



Article

Can I Trust My Phone to Replace My Wallet? The Determinants of E-Wallet Adoption in North Cyprus

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Abstract: E-wallets and mobile payment systems provide fast, secure, and convenient payment in transactions services while minimizing the need for human interaction. However, the adoption of the technology has had varying levels of success. Using a sample of 300 respondents, the study randomly assigned participants into three conditions and provided different information on how they would be reimbursed by their bank in case of fraud. In the three conditions, this study analyzed how prior consumer knowledge about e-wallet technology along with perceived usefulness, perceived ease of use, and trust may be related to the attitudes on the use of e-wallets, which subsequently relates to the intentions to use this technology. The findings suggest that consumer knowledge about e-wallet technology relates to perceived usefulness, perceived ease of use, and trust, which are known to influence attitude and behavioral intention to adopt and use new technologies such as the e-wallet. In addition, the results displayed that those respondents who were assured of immediate reimbursement in case of fraud may have higher intention to adopt e-wallets when compared to those who were informed of delayed reimbursement or those given no information. While the ANOVA results provided tentative support for the hypothesis that assurance of reimbursement will improve the intention to use e-wallet, the subsequent ANCOVA findings demonstrate that when prior consumer knowledge is taken into consideration and groups are compared with this factor in the equation, the group differences disappear.

Keywords: technology acceptance model; e-wallet; mobile payment



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1. Introduction

Mobile payments and digital finance are turning billions of people's smartphones into financial instruments and giving them more control. Moreover, this process can facilitate progress toward global sustainable development according to the report of the UN Task Force on Digital Financing of the Sustainable Development Goals (SDGs) [1]. The rapid increase in the use of mobile phones and our growing use of internet-connected technologies in our daily life have had an impact on consumer financial transactions and have led to the development of cashless electronic payment systems. Research conducted by Pew, a US-based think tank exploring social issues and public opinion, reports that there is an increasing trend in the use of e-wallet technology, however, the research report also argues that there are some hurdles that limit the consumer adoption of mobile payments compared to the adoption of credit and debit cards [2]. The Pew Report states that 30 percent of consumers in the US reported their concerns of possible loss of funds and feared "poor protection" compared to credit and debit cards, and 15 percent reported actual issues they experienced with the use of mobile payments [2]. Thus, despite the increasing trend in adoption worldwide and the introduction of mobile payment systems such as e-wallets in many countries, the acceptance of this new technology is still far from reaching its potential levels [3].

E-wallets and the associated mobile payment systems are important innovations enabling fast and secure payment in transactions while minimizing the need for human

interaction. Especially during the COVID pandemic, contactless payment methods gained more attention. Consequently, a number of studies have been carried out in an effort to explain antecedents of consumer adoption of e-wallet technology using technology acceptance models (TAM). For example, Triverdi [4] explored effects of perceived trust, subjective norms, and self-efficacy together with perceived usefulness and perceived ease of use on behavioral intention to use e-wallets. Liébana-Cabanillas et al. [5] investigated the moderating effect of age and the influence of ease of use, attitude, usefulness, risk, and trust on e-wallet adoption. Most studies investigated the effects of perceived usefulness and ease of use which are two of the main constructs of TAM. However, there has not been sufficient research to understand the effects that consumer knowledge of the technology, levels of trust, and the possible role that assurances from financial institutions may have on the adoption of this technology. Because these are all issues that banks can directly influence to increase e-wallet technology adoption, understanding their role is critical. This study intends to take into account these aspects in addition to the perceived usefulness and convenience of use on the attitudes and intentions to use the e-wallets in order to fill this critical gap.

This paper includes a survey where respondents were randomly assigned to three groups. A control group was formed which was not offered any assurances from their financial institution for reimbursement in the case of problems with their payment. In the other two groups, one group was assured that their financial institution would immediately cover any damages they might incur due to any unauthorized use of their e-wallet and the other group was informed that their financial institution would cover any damages after reviewing the case within five working days.

The proposed research questions are:

- (1) What are the factors influencing customer intentions to adopt the e-wallet in general?
- (2) How does the knowledge that there will be guaranteed reimbursement in case of fraud/unauthorized use influence consumer adoption intentions?
- (3) How does the time frame of the guaranteed reimbursement in case of unauthorized use influence consumer adoption intentions?

The rest of the article includes a brief review of literature on e-wallets and use of technology in banking together with literature on TAM. Hypotheses are developed based on the literature review and existing theories. The methodology section includes information on sampling methods, the context of the study, and sampling characteristics. Measures used to analyze items of each construct are also identified in this section. Results of the study are presented in Section 5, followed by the discussion section. The discussion section includes ideas on the meanings of findings. The implications and limitations section contains views on theoretical and practical implications of findings and the limitations of the study together with recommendations on future possible research. The conclusion section summarizes the aim and findings of the article.

2. Literature Review

2.1. E-Wallet

Banking system and financial services, in general, depend heavily on trust. Secure financial clearing and fund transfer payment systems adopted by banks and other financial institutions form the main infrastructure of business transactions and thus economic growth. A productive and well-qualified clearing system is necessary for the success of banking services. Recent technological changes and the introduction of online banking applications has compelled banks to explore, develop, and invest more in such digital platforms. Online banking altered the nature of business of producing banking services from payments to distribution and marketing. Especially in newly developing regions of the world where individuals have limited access to financial services, electronic payment systems reached via smartphones have increased the rate of transactions on these platforms [6].

The e-wallet enables individuals to execute transactions with mobile applications instead of physical transactions. In e-wallet technology, a mobile application is used to

complete a financial payment transaction to convey funds from one party to another with or without an intermediary party [7]. Short message services (SMS) and near field communications (NFC) systems are the two main technologies used for mobile payment [8]. In short message services, technology consumers can pay for digital or online purchases with the use of short message service or mobile internet connection as they do in e-commerce [3]. NFC systems are usually employed for ticketing, vending, and point-of-sale item purchases. Buyers use a QR code with the use of their mobile payment application and hold up their phones for reading by the seller's NFC terminal or Bluetooth device [3]. Businesses use electronic wallets as point-of-sale (POS) terminals once credit cards of customers are connected to their smart phones. Customers can use e-wallets as payment platforms through downloaded mobile applications [7,9]. Here, bank's mobile applications or private financial institutions' applications act as intermediate providers of connection services in transactions between the buyer and the seller.

With the increased use of mobile phones and applications, banks and sellers face newer and easier access opportunities to markets where they can improve services, market their brands and increase revenues at a larger scale with faster transactions and lower costs [5,7]. In addition, consumers have safer transactions with the help of encrypted mobile phone applications with increased protection and reduced application time [5].

2.2. Technology Acceptance Model

The technology acceptance model (TAM) is regarded as an important theory helping us to understand the factors that influence how consumers adopt information systems [10]. TAM proposes that perceived ease of use and perceived usefulness are the main factors determining the intention to use technology [11]. TAM has been developed on the basis of the theory of reasoned action (TRA). According to this theory, objectives and attitudes of people shape their behaviors. Inspired by this theory, Davis [12] stated that perceived usefulness and perceived ease of use influence individuals' attitudes and intentions toward using technological services. After initial implementation of TAM, Davis extended his model by proposing that the use of technology is a result of "user motivation" which is affected by an "external stimulus" originating from the system's characteristics [13]. In 1989, Davis used the technology acceptance model in a study among 104 MBA students on a computer word processing application [14,15]. A theoretical extension of the technology acceptance model (TAM) was introduced in 2000 by Venkatesh and Davis by including social influence and cognitive instrumental processes into the framework [16]. The extension of the model was called TAM2. Recent studies of Venkatesh et al. [17] evolved into a different extension model called the unified theory of acceptance and technology (UTAUT), combining previous models on consumer acceptance of technology. According to the UTAUT model, performance expectancy, effort expectancy, social influence, and facilitating conditions influence the diffusion of technology [18]. In 2008 Venkatesh and Bala [19] proposed a new modified model called TAM3 by combining the TAM2 of Venkatesh and Davis [16] with determinants of perceived ease of use [19].

The technology acceptance model has been used in a large number of studies to understand the adoption of a variety of technological information systems. Although TAM has been modified numerous times with new extensions, the core model remained the same. Technology acceptance model's explanatory power and effectiveness in generalizability to different settings in technology adoption has made it a preferred theoretical framework to use in research [20–23]. With regard to commercial mobile technologies TAM stands as the most widely employed model in prior literature [5,24].

Although there have been other models that have added more predictors to the original TAM such as the TAM2, UTAUT, TAM3, application of the theory of planned behavior to TAM (TBP-TAM), or models that have taken different perspectives on the use of new technology such as the diffusion of innovation theory (DOI), task force fit technology (TTF), and enterprise content management (ECM), the current study takes the basic two predictor variables of PU and PEOU from TAM and extends it by merely adding trust and customer

knowledge. This maintains the constructs assessed and included as predictors in the model at the most basic level feasible, resulting in a more parsimonious model. In model choice, the parsimony principle states that simpler or more compact models with fewer parameters should be preferred over more complex models. A parsimonious model is less likely to over fit the dataset.

This study used the core predictors in the technology acceptance model and extends it with the addition of consumer knowledge and trust. In addition to parsimony, the extended core model is preferred over other theories and models by taking into account the context and purpose of the current study and some of the criticisms of the other models. For example, the theory of planned behavior (TPB) has been applied in a very wide variety of settings, however, the TPB assumes that behavior is based on a cognitive evaluation of the benefits and costs. Thus, it belongs to the group of rational choice models [25]. However, the current study considered trust to be an important factor. The diffusion of innovation (DOI) theory was not preferred. DOI argues that there is a progressive and gradual diffusion process within communities and systems of users for new technologies. The communication channels and knowledge influence this process. The DOI theory is more suitable for firm or community levels rather than the individual level analysis, as it takes complex societal factors into consideration [25]. TAM2, TAM3, and UTAUT, on the other hand, base their assumptions on the voluntary use environment, believing that individuals have an option in deciding to use the new technology. However, in certain cases, the use of the new technology is mandatory or inevitable [25]. In addition, UTAUT and UTAUT2 have been criticized for result bias across cultures [26] and do not have individual factors that may help understand individual system acceptance [25]. The current study is based on the North Cyprus context with a specific traditional culture where information and trust are significant. Thus, the core TAM model with extensions of consumer knowledge and trust was used instead of UTAUT.

In task-force fit technology (TTF) theory, different settings lead to different specific task characteristics and technology characteristics [27]. The current study used TAM as a more widespread model suitable for general environments instead of TTF. The enterprise content management (ECM) concept lacks a well-defined framework and when implemented produces varying results in terms of objectives, processes, and technologies [28]. Thus, the extended technology acceptance model, with two new constructs, is selected as a well-defined model instead of the ECM concept as the main model for this study.

According to TAM, “external variables”, such as familiarity and prior knowledge about the benefits of a new technology, certain incentives, and/or social influence, affect the acceptance and use of technology through people’s confidence and views. In this model, external variables affect people’s perceived ease of use and perceived usefulness in such a way that using technology is expected to produce better outcomes with little effort [12]. In the current study, consumer knowledge on e-wallets, such as how easy it is to adopt this technology and/or the level of security provided by using e-wallets, is considered as an external variable which has an effect on perceived ease of use, perceived usefulness, trust, and attitude towards the new technology and ultimate intention to use the application. For example, according to a study carried out on the adaptation of new technologies, consumer knowledge management about the security and effectiveness of the technology used plays a significant role in consumers’ intention to adopt electronic vehicles [29].

3. Hypothesis Development

3.1. Role of Consumer Knowledge (CK)

Our behavior is influenced by our prior knowledge about the advantages of using a new technology or product especially when we are choosing between alternatives [29,30]. Information about a new product can depend on objective or subjective knowledge. While objective knowledge depends on accurate information, subjective knowledge includes an individual’s rate of comprehension of the product [29,31]. For example, it has been shown that customer knowledge positively influences the intention to use electronic vehicles [32].

Positive ideas of consumers on the environmentally friendly aspects of electronic vehicles result in a positive role in their willingness to adopt this new auto-technology [29]. Similarly, the behavioral intention to adopt and use e-wallets is expected to be related to customer's familiarity on the advantages of carrying out their financial transactions with e-wallets. Koeing-Lewis et al. [33] demonstrated that facilitating conditions such as "m-payment knowledge" has a significant influence on intention and actual usage. Adoption rates are anticipated to rise with greater awareness of how simple e-wallets are to use and familiarity with the advantages and security they offer. Customers, for instance, are anticipated to have more trust in the application if they are given the assurance that their personal information is encrypted and will not be lost. Thus, with the understanding that consumer awareness of e-wallets affects perceived usefulness, ease of use, and intention to adopt this new technology, the degree of consumers' subjective knowledge of e-wallets and its effect on the intention to use e-wallets will be investigated in this study.

Hypothesis 1 (H1). *Consumer knowledge on e-wallets positively relates to perceived usefulness.*

Hypothesis 2 (H2). *Consumer knowledge on e-wallets positively relates to perceived ease of use.*

Hypothesis 3 (H3). *Consumer knowledge on e-wallets positively relates to trust.*

3.2. Perceived Usefulness (PU)

Perceived usefulness (PU) is our understanding that using specific technology will improve our lives [12]. In this study, the PU refers to a person's understanding of the advantage that can be gained by adopting the new payment technologies. TAM suggests that PU is an influential factor affecting acceptance of technology, leading people to believe that the use of technology will improve their productivity [12]. Several studies proposed that perceived usefulness directly and positively affects attitude and behavioral intention to use a new technology [34–37]. A study on e-wallet use stated that perceived usefulness has a positive influence on attitude and intention to use e-wallets [38,39]. When new technological products are in question, our attitude toward the new technology influences our acceptance of the new technology [29,30]. Therefore, perceived usefulness of the e-wallet technology is expected to have a positive relationship with the attitude toward e-wallet use.

Hypothesis 4 (H4). *Perceived usefulness positively relates to attitude towards using e-wallets.*

3.3. Perceived Ease of Use (PEOU)

Perceived ease of use (PEOU) is our perception that we can use a new technology with minimal effort [12]. Davis [12] argues that an "easy to use" application will usually be selected over others. TAM places PEOU as a construct that enables the use of new technological systems. Dahlberg et al. [40] claims that PEOU is the most important and extensively employed antecedent in the assessment of the adoption of mobile payments. Prior research has indicated that perceived ease of use has a positive role in using mobile payment technology [35,41–45]. In addition, several studies have displayed the influence of perceived ease of use on the user attitude toward mobile payment, especially in the context of China's mobile payment adoption, where e-wallets are extensively used [35,44,45]. Thus, we expect PEOU to have a positive relationship with the attitude to use e-wallets:

Hypothesis 5 (H5). *Perceived ease of use positively relates to attitude towards using e-wallets.*

According to a study on consumer acceptance of online banking by Pikkarainen et al. [23], although perceived ease of use has a positive impact on intention to use technology, it was reported that when compared with perceived usefulness its role is weaker. Perhaps PEOU affects the intention to use technology through its role in enhancing PU rather than influencing intention directly. Barry and Jan [46] concluded that PEOU has a

significant and positive effect on perceived usefulness and on behavioral intention to use a particular system. Al-Marroof and Al-Emran [47] applied this argument to the adoption of web-based learning technologies, and demonstrated that when people perceive the technology as simple to use (i.e., PEOU), they become more convinced that the technology will be more useful for them (i.e., PU) and subsequently they have higher intention to use it (i.e. BI) [39]. Therefore, we expect PEUO to also have an indirect effect on attitude and behavioral intention through perceived usefulness.

Hypothesis 6 (H6). *Perceived ease of use has an indirect positive relationship with attitude and behavioral intention to use e-wallets through perceived usefulness.*

3.4. Trust (TRU)

In the banking industry, customer relationships are largely based on trust. Especially after the financial crisis of 2008, trust acts as a catalyzing agent in establishing a relationship with consumers who need to believe that their transactions and savings are safe in their respected institutions [48]. Trust develops as transaction parties mutually agree of each other's reliability [49]. In a study on the acceptance of online banking in Saudi Arabia, Al-Somali, Gholami and Clegg [18] showed that trust, PU, PEOU, and other variables explain 85% of the variance in attitude towards online banking. In prior studies, trust is also shown as a construct that affects attitude in online transactions [21,50–52]. In the adaptation of electronic payment systems such as the e-wallet, where perceived risks are more prominent, trust plays a significant role in continuation of relationships with customers. According to Shin [53], trust is an important element in e-wallet acceptance where consumers are concerned with the possibility of fraud [38]. Therefore, trust is expected to have a positive relationship with attitude to use e-wallets and also behavioral intention to use e-wallets through attitude.

Hypothesis 7 (H7). *Trust positively relates to attitude towards using e-wallets.*

3.5. Attitude to Use E-Wallet (ATT)

Whether a person views using new technology favorably or unfavorably determines their attitude toward it. [54]. Davis [12] proposed in TAM that behavioral intention is determined by attitude toward a new technology [38]. Similar to the technology acceptance model of Davis [12], Ajzen [55]'s theory of planned behavior also considers attitude as a significant element which affects consumers' behavioral intentions [35]. Prior research on technology adoption established that attitude is an important antecedent influencing the intention to continuous use [56–59]. Other studies also consider attitude as a prevalent construct that influences adopting mobile payment technologies [5,35,58]. In addition, Schierz, Schilke, and Wirtz [60] and Wulandari [61] also backed up the hypothesis that attitude affects behavioral intentions in the mobile payment systems context [62]. Similarly, a study conducted by Upadhyay et al. [62] on meta-UTAUT technology adoption model revealed that attitude has emerged as the most powerful construct affecting intentions of consumers to use mobile payment services. Therefore, considering prior research we propose that:

Hypothesis 8 (H8). *Attitude positively relates to behavioral intention to use e-wallets.*

3.6. Behavioral Intention to Use E-Wallet (BI)

Behavioral intention to use e-wallet is an individual's decision to try to use the new technology and is the dependent variable in the conceptual model presented in Figure 1.

3.7. Reimbursement Condition

Although the e-wallet is an advantageous way of completing transactions, the adoption rate is contrary to expectations [59,63]. Discounts, awards, and cashback incentives

are offered as marketing tactics to entice customers. Reimbursement assurances have a significant role in influencing consumer confidence when determining whether or not to use mobile payment systems.

Hypothesis 9 (H9). *Reimbursement condition will relate to behavioral intention to use e-wallets.*

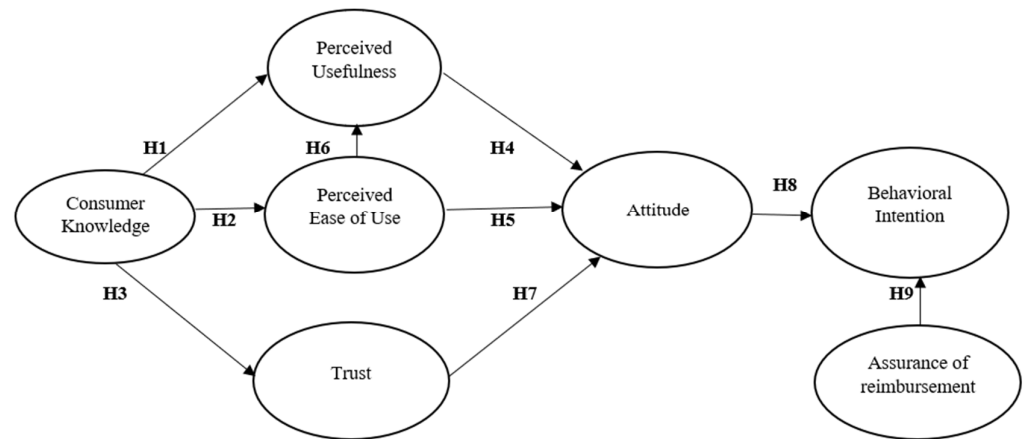


Figure 1. The conceptual model.

4. Methodology

4.1. Sample

The quota sampling method was used and residents over the age of 18 living in Northern Cyprus were targeted in online and offline questionnaires. The sample preserves the ratios of age and gender distribution in the population data from the TRNC Statistical Institute Statistical Yearbook 2019.

Although e-wallet use is a new method of effortless and secure transaction, it has not yet acquired intended usage rates around the world. According to Khalilzadeh, Ozturk, and Bilgihan [63], regardless of the convenience e-wallet payment systems provide, the adoption rate is not as high as expected. Therefore, it is apparent that factors stimulating consumers to prefer e-wallet usage should be examined more thoroughly. For this purpose, an online survey was used to gather data from a representative sample of adults over the age of 18 from Northern Cyprus. Three groups were formed, where respondents in Group 1 ($n = 110$) were informed that any loss they may incur due to misuse in the system would be reimbursed immediately. Participants ($n = 102$) in Group 2 were informed that their loss would be reimbursed in a period of 5 days in case of misuse. Participants in Group 3 ($n = 88$) served as the control group, where subjects were provided no information on reimbursement. The total number of respondents was 300.

Data were collected from adults residing all over Northern Cyprus. The majority of the respondents were young or middle-aged professionals working in government or private institutions. The questionnaires were formed by modifying existing questionnaires used in prior studies and included a total of 29 questions. The questionnaires were translated into Turkish. Seven of the questions were presented to obtain descriptive information and knowledge on respondents' previous online activities. The indicator questions used in questionnaires with their sources are presented in detail in Table 1. A pilot study was performed in order to obtain feedback from respondents. The initial pilot group consisted of 16 adults whose ages ranged from 18 to 54. The sample included 6 males and 10 females with secondary, bachelors, and graduate education levels. The pilot study provided feedback about the questions' clarity and measured reliability. The questionnaires were corrected accordingly.

The data was analyzed by using SPSS and SmartPLS software programs and with partial least squares structural equation modelling (PLS-SEM). PLS-SEM uses ordinary least squares regressions together with principal components analysis. This method is

called a “variance-based” method since it explains total variance and employs this to predict parameters [64,65]. PLS-SEM is preferred when established theories with new extensions are analyzed in exploratory based-research [47,64]. In addition, PLS-SEM is widely employed for small samples for models with a large number of constructs [64]. Uphadyay et al. [62] employed PLS-SEM conducted with SmartPLS3.3.2 software in a similar study on mobile payment system use during the COVID-19 pandemic period. The authors stated that the PLS-SEM method enabled the analysis of a complicated model regardless of the sample size. Similarly, Shin and Lee [53] employed the same PLS-SEM method to explore factors affecting user acceptance for NFC mobile wallets in the United States and Korea. The researchers suggested that PLS-SEM provides answers to related questions and enables researchers to work with small samples on “advanced” model elements. Since this study is exploring the effect of a new construct on TAM with a small sample, PLS-SEM was selected as a method of analysis.

4.2. Measures

This study included six constructs, namely, consumer knowledge on e-wallets (CK), perceived usefulness (PU), perceived ease of use (PEOU), trust (TRU), attitude (ATT), and behavioral intention to use the e-wallet (BI). A total of 22 items adopted from existing literature were used to measure the six constructs. The three-item CK scale was adopted from Huang et al. [29], the five-item PU scale from Davis [12] and Triverdi [4], the four-item PEOU scale from Davis [12] and Venkatesh and Bala [19], the four-item TRU scale from Laurant and Lin [21] and Parasuraman, Zeithaml, and Malhotra [66], the three-item ATT scale from Shih and Fang [67], and the three-item BI scale from Taylor and Todd [68], Lin, Shih, and Sher [69], and Nor and Pearson [70]. Table 1 provides the indicators used in the study and the original sentences and sources they are derived from. All constructs were measured on five-point Likert scales, with response options ranging from “Strongly Disagree (1)” to “Strongly Agree (5)”.

Table 1. Adopted indicators and original sentences used in conceptual model.

No	Adopted Indicators	Original Sentence	References
1	I know that to use the e-wallet is a good way to complete transactions	I know the technological advantages of EVs over gasoline vehicles	Huang et al. [29] (2021)
2	I know how to use e-wallet applications	I know the integration of EVs and ICT to enhance assisted driving	
3	I know that using the e-wallet is a faster route to complete transactions	I know the technological performance (such as charging time, acceleration, driving comfort and driving range) of EVs	
4	Using e-wallet services saves my time	Electronic mail enables me to accomplish tasks more quickly	Davis [12] (1989), Triverdi [4] (2016)
5	The e-wallet has improved quality of my job performance	Using electronic mail improves my job performance	
6	Using the e-wallet helps me buy easily	Using electronic mail makes it easier to do my job	
7	E-wallet services have improved my productivity	Using electronic mail increases my productivity	Davis [12] (1989), Venkatesh and Bala [19] (2008)
8	E-wallet services increase my effectiveness	Using electronic mail enhances my effectiveness on the job	
9	Interaction with the e-wallet is clear and understandable	My interaction with the system is clear and understandable	
10	Interaction with the e-wallet does not require mental effort	Interaction with the system does not require a lot of my mental effort	

Table 1. *Cont.*

No	Adopted Indicators	Original Sentence	References
11	I think it is easy to get the e-wallet to do what I want to do	I find it easy to get the system do what I want it to do	
12	In general, the e-wallet is easy to use	I find the system to be easy to use	
13	The probability of misuse of transaction information in e-wallets is very low	It protects information about my web-shopping behaviour	Parasuraman, Zeithaml & Malhotra [66] (2005)
14	The probability of misuse of personal information in e-wallets is very low	It does not share my personal information with other sites.	
15	I am worried about connecting my bank/credit card to the e-wallet application	This site protects information about my credit card	
16	I feel safe while using e-wallet	This site compensates me for problems it creates	
17	I like to use the e-wallet	I like to use internet banking	Shih and Fang [67] (2004)
18	I think using the e-wallet is interesting	Using internet banking is an exciting idea	Nor and Pearson [70] (2008)
19	It is desirable for me to learn to use the e-wallet	Using internet banking is an appealing idea	
20	I am willing to keep using the digital wallet in the future	I intend to use internet banking in the future	Taylor and Todd [68] (1995), Lin, Shih, and Sher [69] (2007), Nor and Pearson [70] (2008)
21	I intend to use a digital wallet on a daily basis	Given the chance, I predict I will use internet banking in the future.	
22	I plan to keep using the digital wallet regularly	It is likely that I will use internet banking in the future.	

5. Results

5.1. Data Analysis and Results

Questionnaires were collected from respondents whose ages ranged from 20 to 65. Table 2 provides information on respondents' profiles.

Table 2. Respondents' profile.

Measures	Items	Frequency	Percentage
Gender	Male	147	49.0
	Female	153	51.0
Age	20–40 years	122	40.7
	40–60 years	133	44.3
	60–75+ years	45	15.0
Education Level	Primary school	2	0.7
	Secondary school	38	12.7
	Associate degree	24	8.0
	Bachelor's degree	132	44.0
	Master's degree	104	34.6
	Doctorate		
How often do you use your internet bank account?	I don't have an internet bank account	49	16.3
	Less than once a week	37	12.3
	Once a week	61	20.3
	Every day	120	40.0
	Several times a day	33	11.0

Table 2. *Cont.*

Measures	Items	Frequency	Percentage
Do you shop online?	Never	31	10.3
	Occasionally	53	17.7
	Sometimes	97	32.3
	Often	92	30.7
	Very often	27	9.0
Do you make payments online?	Never	22	7.3
	Rarely	42	14.0
	Sometimes	73	24.3
	Often	68	22.7
	Regularly	95	31.7
Do you have an e-wallet? If so, how often do you use it?	Never	132	44.0
	Rarely	39	13.0
	Sometimes	54	18.0
	Often	46	15.3
	Regularly	29	9.7

5.2. Measurement Model

Item loadings of latent variables were examined in the measurement model together with reliability. Indicator loadings of each item display how much change is provided by the related construct. Prior research indicates that the acceptable loading level is 0.708 for convergent validity of each construct [71]. Table 3 shows the item loadings of each item together with the values of composite reliability (CR), average variance extracted (AVE), Cronbach's alpha VIF values, and R-square values for each construct.

Table 3. Item loadings, CR, AVE, Cronbach's alpha, variance inflation figures (VIF) and R-square values.

Constructs	Indicators	Loadings	CR	AVE	Cronbach's Alpha	VIF	R ²
Consumer Knowledge	CK1: I know that to use the e-wallet is a good way to complete transactions	0.875	0.867	0.686	0.770	1.835	0.545
	CK2: I know how to use e-wallet applications	0.796				1.512	
	CK3: I know that using an e-wallet is a faster route to complete transactions	0.812				1.547	
Perceived Usefulness	PU1: I believe that using e-wallet services will save my time	0.779	0.915	0.682	0.884	2.623	0.691
	PU2: I think that e-wallet will improve the quality of my job performance	0.833				2.338	
	PU3: The e-wallet will help me buy easily	0.843				2.848	
	PU4: E-wallet services will improve my productivity	0.820				2.429	
	PU5: E-wallet services will increase my effectiveness	0.853					
Perceived Ease of Use	PEOU1: Interaction with e-wallets will be clear and understandable	0.819	0.904	0.702	0.859	1.946	0.584
	PEOU2: Interaction with e-wallets will not require mental effort.	0.869				1.919	
	PEOU3: I think it will be easy to get e-wallets to do what I want to do	0.832				2.273	
	PEOU4: In general, I believe that the e-wallet will be easy to use	0.831				1.902	
			0.921	0.745	0.886		0.496

Table 3. Cont.

Constructs	Indicators	Loadings	CR	AVE	Cronbach's Alpha	VIF	R ²
Trust	TRU1: The probability of misuse of transaction information in e-wallets is very low	0.858	0.908	0.766	0.848	3.201	0.347
	TRU2: The probability of misuse of personal information in e-wallets is very low	0.902				3.924	
	TRU3: I am worried about connecting my bank/credit card to the e-wallet application	0.820				1.917	
	TRU4: I will feel safe while using e-wallets	0.873				2.279	
Attitude	ATT1: I would like to use e-wallet	0.881	0.951	0.866	0.923	2.154	
	ATT2: I think using e-wallet will be interesting	0.924				2.865	
	ATT3: It is desirable for me to learn to use the e-wallet	0.818				1.880	
Behavioral Intention	BI1: I am willing to keep using e-wallets in the future	0.921				3.102	
	BI2: I intend to use an e-wallets on a daily basis	0.920				3.503	
	BI3: I plan to keep using e-wallets regularly	0.951				4.699	

The acceptable level for composite reliabilities is 0.70 [72]. All our items meet this threshold and as shown in Table 3 the Cronbach's alpha levels of coefficients are also above the recommended level of 0.7 [73]. The collinearity issue was tested by examining the variance inflation figures (VIF). Table 3 displays the VIF values for items. VIF values above 5 indicate that there exists a "collinearity problem", an ideal value is close to 3 or lower [71]. Items related with trust and behavioral intention have VIF values above 3 but not larger than 5.

In order to assess the model's exploratory power, R-square is tested. R-square which ranges from 0 to 1 is accepted to have higher explanatory power as the value increases. According to Hair et al. [71], 0.75 R-square value indicates a substantial, 0.5 value a moderate, and 0.25 value a weak explanatory power. Table 3 displays R-square values of the model which range from 0.49 to 0.69 indicating moderate power.

The average variance extracted (AVE) is the rate of variance constructs acquired from their indicators compared to the variance due to measurement error. AVE values are also provided in Table 3. The recommended minimum level is 0.50 [74] and is met by all.

Table 4 displays the results of the model according to the Fornell–Larcker criterion. In addition, Table 5 provides findings according to the heterotrait–monotrait (HTMT) criterion, which are all below 0.90 except behavioral intention.

Table 4. Fornell–Larcker criterion.

		1	2	3	4	5	6
1	Attitude	0.875					
2	Behavioral intention	0.831	0.931				
3	Consumer knowledge	0.650	0.649	0.828			
4	Perceived ease of use	0.646	0.693	0.686	0.838		
5	Perceived usefulness	0.666	0.682	0.704	0.722	0.826	
6	Trust	0.614	0.680	0.589	0.634	0.566	0.864

Notes: The square root of AVE are presented in the diagonal and correlation values are below the diagonal.

The Fornell–Larcker test was performed to measure discriminant validity. According to Fornell–Larcker [74], the square root of average variance extracted shows discriminant validity when the end value is greater than correlation values among the latent variables. In Table 4, the average value extracted results are on the diagonal and shown in bold and correlations among latent variables are below the diagonal. All AVE values are larger than

the correlation values in their respective rows. Thus, the Fornell–Larcker test results show that discriminant validity is established.

Table 5. Heterotrait–monotrait Ratio (HTMT).

		1	2	3	4	5	6
1	Attitude						
2	Behavioral intention	0.934					
3	Consumer knowledge	0.792	0.767				
4	Perceived ease of use	0.745	0.778	0.843			
5	Perceived usefulness	0.758	0.751	0.842	0.819		
6	Trust	0.686	0.746	0.709	0.720	0.635	

The heterotrait–monotrait ratio (HTMT) shows the mean value of item correlations relative to the geometric mean of the average correlations measuring the same construct [71]. The threshold value for HTMT Ratio is 0.9. Table 5 shows that the ratio of behavioral intention and attitude is 0.934 indicating that there exists no discriminant validity between these two constructs.

5.3. The Summary of the Relationships

PLS analysis is performed with bootstrapping, in order to test hypotheses. The summary of the relationships is presented in Figure 2 and Table 6.

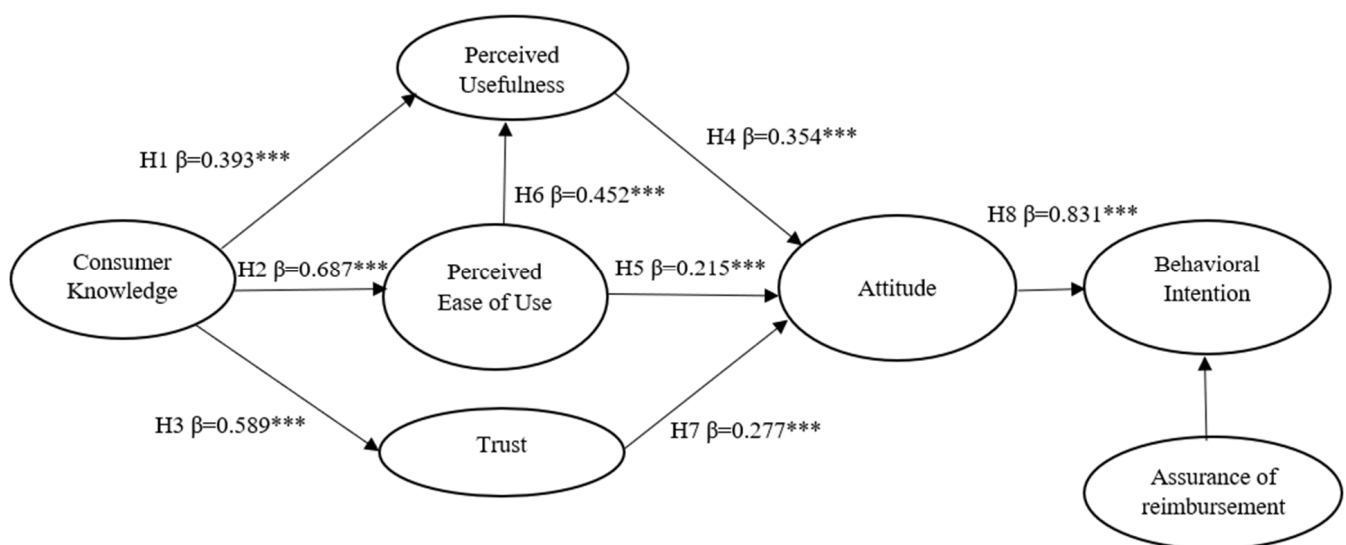


Figure 2. Results of the proposed model. Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; ns = non-significant.

Table 6. The summary of the relationships.

Hypotheses Relationships	Beta	Significance	Effect Size (f^2)	Decision
CK -> PU	0.393	0.000	0.985	Supported
CK -> PEOU	0.687	0.000	0.151	Supported
CK -> TRU	0.589	0.000	0.530	Supported
PU -> ATT	0.354	0.000	0.126	Supported
PEOU -> PU	0.452	0.000	0.271	Supported
PEOU -> ATT	0.216	0.001	0.041	Supported
TRU -> ATT	0.277	0.000	0.097	Supported
ATT -> BI	0.831	0.000	2.233	Supported

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; ns = non-significant.

When the effect size f^2 is examined, it is apparent that all of the constructs have values within the accepted ranges, which are 0.02 as small, 0.15 medium, and 0.35 large [64].

Hypothesis 1 proposes that consumer knowledge on e-wallets is positively related to perceived usefulness. The results support Hypothesis 1 and indicate that consumer knowledge predicts perceived usefulness in a significant and positive way since the path coefficient is $\beta = 0.393$ and $p < 0.001$. Hypothesis 2 states that consumer knowledge on e-wallets is positively related with perceived ease of use. Results show that consumer knowledge on e-wallet predicts perceived ease of use positively and significantly ($\beta = 0.687$ and $p < 0.001$) and hence support Hypothesis 2. Hypothesis 3 proposes that consumer knowledge on e-wallets is positively related with trust. Measures support Hypothesis 3 and indicate that consumer knowledge has a positive and significant relationship with trust since $\beta = 0.589$ and $p < 0.001$. Hypothesis 4 proposes that perceived usefulness is positively related with attitude towards e-wallets. The fourth hypothesis is also confirmed by the study where the path coefficient results as $\beta = 0.354$ and the p -value is significant ($p < 0.001$). Results also indicate that perceived ease of use has a positive relationship with attitude ($\beta = 0.215$). This positive effect is also significant ($p < 0.001$) indicating that perceived ease of use is related with attitude parallel to what is proposed in Hypothesis 5.

It is also apparent from results that Hypothesis 6 is also confirmed since perceived ease of use has a direct positive relationship with perceived usefulness ($\beta = 0.452$, $p < 0.001$) and an indirect relationship with attitude and behavioral intention. When indirect effects are analyzed, results show that perceived ease of use has a special indirect effect on attitude and behavioral intention through perceived usefulness (PEOU \rightarrow PU \rightarrow ATT \rightarrow BI = 0.133). Hypothesis 7 proposes that trust has a positive relationship with attitude to use e-wallets, which is confirmed by a positive path coefficient of $\beta = 0.277$ with significance $p < 0.001$. Results also suggest that attitude has a positive relationship with behavioral intention to use e-wallets, as stated in Hypothesis 8, since the coefficient is $\beta = 0.831$ and significance is $p < 0.001$. Figure 2 displays the results of the proposed model.

5.4. Results of the Survey Experiment

A survey experiment analyzing preferences of e-wallet usage was employed in an effort to measure how different information provided to users on e-wallet properties influences the intention to use this new payment system. For this purpose, three groups are formed while gathering data. Participants in Group 1 (the immediate reimbursement group) were provided with the information that their probable losses in case of a fraud would be reimbursed immediately. Respondents in Group 2 (reimbursement in 5 days group) were told that their losses would be reimbursed in 5 working days in case of a fraud. Participants in Group 3 (no information provided group), the control group, were provided with no such information.

In a total of 300 questionnaires, the information of different groups was distributed randomly with the use of an online data-gathering system. A total of 110 respondents answered to the questionnaires of Group 1, 102 participants took place in Group 2, and 88 respondents were in Group 3.

Table 7 displays the means of six latent variables by three groups with different knowledge on reimbursement periods.

Table 7. Means for dependent variables for three different groups.

Type	Reimbursement Period	Consumer Knowledge	Perceived Usefulness	Perceived Ease of Use	Trust	Attitude	Behavioral Intention
Group 1	Immediate	4.1182	3.9636	3.9977	3.6841	4.1455	4.0303
Group 2	5 days	3.9020	3.7608	3.9044	3.4436	3.9444	3.7451
Control 3	No information	3.9729	3.8943	3.9375	3.5313	4.0341	3.8333

Respondents in Group 1 who were given the information that their losses would be reimbursed immediately in case of a fraud had the highest mean in all variables. In other words, people in Group 1 have the highest trust in, attitude towards, and intention to use e-wallets. Respondents in Group 2 who had the information that their losses would

be covered in five days had the lowest intention, while the control group participants' (Group 3) intentions resulted higher than Group 2 respondents.

A one-way ANOVA test was employed to measure whether respondents who were offered information on immediate reimbursement in case of a fraud and those who were given no information had a significant difference in intention to adopt e-wallets. The result of ANOVA showed that there was a significant effect of immediate reimbursement information on the intention to adopt e-wallets $F(1300) = 3.474, p < 0.05$. Respondents who were provided with immediate reimbursement information had a significantly higher intention to adopt an e-wallet ($M = 4.0303, SD = 0.73578$) than those who were not offered any information ($M = 3.8333, SD = 0.82428$) or than those who were offered information of reimbursement in five days ($M = 3.7451, SD = 0.86387$). The results of ANOVA confirmed the proposition of Hypothesis 9, which claimed that guaranteed immediate reimbursement is related to the intention to use e-wallets.

Analysis of covariance (ANCOVA test) was also conducted in order to explore how consumer knowledge (covariate) affects different groups and lead to different reactions on intention. Table 8 summarizes mean scores and standard deviations for behavioral intention in each of the three experimental conditions, and Table 9 reports the ANCOVA results. The results of the ANCOVA test indicate that consumer knowledge and behavioral intention were significantly related to each other. In other words, prior consumer knowledge significantly influences intention to adopt e-wallets [$F = 202.984, p < 0.001$]. However, in ANCOVA, when we take the role of prior knowledge into consideration and compare the groups, the group differences disappear. This indicates that when people acquire prior knowledge about the product, having incentives such as assurances on reimbursement in case of fraud or not having any kind of incentive do not play a significant role in intention to use the e-wallet.

Table 8. Descriptive statistics.

Group Type	Mean	St. Deviation	N
1 Immediate reimbursement	4.0303	0.73578	110
2 Reimbursement in 5 days	3.7451	0.86387	102
3 No knowledge	3.8333	0.82428	88
Total	3.8756	0.81380	300

* Dependent variable: Behavioral Intention.

Table 9. ANCOVA Results.

Target Variable	SS	df	MS	F	Sig
Behavioral intention					
Dependent variable (type)	1.045	2	0.523	1.345	0.262
Covariate (consumer knowledge)	78.915	1	78.915	202.984	0.000

The structural model was examined in order to explore the effect of different reimbursement-period information provided to respondents. Multi-group analysis with bootstrapping results for survey groups are presented in Table 10. The results indicated that consumer knowledge is positively significantly related with perceived usefulness in all groups ($\beta_1 = 0.311, p < 0.05$; $\beta_2 = 0.389, p < 0.05$; $\beta_3 = 0.504, p < 0.05$). Similarly, consumer knowledge is positively related to perceived ease of use and trust in all groups. While perceived usefulness positively relates to attitude in Group 1 ($\beta_1 = 0.412, p < 0.05$), this hypothesis is not supported for Group 2 ($\beta_2 = 0.243, p > 0.05$), and is supported in Group 3 ($\beta_3 = 0.403, p < 0.05$). These findings indicate that for Groups 1 and 3, to whom reimbursement guarantee is provided and no information was given (the control group), perceived usefulness influences attitude towards e-wallets. For Group 2, to whom information of 5-day reimbursement was provided, perceived usefulness has no effect. This may mean that respondents have no perception of usefulness when reimbursement is delayed.

Table 10. Hypothesis testing of groups.

	Group 1			Group 2			Group 3		
	Beta	Signif.	Result	Beta	Signif.	Result	Beta	Signif.	Result
CK -> PU	0.311	0.000	Supported	0.389	0.000	Supported	0.504	0.000	Supported
CK -> PEOU	0.658	0.000	Supported	0.759	0.000	Supported	0.627	0.000	Supported
CK -> TRU	0.586	0.000	Supported	0.630	0.000	Supported	0.546	0.000	Supported
PU -> ATT	0.412	0.000	Supported	0.243	0.099	Not Supported	0.403	0.000	Supported
PEOU -> PU	0.565	0.000	Supported	0.472	0.000	Supported	0.303	0.007	Supported
PEOU -> ATT	0.250	0.037	Supported	0.239	0.100	Not supported	0.160	0.131	Not supported
TRU -> ATT	0.113	0.281	Not supported	0.381	0.004	Supported	0.333	0.000	Supported
ATT -> BI	0.766	0.000	Supported	0.879	0.000	Supported	0.840	0.000	Supported

Although the effect of perceived ease of use on attitude is supported in Group 1 ($\beta_1 = 0.037$ $p < 0.05$), it is rejected according to the results of Group 2 ($\beta_2 = 0.100$ $p > 0.05$) and Group 3 ($\beta_3 = 0.160$ $p > 0.05$). These findings indicate that respondents who have been provided with guaranteed immediate reimbursement in case of fraud have perceived ease of use affecting attitude. On the other hand, the respondents with no guarantee of immediate reimbursement tend to have perceived ease of use with no significant effect on attitude. Lastly, the trust indicator for Group 1 ($\beta_1 = 0.113$ $p > 0.05$) does not influence attitude, contrary to expectations. Respondents with guaranteed reimbursement assurance were expected to have higher levels of trust and more influence of trust on attitude. This result may indicate that prior knowledge on guaranteed reimbursement may not have a direct effect on trust. The trust indicator for Groups 2 and 3 were significant and the effect of trust on attitude is supported for these groups, again contrary to expectations. All other hypotheses are supported.

6. Discussion

The present study investigated the determinants of e-wallet mobile system adoption with the use of extended TAM variables in Northern Cyprus. In addition, an online survey was used to determine the influence of reimbursement periods on adoption intentions. The proposed research questions were: (1) what are the factors influencing the customer intentions to adopt the e-wallet in general? (2) How does the knowledge that there will be guaranteed reimbursement in the case of fraud/unauthorized influence consumer adoption intentions? (3) How does the time frame of the guaranteed reimbursement in case of unauthorized use influence consumer adoption intentions?

For research question one, the results of the study confirmed that consumer knowledge, perceived usefulness, perceived ease of use, trust, and attitude have a significant and positive effect on behavioral intention to use e-wallets. Provision of information to consumers on the advantages and procedures of using e-wallets clearly influences attitude and intention to adopt this new transaction technology through the TAM model's well-established constructs. The results indicate that consumer knowledge predicts perceived usefulness in a significant and positive way since the path coefficient $\beta = 0.393$ and $p < 0.001$. The results of the study also show that consumer knowledge on e-wallets predict perceived ease of use positively and significantly ($\beta = 0.687$ and $p < 0.001$). In addition, the analysis indicates that consumer knowledge positively and significantly affects trust, since $\beta = 0.589$ and $p < 0.001$. This is parallel to the findings of Huang et al. [29] where it was confirmed that consumer knowledge management about the security and effectiveness of the technology used plays a significant role in consumers' intention to adopt electronic vehicles [29]. The findings of this study fill a gap in previous research on mobile payment systems by analyzing the impact of providing knowledge to consumers.

As stated in the technology adoption model, perceived usefulness and perceived ease of use of adopting e-wallets are essential constructs affecting attitude and intention in a positive direction. The path coefficient resulted as $\beta = 0.354$ and the p value is significant ($p < 0.001$). Results also indicate that perceived ease of use has a positive effect on attitude ($\beta = 0.215$). This positive effect is also significant ($p < 0.001$), indicating that perceived ease

of use predicts attitude. These findings are similar to the findings of Liebana-Cabanillas, Ramos de Luna and Montoro-Rios [37]; Hsu and Chiu [36]; Ooi and Tan [44]; Pham and Ho [45]; and Flavian, Guinaliu, and Lu [35] who all proposed that there exists a positive relationship between perceived usefulness and attitude and a positive relationship between perceived ease of use and attitude.

In addition, the results indicate that perceived ease of use has an indirect positive effect on attitude through perceived usefulness. Perceived ease of use has a direct positive effect on perceived usefulness ($\beta = 0.452, p < 0.001$) and an indirect effect on attitude and behavioral intention. When indirect effects are analyzed, results show that perceived ease of use has a special indirect effect on attitude and behavioral intention through perceived usefulness (PEOU \rightarrow PU \rightarrow ATT \rightarrow BI = 0.133). These findings are consistent with previous research. For example, Pikkarainen et al. [23] stated that although perceived ease of use also has a positive impact on intention to use technology, it has less influence than perceived usefulness and that perceived ease of use affects intention to use technology through perceived usefulness. Barry and Jan [46] concluded in a study that perceived ease of use has a significant and positive effect of on perceived usefulness and perceived usefulness on behavioral intention to use a particular system.

Trust is another prominent antecedent influenced by consumer knowledge which has a positive effect on attitude and intention to use e-wallets. The findings of the study demonstrate that trust has a positive effect on attitude to use e-wallet, which is confirmed by a positive path coefficient of $\beta = 0.277$ with significance $p < 0.001$. This finding confirms the results of previous studies. For example, Al-Sharafi et al. [75] analyzed the importance and role of security issues and trust on mobile payment. The results demonstrated that trust has the greatest influence on mobile payment. Attitude is influenced by previously discussed constructs and affects intention to use e-wallets in payment transactions. These results are similar to prior studies of mobile payment adoption. Flavian, Guinaliu, and Lu [35] explored the main factors determining e-wallet and mobile payment adoption and concluded that mindfulness, perceived usefulness, perceived ease of use, and attitude are the major drivers of behavioral use intention.

Research question two is answered with ANOVA results indicating that when consumers are informed that their losses will be reimbursed immediately, as was the case in Group 1, such knowledge leads to a significant effect on behavioral intention to use e-wallets. For research question three, the results indicate that the time frame of guaranteed reimbursement influences respondents' behavior since respondents who were provided with immediate reimbursement information had significantly higher intention to adopt e-wallets ($M = 4.0303, SD = 0.73578$). Consumers who were not offered any information ($M = 3.888, SD = 0.82428$) or respondents who were offered information of reimbursement in five days ($M = 3.7451, SD = 0.86387$) had lower intention to adopt e-wallet. However, when prior knowledge is included into the equation in ANCOVA, the effect of having reassurances about reimbursement diminishes. Such a finding indicates that providing sufficient and effective knowledge on advantages and capabilities of e-wallet to prospective customers is more effective than launching campaigns with guarantees of cash-back, subsidies, and/or reimbursements.

7. Implications and Limitations

The current study provides valuable information to service literature since it highlights the significance of consumer knowledge on e-wallets when deciding to use the new technology. Availability of detailed information clearly increases adoption attitude and intention. In addition, the provision of incentives, such as immediate reimbursement, encourages consumers in trying the new technology in the case of probable fraud. However, our study also shows that when sufficient and detailed information is included, the effect of incentive provision disappears. Therefore, our study proposes a new perspective to services marketing by proving that providing detailed and effective consumer knowledge on e-wallet technology diminishes the effect of having different type of incentives.

From a managerial point of view, this study highlights the importance of explaining the new technology to prospective customers. Managers of banks or technology firms should consider providing detailed information on the new technology while promoting the new product. The study reveals that both consumer knowledge and trust lead to a significant influence on attitude and behavioral intention to use e-wallets. Therefore, the practitioners in the sector should design their implementation policies of new services with caution to increase information and trust.

In addition, the study reveals that when consumers have prior knowledge about the procedures and advantages of e-wallets, having different kinds of guarantees or assurances on reimbursement in case of fraud do not play a significant role in intention to use e-wallets. Based on this finding, we might recommend that financial institutions focus more on educating and informing users about the product itself, rather than developing or offering different types of assurances for reimbursement. This finding is important for marketing policies since the cost of reimbursement would have high direct and indirect costs for financial institutions. Thus, investing in digital financial services literacy and informing users about the reliability of the technology may be more effective.

Several limitations of the current study should be taken into consideration. Based on the findings and constraints of the current study, some recommendations can be made for future studies. Data is gathered from the traditional small community of Northern Cyprus which has a population with high education levels but also a conservative way of life. Therefore, the new technology might take time to diffuse into the everyday life of islanders. Like the adoption of credit card usage, it is clear that creative and assuring marketing efforts are required for consumers to adopt this new technology of mobile payment system. Thus, a similar study may lead to different results if it is carried out in a multicultural country with a larger population, where consumers are less conservative in adoption of new technologies and more open to completing their transactions in a more convenient way. Future research may include other kinds of incentives that may positively influence the adoption of an e-wallet. For example, future research may include additional constructs such as social influence and familiarity through intensive marketing promotion and the subsequent effects on mobile technology adoption.

8. Conclusions

This article analyzed the determinants of e-wallet adoption in the case of Northern Cyprus. An extended version of the technology acceptance model was employed in order to evaluate the effect of TAM indicators together with an external variable called “consumer knowledge” on e-wallet behavioral intention.

The main proposed hypothesis was that consumer knowledge on benefits and various aspects of e-wallet influence such as perceived usefulness, perceived ease of use, trust, attitude, and behavioral intention to use e-wallet. In addition, a survey experiment was conducted by dividing respondents into three groups and providing each group with different information on reimbursement time in case of fraud.

The sample used consisted of 300 respondents and the data was collected by online and offline questionnaires from adults whose ages ranged from 20 to 65. Structural equation modelling and ANOVA methods were used to analyze the data with SmartPLS and SPSS software. The results indicated that all of the hypotheses were supported. The consumer knowledge indicator influenced perceived usefulness, perceived ease of use, and trust. These indicators in turn affect attitude and behavioral intention. The survey experiment findings supported the hypothesis that when consumers are informed that their losses will be reimbursed immediately, as was the case in Group 1, such knowledge leads to a significant effect on behavioral intention to use an e-wallet. In addition, the survey experiment results demonstrated that the time frame of guaranteed reimbursement influences respondents' behavior, since respondents who were provided with immediate reimbursement information had significantly higher intention to adopt an e-wallet. However, although there was tentative support for the hypothesis that assurance of reimbursement will im-

prove the intention to use an e-wallet in the initial analysis, the subsequent ANCOVA findings demonstrate that when prior consumer knowledge is accounted for the group differences no longer play a significant role.

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References

1. Task Force on Digital Financing. People's Money: Harnessing Digitalization to Finance a Sustainable Future. 2022. Available online: <http://www.digitalfinancingtaskforce.org> (accessed on 20 September 2022).
2. Pew Charitable Trusts. Are Americans Embracing Mobile Payments? Issue Brief. 2019. Available online: https://www.pewtrusts.org/-/media/assets/2019/10/mobilepayments_brief_final.pdf (accessed on 16 September 2022).
3. De Kerviler, G.; Demoulin, N.T.; Zidda, P. Adoption of in-store mobile payment: Are perceived risk and convenience the only drivers? *J. Retail. Consum. Serv.* **2016**, *31*, 334–344. [\[CrossRef\]](#)
4. Trivedi, J. Factors determining the acceptance of e wallets. *Int. J. Appl. Mark. Manag.* **2016**, *1*, 42–53.
5. Liébana-Cabanillas, F.; Sánchez-Fernández, J.; Muñoz-Leiva, F. The moderating effect of experience in the adoption of mobile payment tools in Virtual Social Networks: The m-Payment Acceptance Model in Virtual Social Networks (MPAM-VSN). *Int. J. Inf. Manag.* **2014**, *34*, 151–166.
6. Taufan, A.; Yuwono, R.T. Analysis of factors that affect intention to use e-wallet through the technology acceptance model approach (case study: GO-PAY). *Int. J. Sci. Res.* **2019**, *8*, 413–419.
7. Teng, S.; Khong, K.W. Examining actual consumer usage of E-wallet: A case study of big data analytics. *Comput. Hum. Behav.* **2021**, *121*, 106778. [\[CrossRef\]](#)
8. Amoroso, D.L.; Magnier-Watanabe, R. Building a research model for mobile wallet consumer adoption: The case of mobile Suica in Japan. *J. Theor. Appl. Electron. Commer. Res.* **2012**, *7*, 94–110. [\[CrossRef\]](#)
9. Wang, Y.; Hahn, C.; Suttrave, K. Mobile payment security, threats, and challenges. In Proceedings of the 2016 Second International Conference on Mobile and Secure Services (MobiSecServ), Gainesville, FL, USA, 26–27 February 2016; IEEE: Piscataway, NJ, USA, 2016; pp. 1–5.
10. Lee, Y.; Kozar, K.A.; Larsen, K.R. The technology acceptance model: Past, present, and future. *Commun. Assoc. Inf. Syst.* **2003**, *12*, 50.
11. Charness, N.; Boot, W.R. Technology, gaming, and social networking. In *Handbook of the Psychology of Aging*; Academic Press: Cambridge, MA, USA, 2016; pp. 389–407.
12. Davis, F.D. Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Q.* **1989**, *13*, 319–340. [\[CrossRef\]](#)
13. Marangunić, N.; Granić, A. Technology acceptance model: A literature review from 1986 to 2013. *Univers. Access Inf. Soc.* **2015**, *14*, 81–95. [\[CrossRef\]](#)
14. Davis, F.D.; Bagozzi, R.P.; Warshaw, P.R. User acceptance of computer technology, A comparison of two theoretical models. *Manag. Sci.* **1989**, *35*, 982–1003. [\[CrossRef\]](#)
15. Sharp, J.H. Development, extension, and application: A review of the technology acceptance model. *Inf. Syst. Educ. J.* **2006**, *5*, 9.
16. Venkatesh, V.; Davis, F.D. A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Manag. Sci.* **2000**, *46*, 186–204. [\[CrossRef\]](#)
17. Venkatesh, V.; Morris, M.G.; Davis, G.B.; Davis, F.D. User acceptance of information technology: Toward a unified view. *MIS Q.* **2003**, *27*, 425–478. [\[CrossRef\]](#)
18. Al-Somali, S.A.; Gholami, R.; Clegg, B. An investigation into the acceptance of online banking in Saudi Arabia. *Technovation* **2009**, *29*, 130–141. [\[CrossRef\]](#)
19. Venkatesh, V.; Bala, H. Technology acceptance model 3 and a research agenda on interventions. *Decis. Sci.* **2008**, *39*, 273–315. [\[CrossRef\]](#)
20. Kleijnen, M.; Wetzels, M.; de Ruyter, K. Consumer acceptance of wireless finance. *J. Financ. Serv. Mark.* **2004**, *8*, 206–217. [\[CrossRef\]](#)
21. Luarn, P.; Lin, H.H. Toward an understanding of the behavioral intention to use mobile banking. *Comput. Hum. Behav.* **2005**, *21*, 873–891. [\[CrossRef\]](#)

22. Nysveen, H.; Pedersen, P.E.; Thorbjørnsen, H. Intentions to use mobile services: Antecedents and cross-service comparisons. *J. Acad. Mark. Sci.* **2005**, *33*, 330–346. [\[CrossRef\]](#)
23. Pikkarainen, T.; Pikkarainen, K.; Karjaluoto, H.; Pahlila, S. Consumer acceptance of online banking: An extension of the technology acceptance model. *Internet Res.* **2004**, *14*, 224–235. [\[CrossRef\]](#)
24. Wei, G.; Xinyan, Z.; Yue, M. Notice of Retraction: Literature review on consumer adoption behavior of mobile commerce services. In Proceedings of the 2011 International Conference on E-Business and E-Government (ICEE), Shanghai, China, 6–8 May 2011; IEEE: Piscataway, NJ, USA, 2011; pp. 1–5.
25. Sana'a, Y. A critical review of models and theories in field of individual acceptance of technology. *Int. J. Hybrid Inf. Technol.* **2016**, *9*, 143–158.
26. El-Masri, M.; Tarhini, A. Factors affecting the adoption of e-learning systems in Qatar and USA: Extending the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2). *Educ. Technol. Res. Dev.* **2017**, *65*, 743–763. [\[CrossRef\]](#)
27. Spies, R.; Grobbelaar, S.; Botha, A. A scoping review of the application of the task-technology fit theory. In *Responsible Design, Implementation and Use of Information and Communication Technology*; Springer: Cham, Switzerland, 2020; pp. 397–408.
28. Jaakonmäki, R.; Simons, A.; Müller, O.; Brocke, J.V. ECM implementations in practice: Objectives, processes, and technologies. *J. Enterp. Inf. Manag.* **2018**, *31*, 704–723. [\[CrossRef\]](#)
29. Huang, X.; Lin, Y.; Lim, M.K.; Tseng, M.L.; Zhou, F. The influence of knowledge management on adoption intention of electric vehicles: Perspective on technological knowledge. *Ind. Manag. Data Syst.* **2021**, *121*, 1481–1495. [\[CrossRef\]](#)
30. Liu, Y.X.; Hong, Z.S.; Zhu, J.; Yan, J.J.; Qi, J.Q.; Liu, P. Promoting green residential buildings: Residents' environmental attitude, subjective knowledge, and social trust matter. *Energy Policy* **2018**, *112*, 152–161. [\[CrossRef\]](#)
31. Park, C.W.; Mothersbaugh, D.L.; Feick, L. Consumer knowledge assessment. *J. Consum. Res.* **1994**, *21*, 71–82. [\[CrossRef\]](#)
32. Degirmenci, K.; Breitner, M.H. Consumer purchase intentions for electric vehicles: Is green more important than price and range? *Transp. Res. Part D Transp. Environ.* **2017**, *51*, 250–260. [\[CrossRef\]](#)
33. Koenig-Lewis, N.; Marquet, M.; Palmer, A.; Zhao, A.L. Enjoyment and social influence: Predicting mobile payment adoption. *Serv. Ind. J.* **2015**, *35*, 537–554. [\[CrossRef\]](#)
34. Davis, F.D. User acceptance of information technology: System characteristics, user perceptions and behavioral impacts. *Int. J. Man-Mach. Stud.* **1993**, *38*, 475–487. [\[CrossRef\]](#)
35. Flavian, C.; Guinaliu, M.; Lu, Y. Mobile payments adoption—introducing mindfulness to better understand consumer behavior. *Int. J. Bank Mark.* **2020**, *38*, 1575–1599. [\[CrossRef\]](#)
36. Hsu, M.H.; Chiu, C.M. Internet self-efficacy and electronic service acceptance. *Decis. Support Syst.* **2004**, *38*, 369–381. [\[CrossRef\]](#)
37. Liébana-Cabanillas, F.; de Luna, I.R.; Montoro-Rios, F. Intention to use new mobile payment systems: A comparative analysis of SMS and NFC payments. *Econ. Res.* **2017**, *30*, 892–910. [\[CrossRef\]](#)
38. Chawla, D.; Joshi, H. Consumer attitude and intention to adopt mobile wallet in India—An empirical study. *Int. J. Bank Mark.* **2019**, *37*, 1590–1618. [\[CrossRef\]](#)
39. Sarmah, R.; Dhiman, N.; Kanojia, H. Understanding intentions and actual use of mobile wallets by millennial: An extended TAM model perspective. *J. Indian Bus. Res.* **2021**, *13*, 361–381. [\[CrossRef\]](#)
40. Dahlberg, T.; Guo, J.; Ondrus, J. A critical review of mobile payment research. *Electron. Commer. Res. Appl.* **2015**, *14*, 265–284. [\[CrossRef\]](#)
41. Liébana-Cabanillas, F.; Marinkovic, V.; de Luna, I.R.; Kalinic, Z. Predicting the determinants of mobile payment acceptance: A hybrid SEM-neural network approach. *Technol. Forecast. Soc. Chang.* **2018**, *129*, 117–130. [\[CrossRef\]](#)
42. Liébana-Cabanillas, F.; Muñoz-Leiva, F.; Sánchez-Fernández, J. A global approach to the analysis of user behavior in mobile payment systems in the new electronic environment. *Serv. Bus.* **2018**, *12*, 25–64. [\[CrossRef\]](#)
43. Matamba, E.D.; Li, G. Consumers' willingness to adopt and use WeChat wallet: An empirical study in South Africa. *Technol. Soc.* **2018**, *53*, 55–68. [\[CrossRef\]](#)
44. Ooi, K.B.; Tan, G.W.H. Mobile technology acceptance model: An investigation using mobile users to explore smartphone credit card. *Expert Syst. Appl.* **2016**, *59*, 33–46. [\[CrossRef\]](#)
45. Pham, T.T.T.; Ho, J.C. The effects of product-related, personal-related factors and attractiveness of alternatives on consumer adoption of NFC-based mobile payments. *Technol. Soc.* **2015**, *43*, 159–172. [\[CrossRef\]](#)
46. Barry, M.; Jan, M.T. Factors influencing the use of m-commerce: An extended technology acceptance model perspective. *International Journal of Economics. Manag. Account.* **2018**, *26*, 157–183.
47. Al-Marouf, R.S.; Al-Emran, M. Students' acceptance of Google classroom: An exploratory study using PLS-SEM approach. *Int. J. Emerg. Technol. Learn.* **2018**, *13*, 112–123. [\[CrossRef\]](#)
48. Van Esterik-Plasmeijer, P.W.; van Raaij, W.F. Banking system trust, bank trust, and bank loyalty. *Int. J. Bank Mark.* **2017**, *35*, 97–111. [\[CrossRef\]](#)
49. Aldás-Manzano, J.; Lassala-Navarré, C.; Ruiz-Mafé, C.; Sanz-Blas, S. The role of consumer innovativeness and perceived risk in online banking usage. *Int. J. Bank Mark.* **2009**, *27*, 53–75. [\[CrossRef\]](#)
50. Flavian, C.; Guinaliu, M.; Torres, E. The influence of corporate image on consumer trust: A comparative analysis in traditional versus internet banking. *Internet Res.* **2005**, *15*, 447–470. [\[CrossRef\]](#)
51. Gefen, D. Reflections on the dimensions of trust and trustworthiness among online consumers. *ACM SIGMIS Database DATABASE Adv. Inf. Syst.* **2002**, *33*, 38–53. [\[CrossRef\]](#)

52. Lii, Y.S.; Sy, E. Internet differential pricing: Effects on consumer price perception, emotions, and behavioral responses. *Comput. Hum. Behav.* **2009**, *25*, 770–777. [\[CrossRef\]](#)
53. Shin, D.H. Towards an understanding of the consumer acceptance of mobile wallet. *Comput. Hum. Behav.* **2009**, *25*, 1343–1354. [\[CrossRef\]](#)
54. Leonard, M.; Graham, S.; Bonacum, D. The human factor: The critical importance of effective teamwork and communication in providing safe care. *BMJ Qual. Saf.* **2004**, *13* (Suppl. 1), i85–i90. [\[CrossRef\]](#)
55. Ajzen, I. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* **1991**, *50*, 179–211. [\[CrossRef\]](#)
56. Ariffin, S.K.; Rahman, M.F.R.A.; Muhammad, A.M.; Zhang, Q. Understanding the consumer's intention to use the e-wallet services. *Span. J. Mark. -ESIC* **2021**, *25*, 446–461. [\[CrossRef\]](#)
57. Apanasevic, T.; Markendahl, J.; Arvidsson, N. Stakeholders' expectations of mobile payment in retail: Lessons from Sweden. *Int. J. Bank Mark.* **2016**, *34*, 37–61. [\[CrossRef\]](#)
58. De Luna, I.R.; Liébana-Cabanillas, F.; Sánchez-Fernández, J.; Muñoz-Leiva, F. Mobile payment is not all the same: The adoption of mobile payment systems depending on the technology applied. *Technol. Forecast. Soc. Chang.* **2019**, *146*, 931–944. [\[CrossRef\]](#)
59. Zhao, H.; Anong, S.T.; Zhang, L. Understanding the impact of financial incentives on NFC mobile payment adoption: An experimental analysis. *Int. J. Bank Mark.* **2019**, *37*, 1296–1312. [\[CrossRef\]](#)
60. Schierz, P.G.; Schilke, O.; Wirtz, B.W. Understanding consumer acceptance of mobile payment services: An empirical analysis. *Electron. Commer. Res. Appl.* **2010**, *9*, 209–216. [\[CrossRef\]](#)
61. Wulandari, N. Cashless payment in tourism. An application of technology acceptance model. *J. Environ. Manag. Tour.* **2017**, *8*, 1550–1553.
62. Upadhyay, N.; Upadhyay, S.; Abed, S.S.; Dwivedi, Y.K. Consumer adoption of mobile payment services during COVID-19: Extending meta-UTAUT with perceived severity and self-efficacy. *Int. J. Bank Mark.* **2022**, *40*, 960–991. [\[CrossRef\]](#)
63. Khalilzadeh, J.; Ozturk, A.B.; Bilgihan, A. Security-related factors in extended UTAUT model for NFC based mobile payment in the restaurant industry. *Comput. Hum. Behav.* **2017**, *70*, 460–474. [\[CrossRef\]](#)
64. Hair, J.F.; Hult, G.T.M.; Ringle, C.; Sarstedt, M. *A Primer On Partial Least Squares Structural Equation Modeling (PLS-SEM)*; Sage Publications: New York, NY, USA, 2014.
65. Said, H.; Tanova, C. Workplace bullying in the hospitality industry: A hindrance to the employee mindfulness state and a source of emotional exhaustion. *Int. J. Hosp. Manag.* **2021**, *96*, 102961. [\[CrossRef\]](#)
66. Parasuraman, A.; Zeithaml, V.A.; Malhotra, A. ES-QUAL: A multiple-item scale for assessing electronic service quality. *J. Serv. Res.* **2005**, *7*, 213–233. [\[CrossRef\]](#)
67. Shih, Y.Y.; Fang, K. The use of a decomposed theory of planned behavior to study Internet banking in Taiwan. *Internet Res.* **2004**, *14*, 213–223. [\[CrossRef\]](#)
68. Taylor, S.; Todd, P. Decomposition and crossover effects in the theory of planned behavior: A study of consumer adoption intentions. *Int. J. Res. Mark.* **1995**, *12*, 137–155. [\[CrossRef\]](#)
69. Lin, C.H.; Shih, H.Y.; Sher, P.J. Integrating technology readiness into technology acceptance: The TRAM models. *Psychol. Mark.* **2007**, *24*, 641–657. [\[CrossRef\]](#)
70. Nor, K.M.; Pearson, J.M. An exploratory study into the adoption of internet banking in a developing country: Malaysia. *J. Internet Commer.* **2008**, *7*, 29–73. [\[CrossRef\]](#)
71. Hair, J.F.; Risher, J.J.; Sarstedt, M.; Ringle, C.M. When to use and how to report the results of PLS-SEM. *Eur. Bus. Rev.* **2019**, *31*, 2–24. [\[CrossRef\]](#)
72. Gefen, D.; Straub, D.; Boudreau, M.C. Structural equation modeling and regression: Guidelines for research practice. *Commun. Assoc. Inf. Syst.* **2000**, *4*, 7. [\[CrossRef\]](#)
73. Churchill, G.A., Jr. A paradigm for developing better measures of marketing constructs. *J. Mark. Res.* **1979**, *16*, 64–73. [\[CrossRef\]](#)
74. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **1981**, *18*, 39–50. [\[CrossRef\]](#)
75. Al-Sharafi, M.A.; Al-Qaysi, N.; Iahad, N.A.; Al-Emran, M. Evaluating the sustainable use of mobile payment contactless technologies within and beyond the COVID-19 pandemic using a hybrid SEM-ANN approach. *Int. J. Bank Mark.* **2021**, *40*, 1071–1095. [\[CrossRef\]](#)