

Factors Affecting User Adoption of E-Payment Services Available in Mobile Wallets in Saudi Arabia

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Abstract

Mobile wallets have been in continuous demand and developed over the past few years, especially during the COVID-19 pandemic. Several studies have examined user intentions and perspectives. This study develops a conceptual model combining behavioral factors with the technology acceptance model (TAM). The goal is to identify key factors that influence user's intention to adopt mobile payments. This study uses the TAM and the unified theory of acceptance and use of technology (UTAUT) models with additional factors. The additional factors are security, trust, facilitating conditions, and lifestyle compatibility. The study analyzes the results of a survey of 394 Saudi citizens conducted via an online survey. The results indicate that user attitudes and intentions are positively influenced by all of the factors. Perceived usefulness, perceived ease of use, lifestyle compatibility, and facilitating conditions are direct predictors of user behavior in accepting mobile wallet payments. This study provides an empirical contribution to the literature on mobile payment acceptance on the effect of perceived usefulness and lifestyle compatibility. The results demonstrate that about 26% of the respondents started using mobile wallet services because of the COVID-19 pandemic.

Keywords: *Adoption, M-wallet, M-payment, Saudi Arabia, TAM, UTAUT*

I. Introduction

There has been an increase in demand for digital and cashless payments worldwide [1], [2]. The user's behavioral intention to accept mobile payment and its adoption has experienced an extreme transformation [3], [4]. Several previous studies have been performed in the literature to examine different factors that influence users' behavior to accept and adopt m-payment [5]–[7].

Several studies have demonstrated that consumers desire electronic payment technology that offers fast, secure, accessible, and effective services on a single platform [8]–[10]. M-payment services are defined as any system that provides financial transactions via mobile phone devices and networks [11], [12]. There are different types of m-payment services available, including short messaging system (SMS) payments [7], mobile web payments [10], quick response codes (QR) m-payments [13], near-field communication (NFC) m-payments [11], cloud-based m-payments [14], and mobile wallets, also known as m-wallets [15], [16].

The m-wallet is a payment application that can be installed on a user's mobile device wherein the smartphone holds payment card information [12], [17], [18]. The m-wallet has several services and features that can be substituted for the physical or traditional wallet to make payments and transactions [4], [17], [19]. As mobile commerce, m-wallet services enable users to make several types of transactions such as customer-to-customer, customer-to-merchant, and merchant-to-merchant [17], [20]. The m-wallet is designed to provide a fast, easy, secure, remote, efficient, and transparent solution to making payments [19]. Recently, the e-payment services available in the m-wallet have been used between people rather than cash to stop COVID-19 transmission between individuals [4].

According to [21], the mobile internet user penetration rate has been growing in Saudi Arabia and is expected to reach about 97% by 2025. M-wallet services are being introduced in Saudi Arabia with the intention of improving financial services and reducing costs. This is in line with the goals of the Saudi Vision 2030, which aims to enable digital transformation in various sectors. The Saudi Central Bank (SAMA)¹ aims to raise the level of financial transactions and innovation in financial services. SAMA released a license to

¹ SAMA is the central bank of Saudi Arabia, previously known as the Saudi Arabian Monetary Authority.

STC Pay² after the success of two digital financial services companies—Hala³ and Bayan Pay.⁴

A recent study by [14] provided an analysis of the Saudi Arabian financial technology (fintech) sector and argued that investment in the m-wallet research area is important. The study also added that technology providers should understand user needs and improve customer experience. Many researchers have examined the factors that contribute to the acceptance and adoption of m-payment among Saudi citizens [22]–[24]. This study aims to examine a variety of factors that influence user's acceptance and adoption of m-wallet in the context of Saudi Arabia.

From a practical point of view, identifying the factors that influence m-wallet service adoption in Saudi Arabia would support decision-makers utilizing appropriate, cost-effective strategies for increasing m-wallet usage by governing and deploying independent factors. In contrast, the existing literature on m-payment adoption highlights the significance of understanding the factors that affect behavioral intention and encourage usage of the system [7], [11], [20]. Thus, this study provides an answer to a specific research question: "What are the key factors affecting the adoption of m-wallet services among Saudi citizens?"

This paper is organized as follows. Section 2 provides a literature review on the factors that affect user attitude and behavioral intention toward m-payment adoption and m-wallet services. Section 3 proposes the conceptual framework and research hypotheses. In Section 4, the research methodology is explained. Section 5 presents the results and discussion. The final section provides a conclusion and directions for future research.

II. LITERATURE REVIEW

M-payment technologies have been explored and studied in the literature in several research areas among the following: technological ecosystems [14], [25], service design [26], user experience [27], privacy and trust [28], payment transaction preferences [10], [29], technology acceptance, and intention to use m-payments [3], [17], [20], [30].

Researchers have identified behavioral factors that influence user acceptance to adopt m-payment technologies by applying different technology acceptance theoretical models. Researchers have used two theoretical models to study user intention and acceptance toward adopting new technology: the TAM designed by [31] and the UTAUT model designed by [32].

The TAM model consists of two primary factors: perceived ease of use (PEOU) and perceived usefulness (PU). These two factors have a significant impact on user attitude and, as a result, influence users' behavioral intention to accept

new technology [31]. Several studies have used the TAM model to identify factors that could affect m-payment and m-wallet service adoption in China [33], Singapore [34], the United States (US) [5], South Africa [35], Indonesia [36], India [16], [37], Malaysia [4], [38], and Europe [30].

Many previous studies in the m-payment adoption literature integrate additional factors into the TAM model to make it more comprehensive in examining different users' behavioral intention and usage [4], [16], [30], [33], [36], [38].

Table 1 provides an overview of previous studies in the literature that extended the TAM model to examine other key factors affecting user acceptance to adopt m-payment and m-wallet services. These studies found that by extending the TAM model to include additional factors, the tracking and explaining different factors in measuring user attitude and intention to adopt new technology has been significantly improved. From Table 1, we can link each study to the factors that were used to extend the TAM model. These studies have proven that PU, PEOU, trust, and security are the most critical determinants influencing user to accept and adopt a new technology [16,34–36].

The UTAUT model consists of four main factors: effort expectancy, social influence, performance expectancy, and facilitating conditions [32]. Several studies in the literature have applied the UTAUT model to examine the factors that influence m-payment acceptance [1], [6], [7], [39]–[41].

The UTAUT model has been extended by adding the trust factor [1], [39], [41]. The results have indicated that the trust factor significantly influences user attitude and intention to adopt new technology. A study by [41] examined two additional factors—knowledge and compatibility—as extended factors added to the UTAUT model. The aim was to explore the user's intention to use m-payment services in the US. The results demonstrated that the UTAUT model's extension considerably enhanced the measurement of a user's behavioral intention to adopt m-payments.

The UTAUT2 model extended the classic UTAUT model by including two additional factors—habit and hedonic motivation—was designed by [42]. The study by [7] used UTAUT2 and added perceived security to determine the factors of intention to adopt m-payment among working adults in Malaysia. Likewise, the study by [43] extended the UTAUT2 model by adding lifestyle compatibility factors to examine the factors underlying behavioral intention to adopt m-payment in Bangladesh.

² STC Pay is an integrated payment application by the STC Group.

³ Hala is a company that provides a digital payments platform known as HalalaH.

⁴ Bayan Pay is a company that provides a digital payments platform.

TABLE I. SUMMARY OF VARIABLES USED TO EXTEND THE TAM MODEL BY STUDIES IN THE M-WALLET AND M-PAYMENT LITERATURE

Variables	Country	Field	Author
Perceived usefulness, perceived ease of use, trust, environmental risks, reputation, and mobility.	Indonesia	M-payments	[36]
Perceived usefulness, perceived ease of use, privacy, new technology anxiety, and self-efficacy.	the US	M-payments	[5]
Perceived usefulness, perceived ease of use, trust, security, facilitating conditions, and lifestyle compatibility.	India	M-wallet	[16]
Perceived usefulness, perceived ease of use, trust, security, innovativeness, critical mass, flexibility, cost of transaction, consumer privacy and anonymity, transaction speed, and availability of alternatives.	Singapore	M-wallet	[34]
Perceived usefulness, perceived ease of use, perceived risk, perceived cost, perceived ubiquity, perceived compatibility, perceived personal innovativeness, and perceived social influence.	Europe	M-payments	[30]
Perceived usefulness, perceived ease of use, and perceived risk.	Malaysia	M-wallet	[38]
Perceived ease of use, trust, security, privacy concerns, and related advantages.	South Africa	M-wallet	[35]
Perceived usefulness, perceived ease of use, perceived risk, compatibility, perceived complementarity, and m-payment knowledge.	China	M-payments	[33]
Perceived usefulness, perceived compatibility, awareness, perceived cost, and perceived customer value addition.	India	M-wallet	[37]

In the context of Saudi Arabia, several aspects of mobile acceptance technology have been explored such as m-commerce [44], m-services [45], m-government [46], m-banking [47], m-learning [48], and m-payment [24]. However, few studies have examined the factors affecting m-wallet services adoption in the Saudi Arabian context.

A study by [22] explored user acceptance and concerns toward m-payment technology in Saudi Arabia. The findings reported that the security of the transactions of m-payment and the unauthorized use of mobile devices to make payments are the most significant concerns for mobile users. In addition, a study by [23] used the UTAUT model to investigate 11 factors that influenced the acceptance and use of m-transactions in Saudi Arabia. The study discovered that the most significant influence factors included ease of use,

usefulness, security, trust, culture, cost, government m-readiness, and social influence. A study by [24] adapted the ease of use from the TAM model with three additional factors—awareness, utility, and security—to explore the acceptance of m-payment among Saudi nationals. The study found that the proposed factors successfully identified m-payment acceptance and examined the gender effect, discovering that all factors showed a significant gender-based difference except for utility. The results indicated that males exhibited higher m-payment adoption than females.

To sum up, in this study, we aim to contribute to the m-wallet services literature by exploring the factors that influence user intention to accept and adopt m-wallet services in the context of Saudi Arabia. Based on a review of the previous works, in this paper, we propose using the extended TAM and UTAUT models to determine the factors affecting user acceptance of m-wallet services.

III. CONCEPTUAL FRAMEWORK AND RESEARCH HYPOTHESES

This study is built on previous work by [16] in which they combined the TAM and UTAUT models in terms of two factors—facilitating conditions and lifestyle compatibility. The study by [16] integrated two additional factors, security and trust, and argued that these two factors have a critical effect on user adoption of new technology. This study examined the factors that influenced consumer attitude and intention to adopt m-wallet services in India.

The present study aims to examine the key factors affecting the adoption of m-wallet services in a Saudi Arabian context. The study uses the TAM model and combines two factors from the UTAUT model as this study follows the work of [16]. The TAM and UTAUT models have been chosen from other conceptual frameworks (theoretical models), given that several studies have confirmed their effectiveness in examining user adoption of various technologies such as electronic payments [49], digital payments [1], m-banking [50], m-internet services [45], m-payments [5], [6], and m-wallet services [38], [51].

In this study, the modified TAM and UTAUT models are used to identify the key factors influencing m-wallet services adoption intention. The eight factors identified are as follows: PU, PEOU, security, trust, facilitating conditions, lifestyle compatibility, attitude, and intention. Therefore, this study demonstrates the relevance between these eight factors as they are argued to have a moderating role on user intention to adopt m-wallet services in Saudi Arabia.

PU is defined as "the degree to which a user believes that using a particular technology would improve his or her job performance" [31]. This factor demonstrates that the PU of new technology plays a vital role to accept and adopt a new technology. Several studies have found that PU positively influences user acceptance to adopt m-payment [4], [30], [36], [38], [51]. This study examines the PU factor and presents the relationship between PU and user attitude toward m-

wallet services. This study, therefore, proposes this hypothesis as follows:

H1: PU has a positive effect on user attitude toward m-wallet service adoption.

PEOU is defined according to [31] as "the user's belief on the degree of user-friendliness of a particular technology." Several studies have established that PEOU significantly influences the user to accept and adopt m-payment [4], [16], [24], [36]–[39]. These studies have discovered that *PEOU* positively and significantly influences user intention toward m-wallet services.

H2: PEOU has a positive effect on user attitude toward m-wallet service adoption.

Security (*SEC*) is defined as the degree to which a user believes that using a specific online payment channel will be safe [16]. The m-wallet records sensitive information, so people will have security concerns if a mobile device is lost or stolen. The security concerns regarding m-payment as a new technology appear to be a critical concern for users in some studies [1], [7], [22]–[24], [36], [51], while others did not raise this issue [52]. We believe that security concerns are an important factor to explore. Thus, the following hypothesis is proposed:

H3: Security has a positive effect on user attitude toward m-wallet service adoption.

Trust (*TR*) occurs when one party has confidence in an exchange partner's reliability and integrity. Users need to utilize a new service with comfort, safety, and fewer feelings of risk. Many studies have concluded that trust has a positive effect on user intention to adopt m-payment [1], [16], [23], [24], [36], [37], [51]. Therefore, the following hypothesis is postulated:

H4: Trust has a positive effect on user attitude toward m-wallet service adoption.

Facilitating conditions (*FC*) are defined as the conditions under which an individual believes that the infrastructure is equipped for and encourages the use of new technology. A number of studies have determined that there is a positive relationship between FC and the intention to use m-payment [6], [7], [16]. If there is a complete infrastructure for m-wallet usage, it may lead to an increase in user attitude toward m-wallet service adoption. Therefore, the following hypothesis is proposed:

H5: FC has a positive effect on user attitude toward m-wallet service adoption.

Lifestyle compatibility (*LC*) is defined as the shopping habits and daily lifestyle that impact user technology adoption. Thus, LC affects user decisions to adopt technology. A few empirical studies have combined the effect of different attributes of LC on the intention to use m-payment services [16], [43]. A study by [16] defined LC as "the natural alignment of lifestyle choices and values between two individuals, and extended to include a computer,

mobile devices, and other stakeholders operating in the environment." The results of [16] showed that LC plays an important and significant role in influencing user intention to adopt m-wallet. Therefore, the following hypothesis is proposed:

H6: LC has a positive effect on user attitude toward m-wallet service adoption.

Attitude (*ATT*) and intention (*IN*): Attitude is defined as the positive or negative emotions and feelings of an individual about their behavior when adopting new technology [31]. The intention is defined as an individual tending to use and embrace the latest technology [32]. In the context of m-payment and m-wallet adoption, a significant relationship between attitude and intention has been widely confirmed [1], [12], [16], [20], [36], [38]. Therefore, the final hypothesis is formed as follows:

H7: Attitude has a positive effect on user intention to adopt m-wallet services.

Figure 1 demonstrates the proposed m-wallet technology adoption model, including the main factors of the TAM and UTAUT models and additional factors concerning the relationships established by this study's hypotheses.

IV. RESEARCH METHODOLOGY

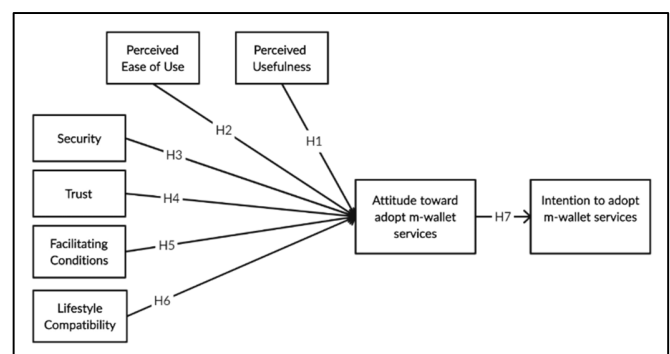


Fig. 1. The proposed model with the study hypotheses.

A. Instrument Development

This study was conducted using a quantitative approach through the development of an online survey. The study features eight factors as follows: PEOU, PU, security, trust, FC, LC, attitude, and intention to use. The developed factors and their items were designed to measure user acceptance of m-wallet service adoption. The factors' scales were adopted from [16]. The factors in the survey were measured using a five-point Likert-type scale, where a value of one signifies "strongly disagree" and a value of five indicates "strongly agree." Three experts have reviewed the methodology and measurement scales in the field to ensure that the content and the structure of the questions are valid. The scale used in the questionnaire is reported in detail in the Appendix.

B. Data Collection

The online survey, which has a total of 40 questions, was distributed online. The online survey featured two sections. The first section is the respondents' demographic information while the second section includes the 40 scales of the factors. The demographic information collected included gender, age, qualification, monthly income (in Saudi Riyals (SR)), mobile device type, and when respondents started using m-wallet services if they have used it (i.e., before or after the COVID-19 pandemic). To identify the usage of the m-wallet among the respondents, two questions were asked about user awareness. Some illustrations were provided referring to m-wallet apps in Saudi Arabia such as STC Pay, Apple Pay, and Mada Pay to avoid misunderstanding of the questions. All of the survey items were mandatory to avoid the problem of missing values.

This study used simple random sampling, which means that respondents had an equal chance of being selected. The online survey was distributed among Saudi Arabian citizens in different age groups between October 22 and October 31, 2020. As the respondents are native Arabic speakers, they received an Arabic copy of the survey to ensure the accuracy of the responses. The study reached 394 respondents.

Table 2 shows the basic descriptive statistics of the respondents. The total number of respondents is 394; 69.8% are females. The majority of the respondents were in two age groups: 21–30 (38.6%) and 31–40 (28.2%). In addition, the majority of the respondents are bachelor's degree holders (67.3%). Out of the respondents, 72.8% had used m-wallet services whereas 27.2% had not previously used m-wallet services. Moreover, 46.7% had used m-wallet services before the COVID-19 pandemic while 25.9% only used them after the pandemic.

TABLE II. DESCRIPTIVE STATISTICS OF THE RESPONDENTS (N = 394)

Demographic		Frequency	Percentage
Gender	Male	119	30.2 %
	Female	275	69.8 %
Age	Under 20	31	7.9 %
	21–30	152	38.6 %
	31–40	111	28.2 %
	41–50	54	13.7 %
	Above 51	46	11.7 %
Qualifications	Secondary	56	14.2 %
	Diploma	31	7.9 %
	Bachelor's	265	67.3 %
	Master's	25	6.3 %
	Doctorate	5	1.3 %
Income (in SR)	Other	12	3.0 %
	Under 5000	125	31.7 %
	5001–10,000	72	18.3 %
	10,001–20,000	112	28.4 %
Mobile device type	Above 20,000	26	6.6 %
	iOS	339	86.0 %
	Android	54	13.7 %
	Other	1	0.3 %

Do you use mobile wallet services?	Yes	287	72.8 %
	No	107	27.2 %
When did you start using mobile wallet services?	Before COVID-19	184	46.7 %
	After COVID-19	102	25.9 %
	Not yet	108	27.4 %

C. Data Analysis Procedure

Statistical Package for the Social Sciences (SPSS) software, Version 23, was used in this study to analyze the collected data. SPSS has been frequently used for analyzing data that were collected from surveys, especially in the previous studies on the user acceptance of new technology [2], [10], [46], [53]. This study applied the simple regression analysis to test the hypotheses, in which it tested the relative influence of the independent variables on the dependent variable.

D. Measurement Model: Reliability and Validity

We evaluated the validity and reliability of the study to ensure that the survey measured the factors correctly. The measurement instrument's reliability and validity were assessed using reliability and convergent validity criteria. Cronbach's alpha was utilized to measure the internal consistency of the survey instrument's reliability. Each factor was tested for reliability and content validity. The acceptable suggested value of the Cronbach's alpha test scores should be above 0.70 [54], and all of the scores in this study reached approximately 0.90 (refer to Table 3). This study's factors, which were adopted from the existing literature [16], showed strong content validity. Table 4 exhibits the correlations between the eight factors; the discriminant results of all of the factors have a valid value.

TABLE III. RELIABILITY OF THE EIGHT FACTORS

Factor	Cronbach's Alpha	Item
PU	0.920	6
PEOU	0.917	5
SEC	0.884	5
TR	0.937	6
FC	0.870	4
LC	0.932	5
ATT	0.941	5
IN	0.942	4
General Reliability	0.983	40

TABLE IV. CORRELATION MATRIX OF THE EIGHT FACTORS

Factor	PU	PEOU	SEC	TR	FC	LC	ATT	IN
PU	1.000							
PEOU	0.792	1.000						
SEC	0.681	0.734	1.000					
TR	0.697	0.752	0.824	1.000				
FC	0.674	0.775	0.729	0.793	1.000			

LC	0.774	0.766	0.734	0.759	0.807	1.000		
ATT	0.803	0.781	0.733	0.751	0.784	0.897	1.000	
IN	0.806	0.767	0.720	0.734	0.746	0.874	0.901	1.000

V. RESULTS AND DISCUSSION

This study applied a simple regression methodology to test the hypotheses. Table 5 presents the relationships between the factors and their significance and the results indicate the strength of the relationship effects between the factors.

First, with regard to perceived usefulness, the results show a significant and positive influence of PU on attitude toward m-wallet service adoption (PU→ATT: β 0.896; $p \leq 0.001$); thus, H1 is supported and confirmed where PU has a direct and positive relationship with attitude toward the technology. Similarly, the results by five different studies [4], [5], [16], [23], [38] confirmed this result, finding that PU had a significant and positive effect on user attitude. In addition, several studies have agreed that PU is the main predictor of attitude [16], [20], [31]. This may refer to when the users find that m-wallet technology is useful, improves their performance, and makes the payment process faster, impacting their attitude and intention to adopt m-wallet services.

The findings of this study show the existence of a positive and significant relationship of PEOU with attitude to adopt m-wallet services (PEOU→ATT: β 0.839; $p \leq 0.001$), H2, confirming the results of [4], [5], [23], [24], [31], [38]. In contrast, the study by [16] found that PEOU has a positive but insignificant impact on attitude toward m-wallet adoption. [16] argued that users may PU as more important than ease of use. This was because of the study's different target group by [16], who focused on knowledgeable students and professionals who were not concerned about the ease of use factor. In this study, the ease of use significantly influences end-user attitudes (including tech savvy users) toward m-wallet service adoption. This study recommends that companies develop their services with high ease and usefulness, significantly affecting users. For example, during the COVID-19 pandemic, STC Pay allowed users to send and receive money according to contact number rather than a bank account number.

H3 was also established and supported by the empirical findings regarding the existence of a positive and significant relationship between security and attitude toward m-wallet services (SEC→ATT: β 0.711; $p \leq 0.001$), like recent studies have also reported (e.g., [7], [16,20]). In the Saudi context, the studies by [23] and [24] supported this finding, confirming the significant impact of security on the user's intentional behavior to adopt m-payment services.

The relationship proposed in H4 is supported, that is, trust positively and significantly affects the attitude to adopt m-wallet services (TR→ATT: β 0.740; $p \leq 0.001$). Several studies have confirmed this result [16,20,23,55], while [36] found no significant impact and influence from the trust factor on attitude to use m-payment. This is because this study used a specific company name that has a good reputation in Indonesia, so the trust factor did not arise for the respondents since they already trusted the good reputation of the company brand. In our study, we did not specify any company, so our result is different.

As hypothesized in H5 regarding facilitating conditions, we found a positive and significant relationship with attitude to adopt m-wallet services (FC→ATT: β 0.760; $p \leq 0.001$). Thus, H5 is confirmed. The results of previous studies by [6,7,16] are in line with this result. If the user believes that there is a complete infrastructure equipped for m-wallet usage such as devices, costs, and necessary help, this increases the effect on attitude to adopt m-wallet services.

The relationship proposed in H6 is confirmed and supported, that is, the effect of LC on attitude. A positive and significant relationship was found between the two (LC→ATT: β 0.860; $p \leq 0.001$). The studies of [16,43] confirmed this result. LC was found to be a useful predictor of attitude to adopt m-wallet services in Saudi Arabia. During the COVID-19 pandemic, shopping habits and, most importantly, daily lifestyles, have been changed, resulting in users adopting new technology such as m-wallet services. When users feel a product is compatible with their lifestyle and can make online payments and transactions anywhere and anytime, they can adopt m-wallet services directly.

Finally, attitude has a direct and positive effect on user intention to use technology, Hypothesis 7 (ATT→IN: β 0.938; $p \leq 0.001$). Previous studies have determined that attitude has a positive and significant influence on intention to use, according to previous research performed in countries such as the US [5], Malaysia [38], Indonesia [36], and India [12], [16].

Among the different predictors of attitude to adopt m-wallet services, PU was the strongest predictor of attitude, sequentially followed by LC, PEOU, and FC. While security and trust presented as the least effective predictors compared by other factors, this finding differs from the study by [1], who argued that trust and security were the best predictors for digital payment, including m-wallet services. The m-wallet is encrypted using different technologies such as personal identification numbers (PINs), fingerprints, or biometrics that are highly secure even if a mobile device is lost or stolen. Users trust that m-wallet service technology provides what they promise and keeps their information encrypted. In addition, user trust in the providers is supported by several regulations on financial transactions in Saudi Arabia.

To sum up, the results show that PU (H1), PEOU (H2), security (H3), trust (H4), FC (H5), and LC (H6) have a

positive and significant relationship with attitude. Thus, attitude (H7) has a positive and meaningful influence on adopting m-wallet services in Saudi Arabia.

TABLE V. EVALUATION OF THE CONCEPTUAL MODEL WHERE $P \leq 0.001$

Hypothesis	Relationship	R ²	β	T	p-value	Result
H1	PU → ATT	0.645	0.896	26.706	0.000	Supported
H2	PEOU → ATT	0.609	0.839	24.720	0.000	Supported
H3	SEC → ATT	0.537	0.711	21.305	0.000	Supported
H4	TR → ATT	0.564	0.740	22.503	0.000	Supported
H5	FC → ATT	0.614	0.760	24.968	0.000	Supported
H6	LC → ATT	0.805	0.860	40.221	0.000	Supported
H7	ATT → IN	0.811	0.938	41.027	0.000	Supported

VI. CONCLUSION

This study aimed to examine the acceptance and adoption of m-wallet services among users in Saudi Arabia. The TAM and UTAUT models were used to develop a conceptual model of technology adoption. On the m-wallet adoption, this study supplemented to previous studies by examining the impacts of different behavioral factors on the user's behavioral intention to adopt m-wallet services. To the best of our knowledge, we conclude that this is the first study that has determined the factors that affect user adoption of m-wallet services in Saudi Arabia from the end-user perspective.

The results support previous studies on the m-payment technology acceptance and adoption [5], [7], [16], namely, that PU, PEOU, security, trust, FC, and LC have a positive and critical impact on user attitude toward m-wallet services use. Thus, the attitude factor has and meaningful influence on the intention to adopt m-wallet services in Saudi Arabia. The key predictor of user intention to adopt m-wallet services was found to be PU, followed sequentially by LC, PEOU, and FC. In addition, security and trust have a positive effect on user attitude toward m-wallet service adoption. It is worth highlighting that there has been a significant change in the adoption of m-wallet services in Saudi Arabia during the COVID-19 pandemic. About 26% of the respondents just started using m-wallet services since the start of the pandemic.

These factors are highly significant to service providers, merchants, banks, and application developers because users will continuously adopt m-wallet services. Practitioners will be able to use these findings to improve their adoption strategies and the quality of their m-wallet services.

For future research, a number of factors could be considered, such as perceived risk, cost, enjoyment, and m-wallet service benefits and rewards. The moderating

effects of age and gender of the user to accept and adopt m-wallet services could be concentrated on in future studies. User satisfaction is an important factor to determine. Thus, future studies should emphasize satisfaction with actual usage in the Saudi Arabian context.

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Appendix

DETAILS ON THE ITEMS OF THE SURVEY QUESTIONNAIRE

Factor	Code	Item	Source
Perceived Usefulness	PU1	I think using m-wallet services would enable me to accomplish transactions more quickly.	Adapted from [16]
	PU2	I believe m-wallet services would be useful for conducting online transactions.	
	PU3	I believe using m-wallet services would improve my efficiency of online transactions.	
	PU4	I think using m-wallet services would make it easier for me to make online payments.	
	PU5	I believe m-wallet improves the quality of online transaction.	
	PU6	Overall, I think using a m-wallet services would improve my performance.	
Perceived Ease of Use	PEOU1	I believe step by step navigation of m-wallet services are easy to understand.	
	PEOU2	I believe learning to use m-wallet services is easy.	
	PEOU3	I like the fact that payments done through m-wallet services require minimum effort.	
	PEOU4	I believe it is easy to transfer money through m-wallet services as minimum steps are required	
	PEOU5	Overall I think m-wallet services is very easy to use.	
Security	SEC1	I will be confident making payments through m-wallet services.	
	SEC2	I believe the m-wallet services have a potential to be safer than traditional payment options such as credit cards and cash.	
	SEC3	I believe technology used in m-wallet is very secure.	

Factor	Code	Item	Source
	SEC4	I believe that transactions conducted through m-wallet are secure.	
	SEC5	I believe the chances of losing money stored in m-wallet apps are low.	
Trust	TR1	I trust transactions happening through m-wallet services.	
	TR2	I trust the business providers of m-wallet services will not divulge any of my information to third party.	
	TR3	I believe m-wallet services keeps customer's interests best in mind	
	TR4	I believe m-wallet services keeps its promises and commitments	
	TR5	I believe that in case of any issue the service provider will provide me assistance	
	TR6	I believe that the m-wallet service providers follow consumer laws.	
Facilitating Conditions (FC)	FC1	My mobile device is appropriate for using a m-wallet services.	
	FC2	The cost of purchasing a mobile device suitable for using m-wallet services is affordable to me.	
	FC3	I have the knowledge necessary to use m-wallet services.	
	FC4	I can easily find a person who can help me out if I get stuck while using m-wallet services.	
Lifelines	LC1	I believe that using m-wallet services will fit my lifestyle.	

Factor	Code	Item	Source
	LC2	I believe that using m-wallet services are suitable for me.	
	LC3	I believe that my m-wallet services are compatible with the way I shop online.	
	LC4	I think m-wallet services is more suitable to me since I spend more time on mobile apps than on desktop.	
	LC5	Keeping a record of transactions and receipts is my habit and I believe m-wallet services fulfills them.	
	Attitude	ATT1	
ATT2		I like the concept of using m-wallet	
ATT3		I feel pleasant about using m-wallet	
ATT4		I think using m-wallet is enjoyable	
ATT5		I value the benefits of m-wallet	
Intention	IN1	I would like to do transactions using m-wallet services in the near future.	
	IN2	It is very likely that I will use my smartphone to pay at the point-of-sale.	
	IN3	I will frequently use m-wallet services in future.	
	IN4	I intend to recommend others to use m-wallet services.	