International Journal of Innovative Research and Scientific Studies, 8(6) 2025, pages: 3362-3373

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

The moderating role of gender in young individuals' usage of E-wallets

Kyra Law Ley Sy[1], Si Chong En[2*], Kelly Tee Pei Leng[3]

[1,2]*Faculty of Management, Multimedia University, Malaysia.*
[3]*Faculty of Social Sciences & Leisure Management, Taylor's University, Malaysia.*

Corresponding author: Si Chong En (*Email: si.chongen@mmu.edu.my*)

Abstract

The widespread use of electronic wallets (e-wallets) has transformed digital payment landscapes yet understanding gender-specific usage patterns remain crucial for service providers and policymakers. This study examines how gender moderates the relationship between users' perceptions of e-wallet attributes such as security, convenience, and transaction speed and their actual usage. Using an online survey of 180 respondents aged 15 - 30 years, the study finds that gender significantly moderates the effect of perceived security on e-wallet usage, with male and female users exhibiting different levels of concern. However, gender does not substantially moderate the effects of perceived convenience or transaction speed. This suggests that while security perceptions vary by gender, male and female users prioritise ease of use and transaction efficiency in their e-wallet interactions. Notably, the findings indicate a shift in digital payment behaviour, where convenience and speed outweigh traditional security considerations. This challenges the assumption that security concerns are the primary drivers of e-wallet usage. These insights contribute to the growing literature on digital financial services and offer practical implications for e-wallet providers. Understanding gender-specific usage patterns can inform targeted marketing strategies and user interface designs that address security concerns while maintaining the universal appeal of convenience and efficiency.

Keywords: Digital payment behaviour, E-wallet usage, Gender differences, Perceived security, User experience.

DOI: 10.53894/ijirss.v8i6.10356
Funding: This study received no specific financial support.
This research was supported by Multimedia University, Malaysia. The funding facilitated the design, data collection, and analysis of the study, as well as the preparation of the manuscript for publication.
History: Received: 21 July 2025 / **Revised:** 25 August 2025 / **Accepted:** 27 August 2025 / **Published:** 29 September 2025

Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Institutional Review Board Statement: This research did not involve human experiments or clinical trials. Informed consent was obtained from all survey participants, and their anonymity was maintained in accordance with standard academic research ethics.
Publisher: Innovative Research Publishing

1. Introduction

The rapid digital transformation of financial services has revolutionised payment methods, with electronic wallets (e-wallets) emerging as a dominant force in digital transactions. As digital financial ecosystems expand, understanding the factors influencing e-wallet usage is critical for academics, financial technology (fintech) developers, and policymakers [1]. Among these factors, gender differences have gained increasing attention, as research suggests that male and female users exhibit distinct behaviours and perceptions regarding financial technologies [2]. Despite the widespread use of e-wallets, the role of gender as a moderating variable in digital payment usage remains underexplored, necessitating further empirical investigation [3].

Existing studies on digital payment adoption highlight key determinants such as perceived convenience, transaction speed, and security [4, 5]. However, gender-based differences in evaluating and prioritising these factors remain an understudied domain. Research consistently shows that women demonstrate a heightened sensitivity to security concerns, prioritising financial safety and data privacy when adopting new payment technologies [6]. Conversely, male users tend to prioritise transaction efficiency and technological innovation, leading to varying usage patterns between genders [7]. These distinctions suggest that gender plays a key role in shaping user preferences and influences the extent to which perceived convenience, security, and transaction speed affect e-wallet usage [8].

This study aims to bridge the gap in digital payment literature by examining the moderating role of gender in e-wallet usage among young individuals. By analysing gender-based variations in perceived convenience, security, and transaction speed, this research contributes to the growing discourse on digital financial inclusion and behavioural finance. The findings hold implications for e-wallet service providers seeking to design targeted marketing strategies and user interfaces that cater to gender-specific needs while enhancing overall usage rates [9]. As financial technologies continue to evolve, understanding gendered usage patterns will be instrumental in fostering inclusive digital financial ecosystems that accommodate diverse user preferences. The following sections present the theoretical framework underpinning e-wallet usage, followed by an empirical analysis of gender-based variations in digital payment behaviour. This research provides a comprehensive understanding of how gender moderates key determinants of e-wallet usage, ultimately contributing to the broader discourse on fintech usage and digital financial behaviour.

2. Literature Review

2.1. Theoretical Framework: Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a foundational model for examining how and why individuals use new technologies. Since its introduction by Venkatesh, et al. [10] researchers have applied this framework across diverse technological innovations, particularly in the context of mobile applications and digital payment platforms. Recent research on UTAUT has focused on three critical components that influence technology usage: perceived convenience, transaction speed, and social influence. Among these, perceived convenience is particularly significant, with studies demonstrating a strong positive correlation between users' perception of convenience and their likelihood of using new technologies [11]. Although not originally included in the UTAUT framework, transaction speed has gained increasing recognition as an essential factor in technology usage. Some scholars propose incorporating transaction speed into the performance expectancy component of the UTAUT model [12, 13]. This addition is particularly relevant in the context of digital payment technologies, where processing time significantly influences user satisfaction and adoption decisions. Recent scholarly work has sought to refine the UTAUT model by integrating these evolving factors. The expanded framework explores the interrelationships between convenience, speed, and social influence [1]. Empirical findings indicate that this modified UTAUT model demonstrates stronger predictive capabilities than the traditional framework, reinforcing the need to adapt theoretical models to reflect contemporary technology adoption behaviours [14]. The evolution of the UTAUT model reflects the dynamic nature of technology usage research. As digital technologies become increasingly embedded in everyday life, the factors influencing their acceptance grow more complex. The heightened emphasis on convenience and speed aligns with modern users' expectations for seamless and efficient technological experiences. Incorporating these elements into the UTAUT framework enhances our understanding of usage patterns, allowing researchers to develop more precise and comprehensive models. By acknowledging the growing importance of convenience and transaction speed—alongside established factors such as social influence—scholars can more effectively predict technology usage trends. This refined understanding is invaluable not only for theoretical advancements but also for the practical design and implementation of new technologies. The expanded model’s improved explanatory power underscores the importance of continuous refinement in technology adoption research. As emerging technologies and shifting user preferences reshape the digital landscape, theoretical frameworks such as UTAUT must evolve to remain relevant and applicable. By integrating elements that reflect contemporary user priorities, the enhanced UTAUT model serves as a robust and precise tool for understanding technology usage in today’s digital era.

2.2. Perceived Convenience (PC) And Usage of E-Wallets (EW)

The relationship between perceived convenience and e-wallet usage has been extensively documented in digital payment literature. Perceived convenience, defined as the extent to which users believe e-wallets simplify their payment transactions, is a crucial determinant of both adoption and continued use. Pal, et al. [15] found that perceived convenience significantly influences users' intentions to adopt mobile payment systems, particularly in retail environments. Findings suggest that users value the ability to conduct transactions without the need for physical cash or cards. Similarly, perceived convenience correlates positively with increased e-wallet usage frequency among urban consumers [16]. Perceived convenience encompasses multiple dimensions, including accessibility, time efficiency, and ease of use. Users who perceive e-wallets as convenient are more likely to integrate them into their daily payment routines. Liu, et al. [4] further highlighted the role of convenience in cross-border transactions and contactless payments, particularly during global health crises, when physical payment methods posed additional complications. These findings reinforce the significant positive relationship between perceived convenience and e-wallet adoption rates.

$H_{1:}$ Perceived convenience has a positive impact on e-wallet usage.

2.3. Perceived Security (PS) And Usage of E-Wallets (EW)

Perceived security has emerged as a critical determinant in the adoption and usage of electronic payment systems, particularly e-wallets. Recent research has consistently emphasised the significant role of security perceptions in shaping consumers' willingness to adopt and continue using digital payment solutions [17]. Studies demonstrate that users' concerns regarding transaction security, data privacy, and financial risk significantly influence their e-wallet usage patterns [5]. When consumers perceive robust security measures in e-wallet systems, their confidence in conducting digital transactions increases. This includes biometric authentication, encryption protocols, and fraud protection mechanisms, all of which enhance users' sense of security. Several empirical studies have found a positive correlation between perceived security and e-wallet adoption rates, particularly during the pandemic [18, 19]. However, the relationship between security perceptions and actual usage behaviour is moderated by factors such as user experience, technological familiarity, and demographic characteristics. While security concerns may initially inhibit adoption, their impact on continued usage diminishes as users gain familiarity with the platform. The literature also suggests that security perceptions vary across user segments and cultural contexts [20] underscoring the need for tailored security features and communication strategies that address specific user concerns in different markets.

$H_{2:}$ Perceived security has a positive impact on e-wallet usage.

2.4. Transaction Speed (TS) Usage of E-Wallets (EW)

The relationship between transaction speed and e-wallet usage has been extensively documented in academic literature, emerging as a critical determinant of digital payment usage. Research consistently demonstrates that the speed of transaction processing significantly influences users' decisions to adopt and continue using e-wallet services [21]. Several empirical studies have established that consumers prioritise swift transaction completion when selecting payment methods (citation needed). In developed markets, transaction speed ranks among the top three determinants of e-wallet usage [22]. Similarly, faster processing times are strongly correlated with increased e-wallet usage frequency among urban consumers. The significance of transaction speed is particularly evident in comparative studies between traditional payment methods and e-wallets. Users frequently cite faster transaction processing as a primary reason for switching from conventional payment methods to e-wallets [23]. This preference for speed aligns with broader digital transformation trends, where consumers increasingly value time-efficient solutions. Furthermore, studies in emerging markets indicate that transaction speed not only influences initial adoption but also plays a crucial role in sustaining long-term e-wallet usage [24] reinforcing its fundamental importance in the digital payment ecosystem.

$H_{3:}$ Transaction speed has a positive impact on e-wallet usage.

2.5. Gender as Moderator

The role of gender as a moderating variable in e-wallet usage has garnered significant attention in digital payment research. Studies consistently show that gender differences can significantly influence how individuals perceive and use financial technologies [2]. Research indicates that men and women exhibit distinct patterns in their approach to digital payment solutions [3]. Women typically demonstrate heightened sensitivity to security concerns in financial transactions, placing greater emphasis on privacy protection and fraud prevention measures [6]. This greater security awareness often leads to a more cautious evaluation of e-wallet platforms before usage. Conversely, male users tend to focus more on utility factors such as transaction speed and convenience [8]. Studies suggest that men are generally more inclined to use financial technologies earlier, particularly when they perceive clear advantages in efficiency and ease of use [2]. However, this tendency toward early usage may sometimes come at the expense of thorough security considerations. Additionally, men

tend to base their decisions more on technological features and functional benefits, whereas women prioritise security and trust [7]. These insights highlight the need for tailored marketing strategies in e-wallet usage. For instance, security features might be emphasised more prominently for female users, while convenience and efficiency could be highlighted for male users. This nuanced understanding of gender as a moderator can inform more effective strategies for increasing e-wallet usage across different demographic segments.

$H_{4a:}$ Gender moderates the relationship between perceived convenience and e-wallet usage.

$H_{4b:}$ Gender moderates the relationship between perceived security and e-wallet usage.

$H_{4c:}$ Gender moderates the relationship between transaction speed and e-wallet usage.

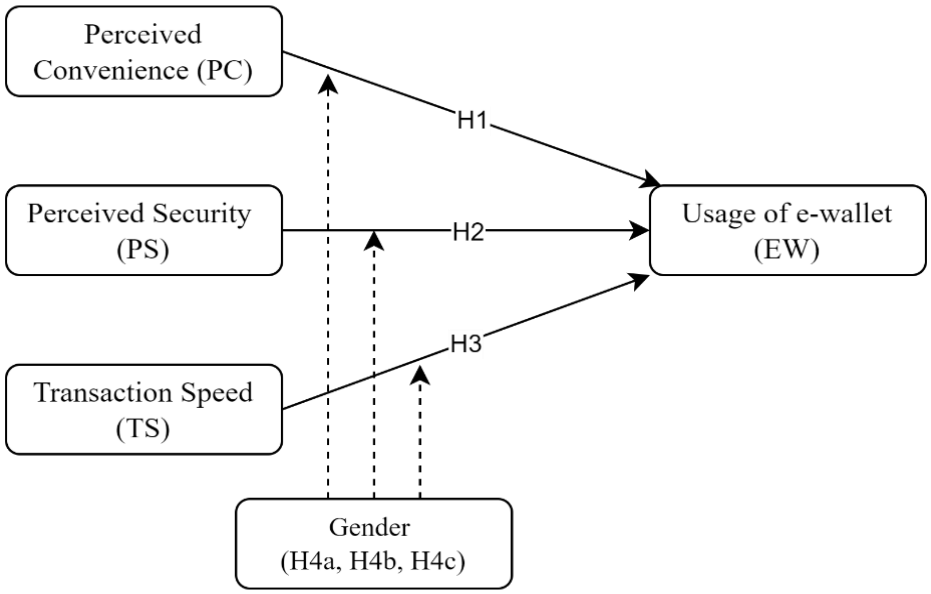

Figure 1.
Research framework.
Source: Sfenrianto, et al. [25] and Davis, et al. [26].

3. Methodology

3.1. Research Design

A quantitative research design involves the systematic collection and analysis of numerical data to identify patterns, relationships, and causal links between variables [27]. Using structured methodologies such as surveys and experiments, this approach relies on advanced statistical tools like SmartPLS for reliable data analysis. This study examines e-wallet usage among young users, aiming to produce objective and generalisable findings. A total of 180 respondents were included, exceeding the minimum required sample size of 132, which was determined based on a desired power of 0.95, a significance level of 0.05, and an effect size of 0.10. Effect sizes were measured using Cohen's d and phi coefficients, where d values of 0.20, 0.50, and 0.80 indicate small, moderate, and significant effects, respectively [28, 29]. Respondents were recruited through an online questionnaire and were required to be at least 15 years old and literate in English. By adhering to rigorous statistical standards and exceeding participant requirements, this study provides robust insights into e-wallet usage patterns among young individuals.

3.2. Instrument and Data Analysis

This study examines e-wallet usage through the UTAUT framework, focusing on perceived convenience, transaction speed, and perceived security. A 20-item adapted questionnaire was employed, with respondents rating statements on a 5-point Likert scale to assess usage levels. Reliability testing validated the findings, and gender was analysed as a moderator between perceived convenience, perceived security, transaction speed, and e-wallet usage. The research instruments were adapted from Sfenrianto, et al. [25] and Davis, et al. [26] ensuring consistency with prior validated studies. These adaptations preserved the reliability and relevance of the tools, grounding the research in proven methodologies. By leveraging validated instruments, the study builds on existing knowledge while ensuring accuracy and credibility in data collection.

This approach enhances the study's validity, ensuring that findings align with best practices in research methodology. The integration of established frameworks and validated tools contributes to robust and meaningful results, offering

valuable insights into factors influencing e-wallet usage. The methodological rigour of this study strengthens its contribution to the existing body of knowledge on digital payment systems.

4. Results

Partial Least Squares (PLS) modelling was conducted using SmartPLS 4 [30] to evaluate both the measurement and structural models, as this method does not assume data normality and is suitable for survey research, which often involves non-normally distributed data [31].

Given that data collection was performed using a single source, the potential issue of common method bias was addressed by applying the full collinearity test, following the recommendations of Kock and Lynn [32] and Kock [33]. Table 1 shown this approach involves regressing all variables against a common variable, and if the Variance Inflation Factor (VIF) is ≤ 5, common method bias is considered not problematic. The analysis produced VIF values below this threshold, suggesting that single-source bias is not a major concern in the dataset.

Table 1.
Full Collinearity Testing.

EW	Gender	PC	PS	TS
3.623	1.012	3.065	2.964	3.462

Note: EW = Usage of e-wallet; PC = Perceived Convenience; PS = Perceived Security; TS = Transaction Speed.

4.1. Descriptive Analysis

The demographic analysis in Table 2 reveals a young, digitally engaged population. A majority (58%) of respondents are aged 22 to 25, while 26% fall within the 19 to 21 age group. The gender composition is nearly balanced, with a slight male predominance at 52%. From an occupational perspective, the sample consists primarily of employed professionals (43%) and students (42%), with smaller proportions of self-employed (9%) and unemployed (6%) participants. E-wallet usage patterns indicate widespread digital payment adoption. 35% of respondents report consistent usage, while 26% use e-wallets occasionally. Notably, only 7% have never used e-wallets, and 32% use them infrequently. These findings highlight the growing acceptance of digital payment solutions among young users, reflecting a strong technological orientation and openness to innovative financial technologies.

Table 2.
Respondents' demographic profile

Demographic Profile	Total Respondents (n=180)	Percentage (%)
Age		
15-18 years old	10	6
19-21 years old	47	26
22-25 years old	105	58
26-30 years old	18	10
Gender		
Female	86	48
Male	94	52
Working status		
Student	76	42
Employed	77	43
Unemployed	11	6
Self- employed	16	9
Frequency of using e-wallets		
Never	12	7
Rarely	58	32
Sometimes	47	26
Always	63	35

4.2. Measurement Model

The reliability and validity analysis in Table 3 supports the soundness of the measurement model used to assess four key variables: perceived convenience, perceived security, transaction speed, and e-wallet usage. Cronbach's alpha values range from 0.791 to 0.896, exceeding the standard threshold of 0.7, indicating strong internal consistency reliability across all constructs. Transaction speed demonstrates the highest reliability ($\alpha = 0.896$), while perceived convenience, though the lowest, still meets acceptable standards ($\alpha = 0.791$). Composite reliability (CR) scores are even higher, ranging from 0.878 to 0.928, further confirming excellent construct reliability and measurement consistency. The Average Variance Extracted (AVE) values fall between 0.683 and 0.763, surpassing the recommended threshold of 0.5, indicating that each construct explains over 50% of the variance in its respective indicators. Among them, transaction speed demonstrates the strongest

convergent validity (AVE = 0.763). Collectively, these metrics provide strong evidence of a well-validated measurement model, characterised by high internal consistency, reliability, and convergent validity, thereby making it suitable for subsequent structural analysis.

Table 3.
Construct reliability and validity.

	Cronbach's alpha	Composite reliability (rho_c)	Average variance extracted (AVE)
Perceived convenience	0.791	0.878	0.706
Perceived security	0.857	0.901	0.696
Transaction speed	0.896	0.928	0.763
Usage of e-wallet	0.883	0.915	0.683

The Heterotrait-monotrait ratio (HTMT) analysis in Table 4 demonstrates strong discriminant validity among the constructs. Most HTMT values fall below the conservative threshold of 0.85, indicating a good distinction between constructs. However, a few notable relationships warrant attention. The HTMT ratio between usage of e-wallets and perceived convenience (0.956) slightly exceeds the threshold, suggesting these constructs may have some conceptual overlap. Although the HTMT value (0.956) is high, the upper bound of the 90% CI is 0.996, which is still below 1.00. According to Henseler, et al. [34] if the upper limit of the confidence interval is less than 1, then discriminant validity is established, even if the HTMT point estimate is close to 1. Similarly, the relationship between transaction speed and perceived convenience (0.838) approaches the upper limit, indicating a close but acceptable distinction. The moderating effects (gender interactions) demonstrate appropriate discrimination, with all values well below the threshold. The gender variable exhibits excellent discriminant validity with very low HTMT ratios (below 0.064) across all constructs, confirming its distinctiveness as a moderating variable in the model.

Table 4.
Discriminant validity- Heterotrait-Monotrait ratio (HTMT).

	1	2	3	4	5	6	7	8
1. EW								
2. Gender	0.037							
3. PC	0.956	0.032						
4. PS	0.648	0.064	0.611					
5. TS	0.828	0.060	0.838	0.691				
6. Gender x PC	0.540	0.033	0.682	0.368	0.409			
7. Gender x PS	0.459	0.048	0.361	0.715	0.437	0.536		
8. Gender x TS	0.451	0.050	0.396	0.435	0.701	0.582	0.621	

Note: EW = Usage of e-wallet; PC = Perceived Convenience; PS = Perceived Security; TS = Transaction Speed.

In Table 5, the R-square value of 0.724 indicates that the model explains 72.4 percent of the variance in e-wallet usage, demonstrating strong predictive accuracy. The adjusted R-square of 0.714, which accounts for the number of predictors, remains robust and suggests the model maintains its explanatory power without overfitting. These findings collectively indicate that the model effectively captures and explains the variance in e-wallet usage behaviour.

Table 5.
R-square value.

	R-square	R-square adjusted
Usage of e-wallet	0.724	0.714

Table 6 presents the four key constructs related to e-wallet usage and their respective measurement items. The *"Usage of E-wallets"* construct includes five items (EW1-EW5), which focus on measuring perceptions of e-wallets as substitutes for cash and their associated benefits, with factor loadings ranging from 0.765 to 0.852. *"Perceived Convenience"* consists of three items (PC1-PC3), assessing ease of use and transaction management, particularly while travelling, with strong loadings between 0.811 and 0.862. *"Perceived Security"* comprises four items (PS1-PS4), which evaluate users' confidence in the security features of e-wallets and the protection of their financial information. The loadings range from 0.793 to 0.871. Lastly, *"Transaction Speed"* includes four items (TS1-TS4), which measure the time efficiency of e-wallet transactions compared to traditional payment methods. This construct demonstrates robust loadings between 0.827 and 0.900. All factor loadings across the constructs exceed 0.7, indicating strong construct validity for the measurement items.

Table 6.
Variable description.

Constructs	Items	Measures (Questionnaire)	Sources	Loadings
Usage of E-wallets	EW1	E-wallets are substitutes for cash based on payment methods.	Davis, et al. [26]	0.847
	EW2	E-wallets can support the existing payment methods.		0.852
	EW3	Shifting to using E-wallet will be beneficial for everyone.		0.765
	EW4	E-wallets are an interesting way to make payments.		0.826
	EW5	E-wallets have made payments more efficient.		0.838
Perceived Convenience	PC1	An e-wallet allows me to manage all my transactions and accounts while travelling abroad.		0.847
	PC2	E-wallet is convenient and easy to use.		0.811
	PC3	E-wallet ensures I have control of all your transactions and accounts while abroad.		0.862
Perceived Security	PS1	E-wallets keep my payment credentials secure.	Sfenrianto, et al. [25]	0.815
	PS2	E-wallets are safe and free from scams and fraud.		0.793
	PS3	My financial information is secure and confidential, as is my E-wallet.		0.871
	PS4	E-wallets have top-spec security systems to protect my account.		0.855
Transaction Speed	TS1	By using my e-wallet, I save a lot of waiting time.	Davis, et al. [26]	0.827
	TS2	Transactions are faster using your e-wallet compared to my traditional payment method.		0.900
	TS3	I get a better and quicker response when using my e-wallet.		0.889
	TS4	Paying for my goods is faster than using cash when using my e-wallet.		0.876

Note: EW = Usage of e-wallet; PC = Perceived Convenience; PS = Perceived Security; TS = Transaction Speed.

4.3. Structural Equation Model

Following the recommendations of Hair, et al. [35] and Cain, et al. [36] multivariate normality was assessed using Mardia's skewness and kurtosis tests. The results indicated that the dataset does not meet the assumption of multivariate normality. Specifically, Mardia's multivariate skewness ($\beta = 32.89146$, $z = 1096.382$, $p < 0.05$) and kurtosis ($\beta = 111.34788$, $z = 17.524$, $p < 0.05$) were both statistically significant, suggesting substantial deviations from normality. Given this violation, the structural model was evaluated using a non-parametric bootstrapping procedure with 10,000 subsamples to obtain robust estimates of path coefficients, standard errors, *t*-values, and *p*-values [37].

The structural model analysis in Table 7 and Figure 2 provides valuable insights into e-wallet usage behaviour. The direct effects reveal that perceived convenience significantly influences e-wallet usage ($\beta = 0.454$, $t = 5.328$, $p < 0.001$), demonstrating a strong positive relationship. Similarly, transaction speed has a notable positive effect ($\beta = 0.424$, $t = 4.304$, $p < 0.001$). However, perceived security does not show a significant impact on e-wallet usage ($\beta = 0.020$, $t = 0.272$, $p = 0.786$). The moderating effects of gender reveal an interesting pattern. Gender significantly moderates the relationship between perceived security and e-wallet usage ($\beta = 0.237$, $t = 2.174$, $p = 0.030$), suggesting that the impact of security concerns on e-wallet usage varies by gender. However, gender does not significantly moderate the effects of either perceived convenience ($\beta = 0.125$, $t = 0.827$, $p = 0.408$) or transaction speed ($\beta = -0.249$, $t = 1.658$, $p = 0.097$) on e-wallet usage. These findings indicate that convenience and speed are universal drivers of e-wallet usage, while security concerns may have gender-specific implications. Figure 3 illustrates this interaction: males demonstrated a stronger positive relationship between perceived security and e-wallet usage compared to females. Specifically, male users reported a noticeable increase in e-wallet usage as their perception of security increased, whereas female users exhibited a more modest change. This suggests that perceived security is a more influential factor for encouraging e-wallet usage among males.

Table 7.
Summary of hypothesis.

	Beta	Mean	Standard Deviation	T stat.	P values	Decision
Direct effect						
Perceived convenience → Usage of e-wallet	0.454	0.454	0.085	5.328	0.000	Supported
Perceived security → Usage of e-wallet	0.020	0.017	0.073	0.272	0.786	Not supported
Transaction speed → Usage of e-wallet	0.424	0.424	0.099	4.304	0.000	Supported
Moderating effect						
Gender*Perceived convenience → Usage of e-wallet	0.125	0.123	0.151	0.827	0.408	Not supported
Gender*Perceived security → Usage of e-wallet	0.237	0.236	0.109	2.174	0.030	Supported
Gender*Transaction speed → Usage of e-wallet	-0.249	-0.242	0.150	1.658	0.097	Not supported

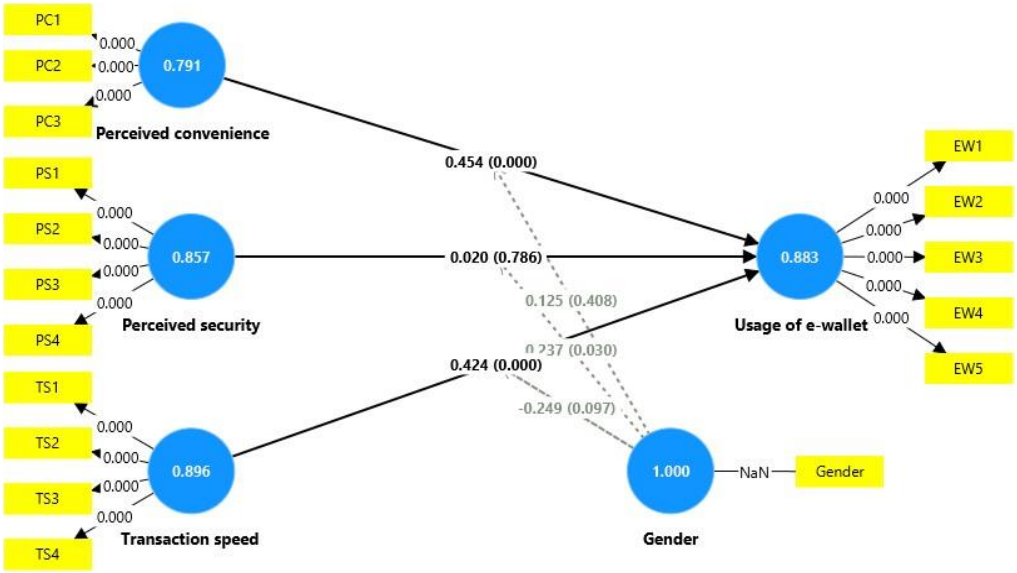

Figure 2.
Structural Model.
Note: p-value < 0.000; Cronbach alpha > 0.70.

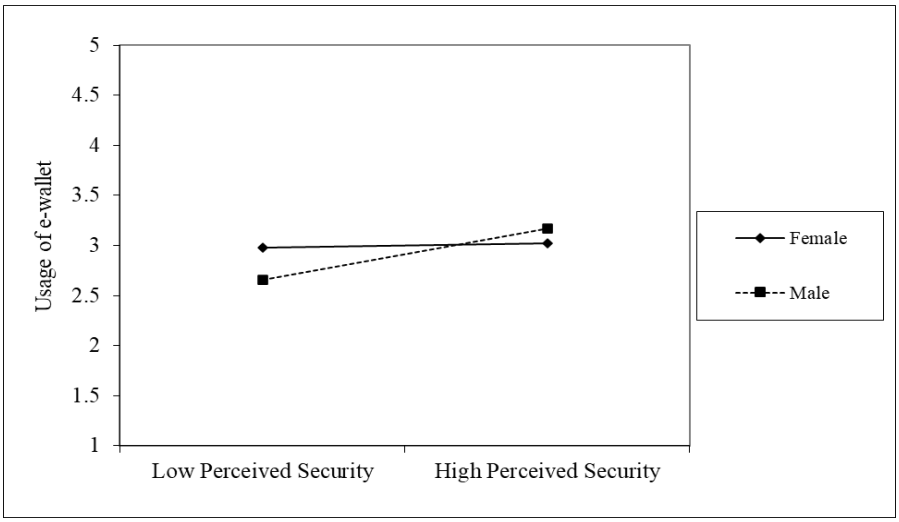

Figure 3.
Interactive Effects Plot for Significant Result on Gender*Perceived Security → Usage of e-wallet.

4.4. PLS Predict Assessment

Table 8.
PLS Predict Assessment.

	Q^2predict	PLS-SEM_RMSE	LM_RMSE	PLS-LM_RMSE
EW1	0.483	0.638	0.658	-0.020
EW2	0.446	0.626	0.685	-0.059
EW3	0.402	0.740	0.754	-0.014
EW4	0.470	0.574	0.610	-0.036
EW5	0.529	0.560	0.581	-0.021

Note: EW = Usage of e-wallet.

In Partial Least Squares Predict (PLS-Predict), the focus is on assessing the model's ability to forecast new data rather than just explaining existing variance (R^2). Following the procedure recommended by Shmueli, et al. [38] a 10-fold cross-validation was used to evaluate predictive relevance at the item level. According to their guidelines, if all PLS-SEM prediction errors (RMSE) are lower than those from a linear model (LM), the model has strong predictive power; if most are lower, moderate predictive power is indicated; if only a few are lower, the model has low predictive power; and if none are lower, predictive relevance is not supported.

As shown in Table 8, all indicators (EW1, EW2, EW3, EW4, and EW5) have PLS-SEM RMSE values lower than those of the LM benchmark. This means all item-level predictions performed better using the PLS model. Therefore, the results suggest that the model demonstrates strong predictive power. This implies that the model not only fits the current data reasonably well but is also capable of making reliable predictions for future observations.

5. Discussion

The statistical analysis of e-wallet usage reveals a complex landscape of technological adoption characterized by distinctive factors influencing digital payment behaviour. Perceived convenience emerges as the most significant driver, demonstrating a robust statistical impact with a t-statistic of 5.328 and a p-value of 0.000. The original sample coefficient of Beta value of 0.454 provides compelling evidence that user-perceived ease of use correlates with digital wallet adoption. This finding highlights the critical importance of intuitive design and seamless user interfaces in technological acceptance, suggesting that financial technology providers must prioritise user experience to drive widespread usage. In contrast to traditional expectations, perceived security has a surprisingly minimal effect on e-wallet usage. The data challenges conventional assumptions about the role of security in technological usage, with a marginal t-statistic of 0.272 and a non-significant p-value of 0.786. This counterintuitive result points to a potential shift in user attitudes, particularly among younger demographics, where convenience appears to outweigh security concerns. This suggests that contemporary users may employ a different risk assessment framework, marked by increased digital trust and greater comfort with technological innovations. Transaction speed also emerges as another critical determinant of e-wallet usage, presenting a statistically significant direct effect with a t-statistic of 4.304 and a p-value of 0.000. The original sample coefficient of Beta value of 0.424 validates the hypothesis that rapid transaction processing substantially influences digital payment usage. This insight underscores the modern user's preference for efficiency, suggesting that technological solutions that enable instantaneous financial transactions are more likely to gain widespread acceptance. The strong correlation between transaction speed and usage suggests that users value technologies that streamline financial processes and reduce time-consuming interactions.

The moderating effects reveal a complex interplay between gender and key factors influencing e-wallet usage. The analysis provides nuanced insights into digital payment technology acceptance, exploring how gender influences the relationships between perceived convenience, security, and transaction speed. The interaction between gender and perceived convenience does not show a statistically significant moderating effect, with a t-statistic of 0.827 and a p-value of 0.408. The original sample coefficient of Beta value of 0.125 indicates that gender does not substantially alter the relationship between perceived convenience and e-wallet usage. This suggests a universal appreciation for user-friendly technological interfaces across gender groups, with convenience factors having a consistent impact on digital payment usage. This result challenges potential assumptions about gender-specific technological preferences, suggesting that both male and female users prioritise ease of use similarly. The lack of significant moderation implies that technological design strategies focused on convenience can be effectively implemented without requiring extensive gender-specific customisation. Organisations developing e-wallet solutions can approach user interface design with a more inclusive, gender-neutral perspective, emphasising universal usability principles.

The most statistically significant moderating effect emerges in the interaction between gender and perceived security, with a t-statistic of 2.174 and a p-value of 0.030. The original sample coefficient of Beta value of 0.237 provides compelling evidence that gender influences the relationship between security perception and e-wallet usage. This finding suggests that male and female users may approach digital security through distinctly different cognitive frameworks, presenting important implications for technological design and marketing strategies. The significant moderation indicates that security considerations are interpreted differently across gender groups, potentially reflecting variations in risk assessment, technological trust, or security prioritization. Financial technology developers must recognize these differences and consider developing more targeted communication and design strategies that address gender-specific security concerns. This suggests a need for more sophisticated approaches to addressing security in digital payment technologies. Figure 3

illustrates this interaction that males demonstrated a stronger positive relationship between perceived security and e-wallet usage compared to females. Specifically, male users reported a noticeable increase in e-wallet usage as their perception of security increased, whereas female users exhibited a more modest change. This suggests that perceived security is a more influential factor for encouraging e-wallet usage among males.

The interaction between gender and transaction speed does not achieve statistical significance, with a t-statistic of 1.658 and a p-value of 0.097. The original sample coefficient of Beta value of -0.249 suggests a potential negative relationship, which approaches statistical significance but does not reach it. This implies that while there may be subtle variations in how gender influences the relationship between transaction speed and e-wallet usage, these differences are not substantial enough to be conclusively determined. The near-significant result points to potential underlying variations that warrant further exploration. It may suggest emerging differences in how male and female users perceive and value transactional efficiency, although these differences are not statistically significant. This finding opens avenues for future research into the more complex interactions between gender and perceptions of technological efficiency.

6. Implications and Limitations

6.1. Theoretical Implications

The findings of this study make a significant contribution to the theoretical discourse on digital payment usage (please check if it's digital payment usage or digital payment adoption) by identifying gender as a moderating factor in e-wallet usage. While previous research has primarily focused on perceived convenience, transaction speed, and security [1, 4] this study extends existing models, particularly the Unified Theory of Acceptance and Use of Technology (UTAUT), by incorporating gender as a critical moderating variable. The results indicate that gender differences shape user priorities in digital payment usage, challenging traditional assumptions in technology acceptance literature [3]. Specifically, the study finds that female users place greater emphasis on security concerns, whereas male users prioritise efficiency. This perspective aligns with existing research highlighting gender-based variations in risk perception and trust in technology [2]. These insights underscore the need for future theoretical frameworks to more explicitly integrate gendered perceptions, refining predictive models of digital payment usage. By acknowledging gender-specific influences, researchers can develop more comprehensive models that better capture user behaviour in financial technology usage.

6.2. Practical Implications

The study provides actionable insights for fintech companies, policymakers, and financial service providers. Since female users exhibit greater sensitivity to security concerns, e-wallet providers should implement enhanced security features such as biometric authentication, AI-driven fraud detection, and multi-factor authentication to build trust and encourage usage within this demographic [5]. Additionally, targeted educational campaigns that highlight existing security measures can help alleviate concerns and increase usage rates [6]. For male users, who prioritise transaction speed and convenience, e-wallet providers should optimise processing speeds, minimise friction in user interfaces, and streamline payment verification processes [7]. Furthermore, gamification strategies and incentives, such as cashback rewards and loyalty programmes, could further enhance engagement and encourage sustained usage [8]. Policymakers should also consider gender-based financial literacy initiatives. Tailored programmes focusing on security awareness for female users and efficiency-driven incentives for male users could promote digital financial inclusion and increase e-wallet usage across diverse demographics [9].

6.3. Limitations and Future Research

This study is subject to several limitations. First, while the sample size is sufficient for statistical analysis, it may not fully represent broader demographic variations in e-wallet usage. Future research should employ larger and more diverse samples to enhance generalizability. Second, this study relies on self-reported data, which may introduce biases related to user perceptions and behaviours. Experimental and longitudinal studies could provide deeper insights into actual adoption patterns over time.

Future research should explore the underlying mechanisms driving these behavioural patterns, particularly the factors contributing to the reduced emphasis on security and the increased importance of convenience. Longitudinal studies could offer deeper insights into whether these trends represent a fundamental shift in technological adoption or are specific to the current user demographic. Additionally, comparative studies across different age groups, technological ecosystems, and cultural contexts would help validate and contextualize these findings, providing a more comprehensive understanding of digital payment technology usage. Exploring the role of emerging technologies, such as blockchain and decentralized finance (DeFi), in shaping e-wallet security and efficiency could further enrich the discourse. Moreover, investigating how cultural and economic factors influence gendered usage patterns may yield more tailored strategies for different market segments [22]. Addressing these research gaps will contribute to a more comprehensive understanding of gender-based digital payment usage trends.

References

[1] E. R. Ahmed, B. Zirari, and I. Tabet, "The moderating role of cost and convenience on the relationship in the UTAUT model to adopt e-payment services," *Journal of International Technology and Information Management,* vol. 32, no. 1, pp. 334-363, 2024. https://doi.org/10.58729/1941-6679.1582

[2] M. T. Alshurideh, B. Al Kurdi, R. e. Masa'deh, and S. A. Salloum, "The moderation effect of gender on accepting electronic payment technology: A study on United Arab Emirates consumers," *Review of International Business and Strategy*, vol. 31, no. 3, pp. 375-396, 2021. https://doi.org/10.1108/RIBS-08-2020-0102

[3] M. Kanwal, U. Burki, R. Ali, and R. Dahlstrom, "Systematic review of gender differences and similarities in online consumers' shopping behavior," *Journal of Consumer Marketing*, vol. 39, no. 1, pp. 29-43, 2022. https://doi.org/10.1108/JCM-01-2021-4356

[4] Y. Liu, J. Li, A. Latifian, and F. A. Rivai, "Applications of mobile payment services in financial strategies: state-of-the-art, taxonomy and upcoming directions with a focus on pandemic crisis," *International Journal of Information Technology & Decision Making*, vol. 23, no. 02, pp. 687-713, 2024. https://doi.org/10.1142/S021962202350027X

[5] W. Lim, U. T. Munikrishnan, C.-M. Leong, L.-C. Hiew, M.-W. Leong, and L. Yang, "Do you want a secure e-wallet? Understanding the role of risk and security in e-wallet continuance intention," *Information & Computer Security*, vol. 32, no. 3, pp. 304-321, 2024. https://doi.org/10.1108/ICS-05-2023-0085

[6] L. Kulkarni and A. Ghosh, "Gender disparity in the digitalization of financial services: Challenges and promises for women's financial inclusion in India," *Gender, Technology and Development*, vol. 25, no. 2, pp. 233-250, 2021. https://doi.org/10.1080/09718524.2021.1911022

[7] S. Jain, S. Basu, Y. K. Dwivedi, and S. Kaur, "Interactive voice assistants–does brand credibility assuage privacy risks?," *Journal of Business Research*, vol. 139, pp. 701-717, 2022. https://doi.org/10.1016/j.jbusres.2021.10.007

[8] B. Świecka, P. Terefenko, and D. Paprotny, "Transaction factors' influence on the choice of payment by Polish consumers," *Journal of Retailing and Consumer Services*, vol. 58, p. 102264, 2021. https://doi.org/10.1016/j.jretconser.2020.102264

[9] N. Singh, N. Sinha, and F. J. Liébana-Cabanillas, "Determining factors in the adoption and recommendation of mobile wallet services in India: Analysis of the effect of innovativeness, stress to use and social influence," *International Journal of Information Management*, vol. 50, pp. 191-205, 2020. https://doi.org/10.1016/j.ijinfomgt.2019.05.022

[10] V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, "User acceptance of information technology: Toward a unified view," *MIS Quarterly*, vol. 27, no. 3, pp. 425-478, 2003. https://doi.org/10.2307/30036540

[11] A. Shankar, "How does convenience drive consumers' webrooming intention?," *International Journal of Bank Marketing*, vol. 39, no. 2, pp. 312-336, 2021. https://doi.org/10.1108/IJBM-03-2020-0143

[12] K. S. Namahoot and V. Jantasri, "Integration of UTAUT model in Thailand cashless payment system adoption: The mediating role of perceived risk and trust," *Journal of Science and Technology Policy Management*, vol. 14, no. 4, pp. 634-658, 2023. https://doi.org/10.1108/JSTPM-07-2020-0102

[13] F. M. Alshannag, H. Z. Makhamreh, A. H. Ngah, B. Eneizan, M. H. Odeh, and A. Alsakarneh, "E-payment acceptance: extended UTAUT model with security factor," *Information Sciences Letters*, vol. 11, no. 3, pp. 943-950, 2022.

[14] T. Hewavitharana, S. Nanayakkara, A. Perera, and P. Perera, "Modifying the unified theory of acceptance and use of technology (UTAUT) model for the digital transformation of the construction industry from the user perspective, Informatics," vol. 8. Australia: MDPI, 2021, p. 81.

[15] A. Pal, T. Herath, R. De', and H. R. Rao, "Is the convenience worth the risk? An investigation of mobile payment usage," *Information Systems Frontiers*, vol. 23, no. 4, pp. 941-961, 2021. https://doi.org/10.1007/s10796-020-10070-z

[16] S. Caroline, A. Putri, E. Oei, V. Verawati, and I. Isnovian, "Differences of individual demographic characteristics towards e-wallet payment in restaurants," *ASEAN Marketing Journal*, vol. 12, no. 2, p. 3, 2021. https://doi.org/10.21002/amj.v12i2.12899

[17] W. A. Khan and Z. U. Abideen, "Effects of behavioural intention on usage behaviour of digital wallet: the mediating role of perceived risk and moderating role of perceived service quality and perceived trust," *Future Business Journal*, vol. 9, no. 1, p. 73, 2023. https://doi.org/10.1186/s43093-023-00242-z

[18] S. Undale, A. Kulkarni, and H. Patil, "Perceived eWallet security: Impact of COVID-19 pandemic," *Vilakshan-XIMB Journal of Management*, vol. 18, no. 1, pp. 89-104, 2021. https://doi.org/10.1108/XJM-07-2020-0022

[19] A. N. A. Malik and S. N. S. Annuar, "The effect of perceived usefulness, perceived ease of use, reward, and perceived risk toward e-wallet usage intention," in *Eurasian Business and Economics Perspectives: Proceedings of the 30th Eurasia Business and Economics Society Conference*, 2021: Springer, pp. 115-130.

[20] M. D. Williams, "Social commerce and the mobile platform: Payment and security perceptions of potential users," *Computers in Human behavior*, vol. 115, p. 105557, 2021. https://doi.org/10.1016/j.chb.2018.06.005

[21] S. Teng and K. W. Khong, "Examining actual consumer usage of E-wallet: A case study of big data analytics," *Computers in Human Behavior*, vol. 121, p. 106778, 2021. https://doi.org/10.1016/j.chb.2021.106778

[22] Q. Wei, W. Xiao, R. M. S. Yaqub, M. Irfan, M. Murad, and M. Z. Yaqub, "Adoption of digital money (e-wallet) in the post COVID-19 era: The moderating role of low distribution charges and low transit time in impulsive buying: A developing country perspective," *Frontiers in Environmental Science*, vol. 10, p. 984316, 2023. https://doi.org/10.3389/fenvs.2022.984316

[23] H. T. Nguyen and N. T. Nguyen, "Identifying the factors affecting the consumer behavior in switching to E-wallets in payment activities," *Polish Journal of Management Studies*, vol. 25, no. 1, pp. 292-311, 2022.

[24] M. A. Sait, M. A. Ali, M. N. Almunawar, and H. M. Haji Masri, "Understanding factors to digital wallet discontinuance intention among past users: An exploratory study," *Journal of Science and Technology Policy Management*, 2024. https://doi.org/10.1108/JSTPM-01-2024-0005

[25] S. Sfenrianto, J. Junadi, and M. H. Saragih, "The analysis of consumer's intention model for using E-payment system in Indonesia," presented at the 2017 International Conference on Sustainable Information Engineering and Technology (SIET), 2017.

[26] K. J. Davis, P. Balaji, and S. Gurusamy, "Whether E-wallets are really a catalyst towards expedition of cashless economy?: An empirical investigation in the aftermath of demonetization," *IOSR Journal of Business and Management*, vol. 1, pp. 50-55, 2017.

[27] H. E. Fischer, W. J. Boone, and K. Neumann, *Quantitative research designs and approaches. In Handbook of research on science education*. UK: Routledge, 2023.

[28] P. A. Swinton *et al.*, "Interpreting magnitude of change in strength and conditioning: Effect size selection, threshold values and Bayesian updating," *Journal of Sports Sciences,* vol. 40, no. 18, pp. 2047-2054, 2022. https://doi.org/10.1080/02640414.2022.2128548

[29] A. Lovakov and E. R. Agadullina, "Empirically derived guidelines for effect size interpretation in social psychology," *European Journal of Social Psychology,* vol. 51, no. 3, pp. 485-504, 2021. https://doi.org/10.1002/ejsp.2752

[30] C. M. Ringle, S. Wende, and J. M. Becker, *SmartPLS 4 [Computer software]*. Boenningstedt, Germany: SmartPLS GmbH, 2022.

[31] W. W. Chin, B. L. Marcolin, and P. R. Newsted, "A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study," *Information systems research,* vol. 14, no. 2, pp. 189-217, 2003. https://doi.org/10.1287/isre.14.2.189.16018

[32] N. Kock and G. S. Lynn, "Lateral collinearity and misleading results in variance-based SEM: An illustration and recommendations," *Journal of the Association for information Systems,* vol. 13, no. 7, pp. 546–580, 2012. https://doi.org/10.17705/1jais.00302

[33] N. Kock, "Common method bias in PLS-SEM: A full collinearity assessment approach," *International Journal of e-Collaboration (ijec),* vol. 11, no. 4, pp. 1-10, 2015.

[34] J. Henseler, C. M. Ringle, and M. Sarstedt, "A new criterion for assessing discriminant validity in variance-based structural equation modeling," *Journal of the Academy of Marketing Science,* vol. 43, no. 1, pp. 115-135, 2015. https://doi.org/10.1007/s11747-014-0403-8

[35] J. F. Hair, G. T. M. Hult, C. M. Ringle, and M. Sarstedt, *A primer on partial least squares structural equation modeling (PLS-SEM)*, 3rd ed. USA: SAGE Publications, 2022.

[36] M. K. Cain, Z. Zhang, and K.-H. Yuan, "Univariate and multivariate skewness and kurtosis for measuring nonnormality: Prevalence, influence and estimation," *Behavior Research Methods,* vol. 49, no. 5, pp. 1716-1735, 2017. https://doi.org/10.3758/s13428-016-0814-1

[37] T. Ramayah, J. Cheah, F. Chuah, H. Ting, and M. A. Memon, *Partial least squares structural equation modeling (PLS-SEM) using SmartPLS 3.0: An updated and practical guide to statistical analysis*, 2nd ed. Kuala Lumpur, Malaysia: Pearson Malaysia, 2018.

[38] G. Shmueli *et al.*, "Predictive model assessment in PLS-SEM: Guidelines for using PLSpredict," *European Journal of Marketing,* vol. 53, no. 11, pp. 2322-2347, 2019. https://doi.org/10.1108/EJM-02-2019-0189