	1.04	0.81	0.68	0.50	0.33	0.71	0.51	0.69	0.39	0.62	0.44	**0.82**

Note: CR = Composite reliability, AVE = Average variance explained, MSV = Maximum shared variance, ASV = Average shared variance.

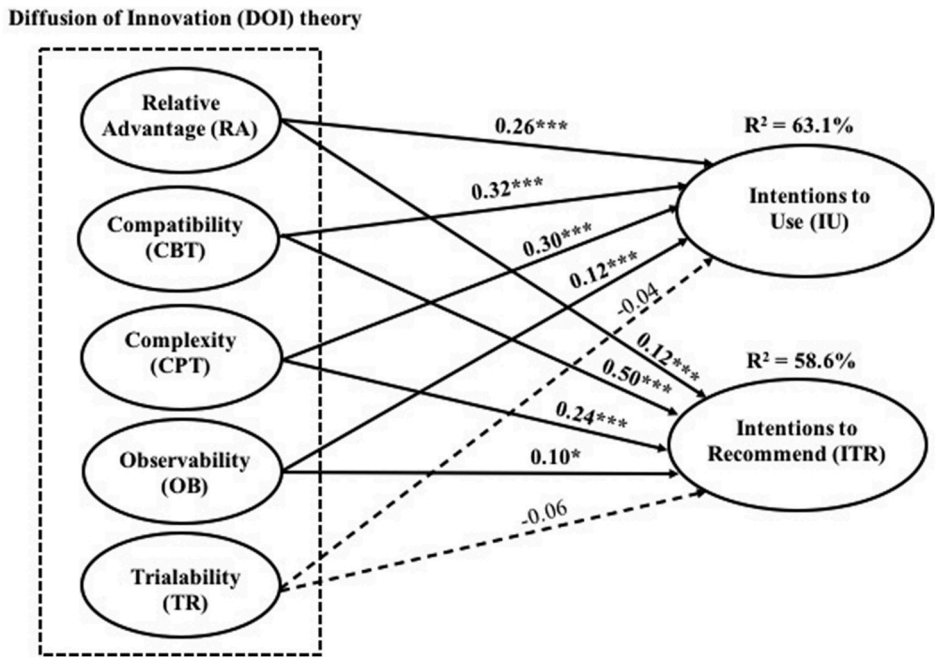

Fig. 2. Results of the structural model testing (N = 1256).

suggested that it is important for m-wallets to maintain consistency in values, prior experiences, and prospective needs, as this might increase prospective consumers' usage and recommendation intentions toward m-wallets.

We found support for H5 and H6, which suggested that low complexity was associated with greater intention to use and recommend m-wallets. The association between low complexity and IU was consistent with some prior IS findings (e.g., Agarwal and Karim, 2015; Agag and El-Masry, 2016) but not others (e.g., Agudo-Peregrina et al., 2014). We also confirmed that low complexity was associated with greater intention to recommend m-wallets, which was consistent with prior literature on mobile-based payments (e.g., Lovett et al., 2013). These significant positive relationships may be due to the time required to complete transactions using m-wallets. Users might be willing to use m-wallets to ease their lives and make their purchasing of goods and services more convenient. Research has suggested that if a technology is difficult to use, and it is hard to locate things, then more time and effort is required to accomplish a transaction, which could be inconvenient for users and goes against one of the basic principles of using m-wallets. Previous literature has reported that concerns about such issues hinder the adoption and usage of m-wallets (Mallat and Tuunainen, 2008).

We used H7 and H8 to determine whether observability was associated with participants' intentions to use and recommend m-wallets. Our findings supported both hypotheses. Support for H7 contradicted the limited prior literature on the topic (e.g., Choudrie et al., 2014), which suggested that observability of the outcomes of innovation usage had no association with the intentions of users below 50 years of age. In contrast, our research suggested a relationship between observability and young adults' intentions to use m-wallets. Support for H8 was in line with prevailing research findings on the topic (e.g., Lovett et al., 2013; Berger and Schwartz, 2011). A possible reason could be that after the changes in Indian economy since demonetization, the use of m-wallets has become popular among the Indian consumers. People who were previously unaware of m-wallets have become aware due to government initiatives and service providers' advertisements. The other reason could be that using new technologies and services was an act of impression management, especially among young adults in the Indian context. Prior literature has confirmed that impression management is an important task for young Indian adults (Dhir et al., 2015). Consequently, observability was associated with the use behavior of young Indian adults regarding their intentions to use and recommend m-wallets.

Our findings did not support H9 and H10, implying that trialability had no relationship with participants' intentions to use and recommend m-wallets. The finding on intentions to use contradicted prior IS studies (e.g., Aydin and Burnaz, 2016; Thakur and Srivastava, 2014). However, they were consistent with several other studies that confirmed the absence of a direct effect (e.g., Agudo Peregrina et al., 2014; Tan et al., 2014) or no significant relationship (Agarwal and Karim, 2015). On the other hand, our findings on the relationship between trialability and ITR contradicted prior IS studies (e.g., Im et al., 2007; Jamal et al., 2012). The probable reasons for the lack of a significant association in the present study could be that it was mainly focused on understanding the acceptance and use of new technology rather than its adoption. Furthermore, users who score highly on innovativeness have already moved beyond the phase of adoption, and those who are left behind might be low on innovativeness.

6. Conclusion

Recent literature on m-wallets has suggested that despite their benefits, they have not been readily accepted by users (Wu et al., 2017). Research has suggested that this is due to challenges associated with the use of m-wallets, which involve uncertainty and risks due to the vulnerable nature of mobile networks (Zhou, 2012). At the time of study, major service providers in India had reached less than 25% of the country's 1.3 billion population, with Deloitte (2018) reporting that Paytm had over 200 million users, MobiKwik had 55 Million, and Oxigen had 25 million users. These statistics have suggested that scholars must undertake empirical studies to understand factors that could be used to speed-up the diffusion of m-wallets to the remaining 75% of the population. In this context, Thakur and Srivastava (2014) recommended that researchers should study m-wallets to gain insights into the drivers of m-wallet adoption. We responded to this call by conducting a large cross-sectional study of potential m-wallets users.

We built our research model on a popular technology use and acceptance theory, DOI, which has provided an appropriate framework for investigating the diffusion of innovations due to its ability to deliver insights into all user types, irrespective of their general and economic backgrounds (Johnson et al., 2018). In particular, we investigated two RQs. The results we used to answer RQ1 confirmed that relative advantage, compatibility, complexity, and observability were associated with greater intention to use and recommend m-wallets. To answer RQ2, we found that intentions to use as well as recommend m-wallets did not differ in terms of their drivers. However, the magnitude of impact was different in the case of relative advantage and compatibility. By conducting the present study, we have provided new knowledge on factors that contribute towards participants' intentions to use m-wallets in emerging markets like India. Furthermore, we have also provided insights into factors that could motivate participants' intentions to recommend m-wallets to others. We have been able to offer several actionable implications on the basis of our findings.

6.1. Theoretical implications

In the present research study, we have made notable theoretical contributions to the body of knowledge on m-wallets, IS, and mobile services, including theories related to technology use, adoption, and acceptance. We have classified the theoretical contributions of the current work into two main parts. In the first part, we have dealt with the significant contribution to DOI, and in the second part, we have dealt with the contribution to previous m-wallet and IS literature.

First, we contributed to DOI by using it to investigate the acceptance and use of a relatively new innovation, m-wallet, for an underexplored geography and demographic group, young adult smartphone users in India. Second, ours was amongst the first few empirical studies to test the applicability of DOI as a whole by assessing all five components in the context of m-wallets. Previous works have not done so. For example, Johnson et al. (2018) did not investigate the role of compatibility, while Oliveira et al. (2016) did not include observability in their research on mobile payments. Therefore, the present study has brought forth a broader picture of the influential role of DOI components in predicting participants' intentions to use and recommend m-wallets. Third, in the current study, we have shown that DOI explained 63.1% of the variance in participants' intentions to use and 58.6% of the variance in their intentions to recommend m-wallets. The predictive power of the current research model was comparable to that in other studies investigating intentions to recommend in the context of m-wallets (e.g., Oliveira et al., 2016). In the present study, we have shown that DOI alone is capable of explaining the recommendation behavior. Finally, previous research has shown a limited existing understanding of how the constituents of DOI relate to consumers' intentions to recommend any service or product. For example, scholars have suggested the presence of indirect relationships between certain DOI components and user intentions (e.g., Agag and El-Masry, 2016). We investigated the direct association of all DOI components with intentions to use as well as recommend. Consequently, we have added valuable information on recommendation behavior to existing DOI literature.

We have also made two contributions to previous literature on mobile payments and IS. First, we have contributed to the limited existing knowledge on the adoption and use of mobile payments, with special reference to m-wallets, in an understudied emerging market. Recent studies have indicated that at present, we possess insufficient knowledge on cultural and social factors that were associated with the adoption of mobile payment systems (Su et al., 2017). Like other scholars, we observed several inconsistencies in prior literature examining participants' intentions to use mobile payments (e.g., Johnson et al., 2018). Some scholars have observed that ease of use has a significant effect on the adoption of mobile-based commerce systems (Johnson et al., 2018; Arvidsson, 2014); however, others found no significant relationship (Koenig-Lewis et al., 2010). We have suggested a need for further empirical studies like the current study to examine inconsistencies in prior literature.

6.2. Practical implications

In the current study, we have presented three implications for managers. First, our results have provided useful knowledge on the strategies m-wallet service providers could adopt to enhance the reach of their services. This is especially relevant in contexts like India and other countries that have struggled with very low adoption and use of m-wallets. We have offered guidance on factors that could encourage users to recommend m-wallets, suggesting that a high probability of recommendation increases the likelihood of higher number of users. Our findings suggested that benefits incurred as a result of service usage are important for formulating intentions to recommend the service to others. Hence, we have recommended that service providers take special care in making the distinct benefits they offer visible and articulate them well in their promotional campaigns and advertisements. We have envisioned these initiatives as highlighting the distinctive features of m-wallets, such as security, trustworthiness, anytime-anywhere transactions, and so on. In previous literature, researchers have suggested that it is important for organizations to understand the behavior of young adults, because they play an influential role in technology adoption and the usage-related decisions of their family and friends (Lapowsky, 2014; Kaur, 2016). Therefore, we have argued that the findings of the present study are crucial for mobile payment service providers, as they yield insights into the behavior of young adults.

Second, in the present study, we have revealed significant explanatory variables that were associated with participants' intentions to use m-wallets. We have suggested that knowledge of these variables can help service providers choose aspects on which to focus to develop potential customers' intentions to use m-wallets. For example, our findings suggested that while developing product features, service providers should consider the compatibility of their service with target users' lifestyles. Furthermore, we have argued that m-wallets should be easy to learn and use. Finally, we have suggested that the mobile payment industry in India can benefit from these findings. Ever since the government unveiled its vision of encouraging and supporting digitally-driven transactions, several mobile payment services have emerged, each with a different response from potential users. Through this study, we have helped service providers in India understand the factors driving potential customers' intentions to use and recommend m-wallets.

6.3. Limitations and future directions

Despite the contributions we have made in the present research, we have acknowledged three limitations that pave the way for future research. First, in the present study, we aimed to understand the behavior of young Indian adults regarding one mobile payment system, m-wallets. This limited product and geographical focus may have hampered the generalizability of the findings. Hence, we have recognized a need for more research to understand participants' adoption and usage intentions toward a wider variety of mobile payments across different geographies. Second, we targeted young adults, which may have limited our findings, as our study reflected the opinion of potential users who were technology-oriented. Hence, we have recognized a need for future studies to focus on potential users from diverse age groups. Finally, we based our study on cross-sectional data, which suffers from self-reporting bias. Thus, we have suggested that future research be longitudinal.

In addition to studying a wide variety of products, geographies, and potential user groups within longitudinal study design, we have also suggested that future researchers should build upon our results in two ways. First, we have suggested that they study the pre-adoption behavior of potential users of m-wallets and other forms of mobile payments using consumer behavior theories, such as consumption value

theory (Sheth et al., 1991). Second, we have suggested that they study post-adoption behavior using IS theories, such as the IT continuance model (Bhattacherjee, 2001).

Acknowledgements

We acknowledge the support received from the Academy of Finland (Decision No 292448, 326066, 334595). The last author is supported by the Research Center at the College of Business Administration and the Deanship of Scientific Research at King Saud University.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jretconser.2020.102091.

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