Embracing Sustainable E-Wallet for Financial Inclusion in Tanzania

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Abstract

Formal financial services. Therefore, its sustainability is essential. The study developed a novel model to investigate its sustainability in Tanzania using a structural equation modelling technique (SEM). Three hundred sixty-one (361) questionnaires were collected and used in the data analysis. Results indicate that perceived usefulness, user satisfaction, and perceived security significantly drive the continued usage of e-wallets. Convenience influences the perceived ease of use and usefulness of the e-wallets, and mobility impacts the perceived ease of use. In contrast, reachability impacts the perceived ease of use and usefulness of the e-wallets. Additionally, the study found that compatibility influences the perceived usefulness of e-wallets, and perceived usefulness, in turn, affects the satisfaction of e-wallet users. Moreover, the study confirmed that perceived security moderates the relationships between satisfaction and continuance usage intention of e-wallets, as well as between perceived usefulness and users' attitudes towards e-wallet usage. The study provides theoretical and practical insights into the sustainability of e-wallets in Tanzania.

Keywords: e-wallet, financial inclusion, mobility, reachability, perceived security, sustainability, convenience, adoption

Abstrak

Layanan keuangan formal sangat penting, oleh karena itu keberlanjutannya menjadi hal yang esensial. Studi ini mengembangkan model baru untuk menyelidiki keberlanjutan layanan ini di Tanzania dengan menggunakan teknik *Structural Equation Modelling* (SEM). Sebanyak 361 kuesioner dikumpulkan dan digunakan dalam analisis data. Hasil penelitian menunjukkan bahwa persepsi terhadap kegunaan, kepuasan pengguna, dan persepsi terhadap keamanan secara signifikan mendorong keberlanjutan penggunaan dompet digital (*e-wallet*). Kemudahan akses memengaruhi persepsi terhadap kemudahan penggunaan dan kegunaan dompet digital, sementara mobilitas memengaruhi persepsi terhadap kemudahan penggunaan. Sebaliknya, keterjangkauan memengaruhi persepsi terhadap kemudahan penggunaan dan kegunaan dompet digital. Selain itu, penelitian ini menemukan bahwa kompatibilitas memengaruhi persepsi terhadap kegunaan dompet digital, dan persepsi terhadap kegunaan pada gilirannya memengaruhi kepuasan pengguna dompet digital. Lebih lanjut, studi ini juga mengonfirmasi bahwa persepsi terhadap keamanan memoderasi hubungan antara kepuasan dan niat untuk terus menggunakan dompet digital, serta antara persepsi terhadap kegunaan dan sikap pengguna terhadap penggunaan dompet digital. Penelitian ini memberikan wawasan teoritis dan praktis mengenai keberlanjutan dompet digital di Tanzania.

Kata kunci: dompet digital, inklusi keuangan, mobilitas, keterjangkauan, persepsi keamanan, keberlanjutan, kenyamanan, adopsi

JEL Classification: G21, O33, L16

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1. Introduction

Traditional payment systems have been considered ineffective in developing countries because most people live in rural and isolated areas without access to banks and other financial institutions (Kilani et al., 2023). This means that conducting financial transactions for them is very difficult and ineffective. Studies have shown that, with traditional payment systems, it becomes difficult for people living in rural areas to participate fully in the formal economy, as they often lack access to financial services. Developing technologies have revolutionized the way payments are conducted in developing countries. Technologies have enabled the introduction of mobile money, which banks and mobile service operators offer. The introduction of mobile money systems has simplified the process of conducting payments and enabled people in rural areas to participate in the formal financial sector. People living in rural areas can pay bills, send money, and purchase products online. Since then, the Bank of Tanzania (BoT) has made much effort to ensure that the payment system in Tanzania is safe, secure, efficient and reliable to enable mobile payment (BoT, 2022a). BoT has implemented various legislations to allow the smooth operation of mobile money, introduced the Tanzania Instant Payment System (TIPS), which is a switch for retail payments, and Tanzania Quick Response Code (TANQR) to increase efficiency and interoperability in payment (BoT, 2022b) .

Reports from the BoT have shown significant growth in the adoption of mobile money following the introduction of the LIPA number. However, the value of mobile money has decreased (BoT, 2022b). The Bank of Tanzania has introduced several interventions, including the Electronic Money Regulations 2015, the National Payment Systems Act 2015, and the Payment Systems Licensing Approval Regulations 2015, to improve the efficiency and Security of electronic payments (BoT, 2022b). While considerable effort has been invested in facilitating the use of e-wallets, several challenges have also been identified that hinder the adoption and utilization of e-wallet services by service providers. These challenges include technological challenges, behaviour challenges, and managerial challenges. Therefore, to accelerate and ensure the sustainable adoption and usage of e-wallet services, it is necessary to identify factors that can create a supportive environment for continued e-wallet service usage by mobile service providers, thereby ensuring financial inclusion in rural and isolated areas.

This Study examines the factors that can influence the continuous usage of e-wallet services in Tanzania. To achieve that objective, it adapted Technology Continuous Theory (TCT) to study the continuous behaviour of using e-wallets. The theory was further extended by using mobile payment characteristics variables (mobility, reachability, compatibility, and convenience) to make it more rigorous in explaining the continuance behaviour of using e-wallets. Moreover, it was also integrated with perceived Security to address the security concerns when using e-wallets.

2. Literature Review and Hypothesis

E-Wallet Platforms, Adoption in Tanzania and Financial Inclusion

E-wallet platforms were introduced in Tanzania in 2008 with the launch of Mpesa (Mng'ong'ose, 2017). In a short span of time between 2008 and 2012, four mobile money service providers entered the market, namely M-Pesa, Tigopesa (now Mix by Yas), Easy Pesa, and Airtel Money. With technological advancements, they transitioned from Unstructured Supplementary Service Data (USSD) to mobile apps for accessing services. Mobile apps offer an intuitive and interactive user interface with functionalities such as connecting with banks, making payments, paying fees, government levies, and fines, as well as purchasing goods. A recent development in mobile applications is the emergence of mini-apps, which were recently introduced by Vodacom Mpesa and Mix by Yas. Mini-apps are lightweight mobile apps within a mobile app which combine web technologies and native app capabilities (Ryu et al., 2022; Y. Wang et al., 2024). With mini-apps, the users do not need to download, install or register to

use it (Schreieck et al., 2023). Additionally, they make it easy and convenient for e-wallet users to conduct transactions between apps without needing to navigate out of the host mobile app. E-wallets have contributed immensely to financial inclusion by allowing people without access to formal financial services to access and participate in the digital economy(Bank of Tanzania, 2023a; FSDT, 2024). It enables citizens to access microloans, purchase goods and services, obtain insurance services, and invest in shares. Access to financial services is an indicator of economic growth. Thus, e-wallets contribute to financial inclusion and economic development. According to Bank of Tanzania (2023b), financial inclusion stands at 76%, driven by adopting financial digital like e-wallets. In a country where 23.3% have bank accounts (Statistica, 2025), e-wallets bridge the gap between the formal financial system and the unbanked population. However, deliberate efforts should be taken to address issues contributing to higher financial exclusion levels in women and youth in rural areas across the country (Were et al., 2024).

Theoretical Research Framework and Hypotheses
This study adapted the Technology Continuous Theory (TCT) to examine the continuous usage of mobile wallets in electronic financial transactions. The theory was developed by combining three theories —the Technology Acceptance Model, the Expectation-Confirmation Model, and the Cognitive Model —to provide rigorous information for examining the continuous use of information systems. The TCT produces high explanatory power compared to individual combined theories, making it the best model for explaining continuous behaviour (Daragmeh et al., 2021a). Furthermore, TCT is considered superior in applicability in the entire adoption cycle, including initial, short-term term and long-term adoption (Daragmeh et al., 2021b). Since technology adoption is influenced by both perception factors and external factors that contribute to its adoption (Kim et al., 2010), this study integrates the TCT theories with the characteristics of mobile payments. The theoretical research framework of the Study is shown in Figure 1.
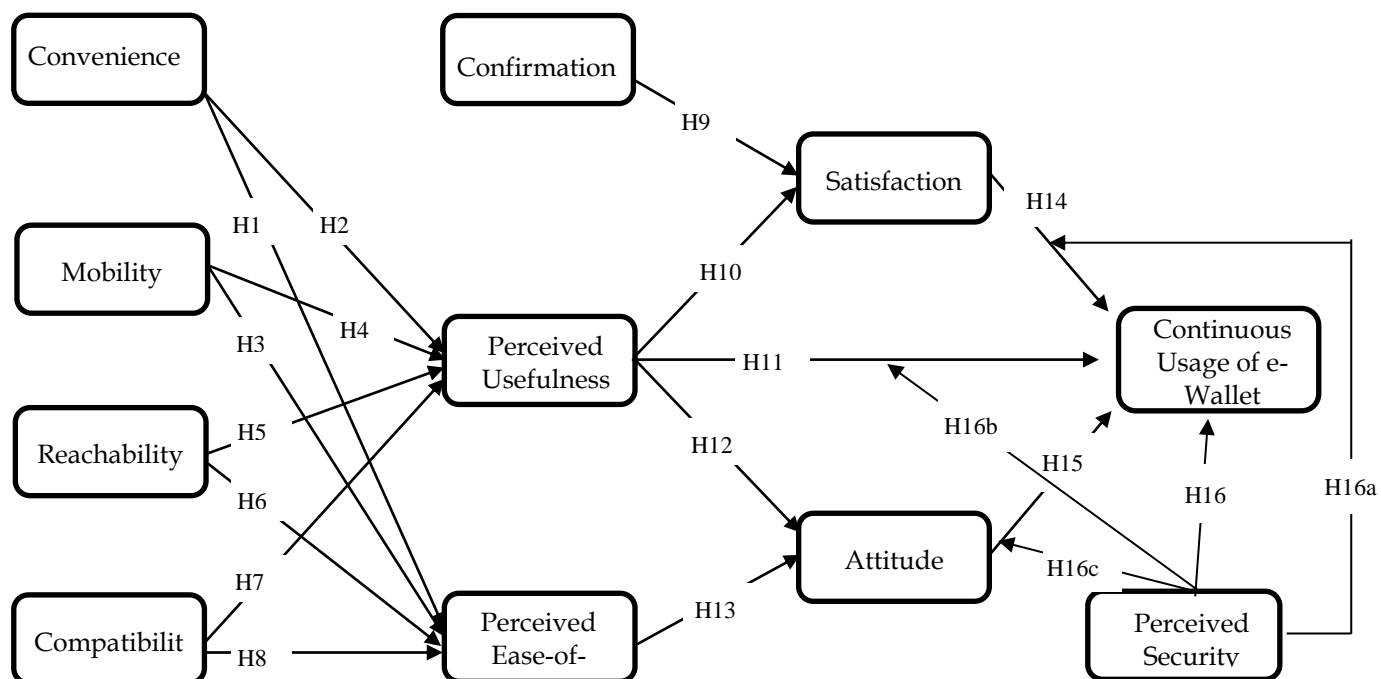

Figure 1: Theoretical framework of the Study

Convenience refers to consumers saving time and effort in accessing services (Berry et al., 2002). It is crucial in technology adoption (Jebarajakirthy & Shankar, 2021). In the context of

an e-wallet, it refers to the effort and time saved when accessing finances for paying e-services. When consumers perceive the service as convenient, they are more likely to consider it beneficial and easy to use. Therefore, they may choose to continue using it. Previous studies have confirmed the influence of consumers' perceptions of convenience on the usefulness of e-services. For instance, the study conducted by Al-Adwan (2020) indicated that convenience influences users' perceived usefulness, while Kim et al. (2013) found that convenience has a positive influence on users' perceptions of the ease of use of mobile payments. Therefore, the current postulate that:

H1: Perceived convenience positively and significantly influences the perceived ease of use of the e-wallets.

H2: Perceived convenience positively and significantly influences the perceived usefulness of the e-wallets.

Mobility is the key distinguishing factor between e-wallets and conventional payment methods. In e-wallets and mobile payments, mobility enables users to access and utilize payment services using mobile devices anywhere and anytime. The mobility characteristics of e-wallets cultivate the perceived usefulness and ease of use of the service. The positive relationship between mobility and perceived usefulness has been documented in IS literature. For instance, Kim et al. (2013), Tjandra et al. (2022) and Zhang (2022a) have found that mobility positively influences perceived usefulness and ease of use in mobile payments. Therefore, the hypotheses:

H3: Mobility positively and significantly influences the perceived ease of use of e-wallets.

H4: Mobility positively and significantly influences the perceived usefulness of e-wallets.

Reachability is the users' ability to effectively and seamlessly access e-wallet services anywhere, anytime (Altay & Okumuş, 2022; Wu & Ho, 2022; Zhang, 2022b). Service providers should enable users to access e-wallet services conveniently and seek clarifications for incomplete transactions, request account balances, and more. (Kim et al., 2013). On the other hand, the reachability feature enables the service provider to contact e-wallet users about e-wallet services or clarify issues related to these services. A highly accessible e-wallet enhances the service's ease of use and the perception of its usefulness, ultimately promoting continued use of the e-wallet services. The above arguments lead to the following hypotheses:

H5: Reachability positively and significantly influences the perceived usefulness of e-wallets.

H6: Reachability positively and significantly influences the perceived ease of use of e-wallets.

Compatibility is defined as the degree to which an innovation is consistent with the existing values and experience of the potential adopters (Rogers, 1995). When innovation aligns with or complements existing norms, the lifestyle and experience of e-wallet users become more straightforward to use and more useful to them. Most nationwide merchants widely accept e-wallets and mobile payments, which are compatible with the users' lifestyles. Therefore, the likelihood of being perceived as beneficial and easy to use is high. The relationship between the innovation's perceived usefulness, perceived ease of use and compatibility has been confirmed in previous studies (Chen et al., 1986; Kim et al., 2013). Hence, the hypotheses:

H7: Compatibility positively and significantly influences the perceived usefulness of e-wallets.

H8: Compatibility positively and significantly influences the perceived ease of use of e-wallets.

Identifying users' expectations of the product or service is essential for developing strategies to meet those expectations. User expectations are the foundation for creating a product or

service that meets user satisfaction. Confirmation constitutes the process whereby a consumer compares prior expectations and the actual performance of the product or service (Bhattacherjee, 2001). As documented in IS literature, confirmation of user expectations is directly linked to user satisfaction. For instance, in the context of mobile payments, previous studies found that when users confirm their expectations, satisfaction levels also increase, and ultimately, their intention to continue using the services or products accelerates (Daragmeh et al., 2022; Koloseni & Mandari, 2017; Qatawneh et al., 2024; Twum et al., 2023). In the context of this study, it is therefore reasonable to postulate that:

H9: User confirmation of expectations has a positive and significant influence on users' satisfaction with e-wallets.

Perceived usefulness constitutes consumers' perceptions of the benefits of the technology, system or services (Davis, 1989). It is among the fundamental driving forces in technology adoption and continuance use of the same (Baidoun & Salem, 2024; Foroughi et al., 2019). Also, perceived usefulness is linked to user satisfaction and attitude (Kar, 2021; Kurniasari & Abd Hamid, 2020). Previous studies have confirmed user satisfaction increases as the perception of e-service or technology's usefulness increases (Foroughi et al., 2019). On the same note, as perceived usefulness increases, users' attitudes towards e-services or technology become more positive. In the context of e-wallets, the study therefore hypothesizes that:

H10: Perceived usefulness positively and significantly influences the users' satisfaction with the e-wallets.
H11: Perceived usefulness positively and significantly influences the users' intention to continue using the e-wallets.
H12: Perceived usefulness positively and significantly influences the users' attitude towards the e-wallets.

Perceived ease of use refers to the ease with which consumers can access the technology or service (Davis, 1989). Perceived ease of use and perceived usefulness are essential factors driving technology adoption (Park & Kim, 2023). It is expected that as technology becomes easier to use, consumers' attitudes towards it will be more positive, thus motivating users to continue using it. The linkage between the perceived ease of use and users' intentions to continue using the technology or service has been well-documented in the information systems literature. For instance, the previous Study on mobile payment and e-wallets has indicated that perceived ease of use significantly influences the intention to use and continue using them (Lim et al., 2024a; Mensah, 2021). Therefore, it is reasonable to postulate that:

H13: Perceived ease of use positively and significantly influences the users' attitude towards the e-wallets.

Satisfaction indicates the success or failure of the product or services (Sedera & Tan, 2005). It encompasses users' experiences and feelings when interacting with the technology. Satisfaction motivates users to use and continue using information systems or technology (Bhattacherjee, 2001). When users are satisfied with the services offered by an information system, they remain interested and continue using it (Q. Chen et al., 2019; S.-C. Chen et al., 2019). In the context of mobile payment and e-wallets, it has been confirmed that user satisfaction is a crucial element in motivating users to continue using e-wallets and mobile payment services (Amin et al., 2024; Franque et al., 2021). Therefore, the Study hypothesizes that:

H14: User satisfaction positively and significantly influences users' intention to continue using the e-wallets.

Attitude is defined as consumers' feelings and beliefs, either positive or negative, towards the intention to adopt or continue using technology (Maryam et al., 2022). A consumer with a

positive attitude towards technology is more likely to adopt it. Similarly, if an individual has a negative attitude, the likelihood of adopting it diminishes. Accordingly, previous studies have confirmed the influence of user attitude on the intention to continue using mobile payment systems (Alhassan et al., 2020; Foroughi et al., 2019; Law, 2020; Maryam et al., 2022). Therefore, the hypothesis:

H15: User attitude influences users' intention to continue using the e-wallets.

Perceived Security in the context of mobile payments or e-wallets entails the degree to which users believe their financial and personal information is secure during transactions in a mobile platform(Hartono et al., 2014). Information security is crucial in financial-related transactions, and its lack deters users from using or continuing to use mobile payment systems. Moreover, users are concerned that their personal information could be stolen and could suffer financial losses as a result of using unsecure mobile payment systems (Al-Qudah et al., 2024; El Haddad et al., 2018; Liébana-Cabanillas et al., 2024). As previously found, these security concerns may alter users' attitudes and diminish the usefulness and satisfaction with e-wallet services. IS literature indicating that user perceptions of Security negatively impact the use and intention to continue using mobile payment services (Lim et al., 2024a). Hence, the hypothesis:

H16: Perceived Security positively and significantly influences users' intention to continue using the e-wallets.

H16a: Perceived security moderates the relationship between user satisfaction and intention to continue using the e-wallets.

H16b: Perceived security moderates the relationship between perceived usefulness and users' intention to continue using the e-wallets.

H16c: Perceived security moderates the relationship between user attitude and the perceived usefulness of using e-wallets.

3. Data and Method

The study employed a quantitative approach to examine the adoption of e-wallets, focusing on identifying the drivers of sustainable e-wallet adoption in support of financial inclusion. The respondents included users of mobile e-wallets in Dar es Salaam, a business city in Tanzania, who had experience using e-wallets at least once per week for shopping or paying for services. The respondents were selected purposively using self-administered questionnaires at various malls and popular shopping centers in Dar es Salaam. The data was collected over the weekends (i.e. Saturday and Sunday). Weekends were selected because people (consumers) tend to shop during that period. The respondents were asked to fill out the questionnaire at the exit points. Of the 397 collected responses, 36 questionnaires were discarded because they had substantial missing values, as recommended by Hair Jr et al. (2010). Hence, 361 were used for the subsequent data analysis. Using G*Power software to estimate sample size and effect size (Kang, 2021), the sample size used for analysis is sufficient to attain a medium effect ($f^2 = 0.15$). The descriptive information of the sample is reported in Table 1. All constructs of the study were borrowed from previous studies and modified to suit the context of the study, as follows: convenience (Roh & Park, 2019), mobility and reachability (Kim et al., 2013), compatibility (Mai & Nguyen, 2024), confirmation and continuance intention (Daragmeh et al., 2022), perceived usefulness and satisfaction (Daragmeh et al., 2022; Deanna et al., 2024), perceived ease of use (Venkatesh & Davis, 2000), perceived Security (Khalilzadeh et al., 2020; Kim et al., 2010), attitude (Schierz et al., 2010). Appendix A presents all measurement items used in this study. The measures were assessed using a five-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree").

4. Results

Table 1: Descriptive information of the Sample

Category/ Variable		Frequency	Percentage (%)
Gender	Male	170	47.1
	Female	191	52.9
Age	18-24	17	4.7
	25-35	91	25.2
	26-45	143	39.6
	Above 45	110	30.5
Frequency of Using e-Wallets	Once per week	73	20.2
	Once per day	159	44.0
	Two to five times per day	78	21.6
	More than five times per day	51	14.1
Income Level	100,000 - 300,000 TZS	11	3.0
	300,001 - 500,000 TZS	9	2.5
	500,001 - 1,000,000 TZS	97	26.9
	Above 1,000,000 TZS	244	67.6

Data Analysis and Results

The study employed the Partial Least Squares (PLS) structural equation modelling (SEM) technique for analysis of the measurement model and structural model. The PLS-SEM was selected because of its ability to estimate models with many latent variables and provide robust predictions in the context of a small sample (Akter et al., 2017). The current study tests 16 direct hypotheses and three moderating hypotheses. Based on its complexity, PLS-SEM fits well with the context of this study.

Partial Least Squares Structural Equation Modelling (PLS-SEM) adalah teknik yang dipilih untuk menganalisis kedua structural dan measurement models dalam penelitian ini. PLS-SEM dipilih karena kemampuannya untuk menangani model kompleks dengan banyak latent variables serta kemampuannya untuk beroperasi dengan sample yang relatif kecil (Akter et al., 2017). A total of 16 direct hypotheses and three moderating hypotheses were tested. PLS-SEM was determined to be the most appropriate analytical approach because of the model's complexity and its predictive aims. The primary focus of the study is on the hypothesis testing results because these results are critical to addressing the research objectives and confirming the relationships that have been proposed in the model.

Measurement Model Evaluation

Before assessing the measurement model, the study initially evaluated the presence of Common Method Bias (CMB). It is essential to determine CMB because its presence may affect the subsequent results by inflating or deflating observed variables (Kock et al., 2021). Using the approach coined by Kock (2015), the value inflation factors (VIF) obtained ranged from 1.001 to 1.921. The obtained VIFs are below 3.3, confirming that the model does not suffer from common method bias.

Reliability and validity were assessed to ascertain the quality of the measurement model. While reliability was evaluated using Cronbach's alpha, composite reliability and validity were assessed using the Average Variance Extracted (AVE) and factor loadings. The finding indicates that Cronbach's alpha and Composite reliability values are above the recommended threshold values of 0.7, indicating that the measurement items are reliable (Hair et al., 2012). Moreover, the AVE values were well above 0.50, signifying that convergent validity has been achieved. The convergent validity results imply that each construct items is theoretically related and reflect a common construct (Lim, 2024). Table 2 shows the psychometric properties

of the measurement items.

Table 2: Psychometric Properties of the Measurement Items

	Cronbach's alpha	Composite reliability (rho_a)	Average variance (AVE)
ATT	0.870	0.908	0.791
CI	0.932	0.932	0.880
CMP	0.922	0.928	0.865
CN	0.879	0.724	0.783
CON	0.885	0.891	0.897
MB	0.759	0.812	0.672
PE	0.853	0.858	0.695
PS	0.850	0.868	0.769
PU	0.846	0.860	0.767
RC	0.836	0.711	0.729
SAT	0.907	0.918	0.784

Further, the study evaluated the discriminant validity of the measurement model using the Hetero trait – Mono trait (HTMT) ratio. A discriminant validity test is essential to ascertain that measures that are not supposed to be theoretically related are genuinely unrelated (Lim, 2024). The results in Table 3 show that the HTMT ratio values are below 0.90, signifying that discriminant validity has been achieved (Henseler et al., 2015).

Table 3: Discriminant Validity Results - HTMT Ratio

	ATT	CI	CMP	CN	CON	MB	PE	PS	PU	RC	SAT
ATT											
CI	0.040										
CMP	0.030	0.877									
CN	0.811	0.060	0.044								
CON	0.069	0.780	0.760	0.066							
MB	0.111	0.059	0.081	0.085	0.089						
PE	0.149	0.031	0.027	0.093	0.132	0.300					
PS	0.059	0.135	0.123	0.038	0.103	0.095	0.040				
PU	0.033	0.838	0.815	0.035	0.682	0.106	0.100	0.349			
RC	0.665	0.051	0.116	0.638	0.039	0.072	0.195	0.057	0.052		
SAT	0.054	0.721	0.770	0.058	0.762	0.092	0.066	0.164	0.706	0.06	

Structural Model Results

The results of the hypothesis testing indicate that thirteen out of sixteen direct hypotheses were supported. Specifically, the study found that convenience has a positive influence on the ease of use (H1) and the usefulness of e-wallets (H2). Additionally, the survey revealed that mobility has a positive influence on perceived ease of use (H3) but does not impact perceived usefulness (H4). The proposition that reachability impacts perceived usefulness (H5) and perceived ease of use (H6) was supported. The study also found that compatibility has a positive influence on perceived usefulness (H7). Conversely, the study found that compatibility has an insignificant influence on the perceived ease of use of e-wallets (H8).

Furthermore, the study found that confirmation of users' expectations has no significant influence on satisfaction with e-wallets (H9), whereas perceived usefulness has a significant influence on the same (H10). The proposition that perceived usefulness positively impacts attitude towards using e-wallets (H12) and attitude towards using e-wallets does not influence users' intention to continue using e-wallets was not supported (H15).

On the other hand, the impact of perceived usefulness on users' attitudes towards using e-wallets was confirmed (H13). Additionally, the study confirmed that perceived usefulness (H11), user satisfaction (H14) and perceived Security (H16) influence users' intention to continue using e-wallets. Regarding moderation analysis, the study found that perceived security moderates the influence of user satisfaction on the intention to continue using e-wallets (H16a) and perceived usefulness on users' attitudes towards using e-wallets (H16b). On the contrary, the study found that the influence of perceived usefulness is not strengthened by users' perceptions of e-wallet security(H16c). The hypothesis test results are indicated in Table 4 and Figure 2.

Table 4: Results of the Hypotheses Testing

|	Hypotheses/Paths			β	t-Values	p- values	Remarks
H1	CON	⟶	PE	0.143	2.179	0.029	Supported
H2	CON	⟶	PU	0.169	2.778	0.005	Supported
H3	MB	⟶	PE	0.247	4.757	0.000	Supported
H4	MB	⟶	PU	0.040	0.984	0.325	Not Supported
H5	RC	⟶	PU	0.090	2.586	0.010	Supported
H6	RC	⟶	PE	0.205	4.048	0.000	Supported
H7	CMP	⟶	PU	0.616	11.573	0.000	Supported
H8	CMP	⟶	PE	0.057	0.76	0.447	Not Supported
H9	CN	⟶	SAT	-0.049	0.938	0.348	Not Supported
H10	PU	⟶	SAT	0.619	15.36	0.000	Supported
H11	PU	⟶	CI	0.385	9.236	0.000	Supported
H12	PU	⟶	ATT	0.027	0.408	0.683	Not Supported
H13	PE	⟶	ATT	0.128	2.39	0.017	Supported
H14	SAT	⟶	CI	0.606	14.764	0.000	Supported
H15	ATT	⟶	CI	0.023	1.035	0.301	Not Supported
H16	PS	⟶	CI	0.099	4.841	0.000	Supported
H16a	PS x SAT	⟶	CI	-0.165	2.936	0.003	Supported
H16b	PS x PU	⟶	CI	0.084	1.868	0.062	Not Supported
H16c	PS x PU	⟶	ATT	0.126	2.316	0.021	Supported
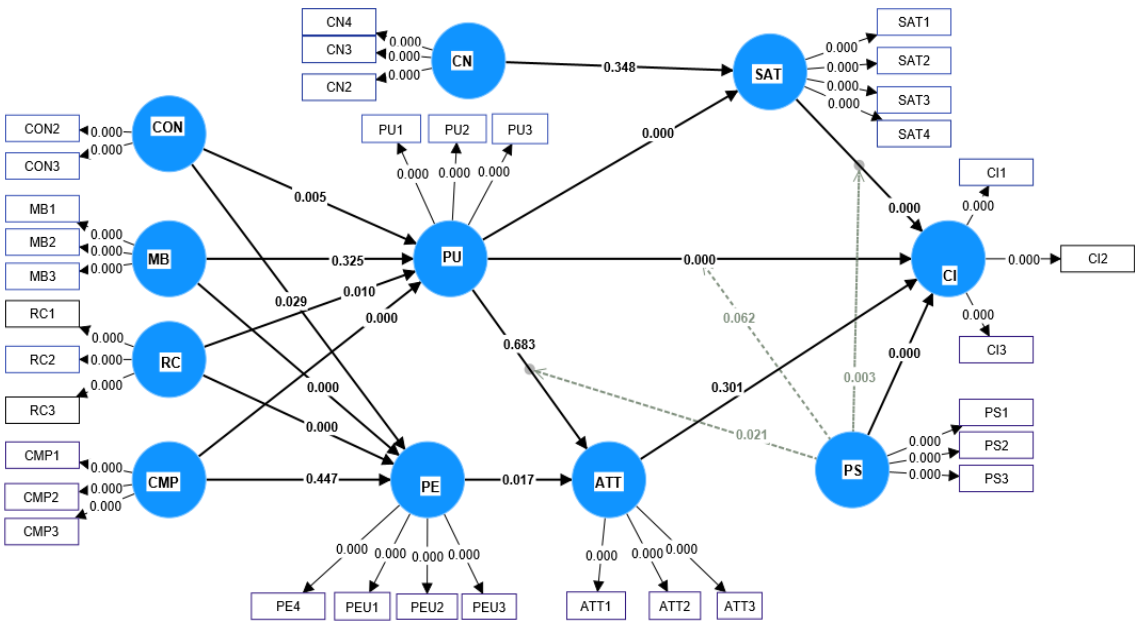
Figure 2: Results of Hypotheses Testing

Explanatory Power and Predictive Ability

Regarding the model explanatory power, the model explanatory power is substantial (R^2 = 71.3%), according to Henseler et al. (2009), these findings complement the model's predictive ability, indicating that Q2 is greater than zero, which signifies that the model has adequate predictive ability. These findings prove the models' reliability in predicting the hypothesized theoretical model of the study.

5. Discussion

The application of e-wallets has gained popularity in Tanzania, and most service providers have incorporated it as a payment method for their services. Due to its widespread use, several regulations and guidelines have been implemented to govern its use, notably the Electronic Money Regulations (2015) and the QR code standards (Bank of Tanzania, 2022). To promote its sustainability for financial inclusion, the current study examines the key issues influencing the continued use of this approach, with a focus on enhancing Tanzania's financial inclusion efforts. The hypothesis test results indicate that as the perception of convenience increases, the user-perceived usefulness and ease of use of the e-wallets for making transactions also increase. This finding complements previous studies conducted by Bansah and Darko Agyei (2022) and Chang et al. (2012), who observed the same trend in e-learning. Similarly, reachability has an impact on the user's perception of the usefulness and ease of use of e-wallets, which is consistent with the study conducted by Wu and Ho (2022).

Additionally, mobility supports perceived ease of use (Altay & Okumuş, 2022; Wu & Ho, 2022). However, the study found that mobility does not cultivate user perceptions of the e-wallet's usefulness. Perhaps because all service providers offer mobility features in e-wallets, the feature becomes a standard prospect rather than an attractive aspect that would enhance the perceived effectiveness of e-wallets.

Additionally, the study confirmed that as e-wallets become compatible with user norms, such as checking balances and making transactions, their perceptions of usefulness increase. This finding collaborates with previous findings such as (Akpınar & Atak, 2025; Setälä et al., 2025), which found the same trend in the context of generative AI and innovative mobile applications. Nevertheless, contrary to the study's expectations, compatibility did not impact the user's perceived ease of use of the e-wallets. The reason could be that e-wallets are easy to use. Thus, compatibility with users' devices, norms and lifestyles does not contribute to users' perceptions of its ease of use.

The study has found that as users' perceptions of the usefulness of e-wallets increase, their satisfaction and intention to continue using them increase, endorsing the previous findings (Arpaci & Kusci, 2025; Liu et al., 2025). On the same note, the study's findings have established that positive perceptions of the system's ease of use boost users' attitudes towards continued usage of the e-wallets, unlike perceptions of the e-wallets' usefulness. The finding is consistent with (Alzboon et al. 2025; Wang & Hou, 2025).

Furthermore, the study confirmed that user satisfaction, perceived usefulness and positive perceptions regarding the security of e-wallets impact their continuance usage. The influence of satisfaction on the continuance intention of using e-wallets for payments is supported by (Chen & Zhou, 2025). On the same note, the impact of user attitude on the continuance intention of using e-wallets is supported by previous studies (Koloseni & Mandari, 2025; Shetu, 2025).

Further, the positive perceptions of the security of the e-wallets are supported by (Lim et al. (2024). These findings have powerfully demonstrated the moderating effects of perceived

security in heightening the user's attitude and satisfaction levels towards the intention to continue using e-wallets. However, the study falls short of confirming whether positive perceptions of security strengthen the user's perceptions of usefulness and their intention to continue using the e-wallets.

Theoretical Implications

The current study provides insightful information on key issues for sustainable e-wallet adoption in Tanzania and thus contributes to the body of knowledge in the following ways: First, the study contributes to the IS literature on e-wallet adoption by developing and testing a research model which integrates the TCT with mobility, reachability, compatibility, convenience and perceived security variables. These variables reflect the characteristics of mobile payments. The resulting theoretical framework demonstrated substantial explanatory power (R^2 = 71.3%), empirically validating the study's theoretical framework and providing a significant explanation for the continuance adoption of the e-wallet.

Second, the study investigated the moderating effects of perceived security, which has been rarely modelled along with TCT and has not been previously investigated in Tanzania. To the researcher's best knowledge, this could be the first comprehensive study to integrate and operationalize these variables in this manner. Third, by investigating the moderating effects of perceived security, this study revealed the mechanism that could further explain the intriguing impact of user security perceptions on users' intention to continue using e-wallets. Fourth, the study complements the existing IS literature, particularly in e-wallet adoption, by indicating that user satisfaction, perceived usefulness and perceived security produced significant and positive interventions on users' e-wallet continuance intention, similar to previous studies (Ariffin et al., 2021; Bakar et al., 2024; Lim et al., 2024b; Reza et al., 2024), however, mobility, reachability, compatibility and convenience act in the frontage in stimulating this outcome.

Practical Implications

In addition to its theoretical implications, the study has several practical impacts on service providers and policymakers. Users of e-wallets may find them helpful and easy to use if service providers and developers can make them more convenient, compatible with user norms, and accessible. Streamlining user experience that will render transactions effortless by integrating with banking services, QR codes, and NFC technology (Hopalı et al., 2022) and enabling between-app transactions could help boost convenience in using e-wallets. Therefore, users' perceptions of its usefulness will increase, and consequently, they will continue to use it. Furthermore, the reliable, anywhere, and anytime accessibility of e-wallet services could enhance users' perceived usefulness of using e-wallets. Enhancing e-wallet compatibility to mimic user norms when using e-wallets by introducing compatible services that match with users' lifestyles and do not require effort to re-adjust lifestyle (Bakar et al., 2024; Hopalı et al., 2022) such as checking balances and withdrawing money could cultivate user perceived usefulness.

Similarly, service providers and developers could strive to increase user satisfaction with the e-wallets by focusing on efficiency, service reliability, service security, customer service, user-friendly interface and economic benefits (Nurcahyo et al., 2023). By doing so, the satisfaction level will increase, and the user will continue using the e-wallets. Additionally, in recognizing the significance of the moderating effects of perceived security, it is imperative that when considering the usefulness and user satisfaction aspects of e-wallets, security aspects should be included, as they strengthen users' desire to continue using the e-wallets. Overall, the suggested strategies regarding the study's outcomes will contribute to the sustainability of the e-wallets and, ultimately, the country's financial inclusion efforts.

6. Conclusion

This study employed the TCT as the foundational research model. Nevertheless, the TCT was extended by including convenience, reachability, mobility, compatibility, and perceived security variables. The study found that for the sustainability of the e-wallets, the user's perceived usefulness, satisfaction, and perceived security are the immediate antecedent pillars for users' continuance intention to use them. However, cultivating a positive attitude towards users' continuance intention on e-wallets should not be a priority for policymakers and developers as this factor was not significant. The findings of this study offer both practical and theoretical implications for practitioners and policymakers for the sustainability of e-wallets and the country's financial sustainability efforts.

Despite the insightful findings offered in this study, it has some limitations that are worth addressing in future studies. First, the study employed self-reported measures, which are often susceptible to common method bias. Future studies may use surveys and interviews to address the common method bias (CMB). However, the study confirmed through a full collinearity test that no CMB issue exists. Thus, the findings are not biased. Further, the findings of this study may not be generalized because it was conducted in only one place, Dar es Salaam, Tanzania. Since e-wallet experiences may differ across countries and cultures, future studies may conduct a similar survey across countries to obtain a more generalized picture of the sustainable drivers of e-wallet use among consumers. Also, further studies may focus on understanding the e-wallet's sustainability and financial inclusion for people with disabilities, an area that received little attention.

Recommendation

To support Embracing Sustainable E-Wallet for Financial Inclusion in Tanzania, it is recommended that e-wallet developers and service providers focus on improving accessibility and digital literacy, especially in rural areas and low-income groups. The government and the private sector need to work together to provide reliable network infrastructure and ensure affordable transaction costs. In addition, educational campaigns on the security and benefits of sustainable e-wallet use are essential to build user trust and encourage wider adoption, so that e-wallets can truly serve as an effective financial inclusion tool in Tanzania.

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