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EXPLORING MOBILE PAYMENT ADOPTION BEHAVIOR IN A SUSTAINABLE DIGITAL PAYMENT ENVIRONMENT.

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Abstract

With the rapid development of digital technology, mobile payment has become an indispensable part of consumers' daily lives and an important tool for promoting paperless transactions and improving resource utilization efficiency under ESG (Environmental, Social, and Governance) trends. This study aims to explore the key factors influencing users' adoption of mobile payment services. Based on the Technology Acceptance Model (TAM), this research integrates user interface, user experience, and trust to examine their effects on perceived usefulness and perceived ease of use. Data were collected through an online questionnaire survey. A total of 267 questionnaires were returned, of which 212 valid responses were analyzed using SPSS statistical software. The findings reveal that user interface, user experience, and trust positively influence perceived ease of use, while user interface and user experience also have significant positive effects on perceived usefulness. Overall, the results suggest that a clear user interface, favorable user experience, and strong trust can enhance users' positive attitudes toward mobile payment adoption. These findings not only provide practical implications for mobile payment service providers in strengthening their market competitiveness but also contribute to the development of sustainable digital payment systems aligned with ESG principles.

Key words: Mobile payment, Technology Acceptance Model, ESG, user interface

Introduction

In recent years, with the rapid advancement of smartphones and internet technologies, mobile payment has become an important innovation in modern financial systems and one of the major payment methods in daily life. Mobile payment allows consumers to conduct transactions through mobile devices anytime and anywhere, significantly improving transaction convenience and efficiency (Dahlberg et al., 2008). With the expansion of digital services and e-commerce, mobile payment has become widely adopted in both online and offline markets.

At the same time, under the rapid development of the digital economy and financial technology (FinTech), digital payment has become essential infrastructure for modern commerce. In addition to enhancing transaction efficiency, digital payment supports paperless transactions, reduces cash usage, and promotes environmental sustainability (Gomber et al., 2017). Furthermore, digital payment contributes to improving financial accessibility and financial inclusion (Ozili, 2018).

However, despite the growing popularity of mobile payment services, users' acceptance and usage behaviors still vary among demographic groups. Previous studies have indicated that perceived usefulness and perceived ease of use are key factors affecting users' acceptance of technological products (Davis, 1989). When users perceive mobile payment systems as convenient and easy to use, their adoption intention is more likely to increase. In Taiwan's competitive mobile payment market, platforms such as LINE Pay, JKOPay, and Taiwan Pay have become widely used. Therefore, this study applies the Technology Acceptance Model (TAM) and incorporates external variables including user interface, user experience, and trust to examine their effects on perceived usefulness, perceived ease of use, and users' attitudes toward mobile payment adoption.

Literature Review

Mobile Payment

Mobile payment refers to electronic payment transactions conducted through mobile devices. With the rapid development of smartphones and internet technologies, mobile payment has become one of the most important payment tools in modern society and has significantly transformed consumers' payment behaviors (Dahlberg et al., 2008). Previous studies have indicated that the growth of mobile payment is closely associated with advancements in information technology, the widespread adoption of mobile devices, and the expansion of e-commerce (Mallat, 2007). Mobile payment enhances transaction convenience and reduces transaction time costs, leading to its widespread adoption among consumers and businesses.

Mobile payment can generally be classified into proximity payment and remote payment. Proximity payment refers to transactions conducted in physical environments through technologies such as Near Field Communication

(NFC), whereas remote payment is mainly applied to online shopping and internet-based transactions (Morosan & DeFranco, 2016; Pourghomi et al., 2013). Retail stores and online platforms have increasingly adopted mobile payment systems to provide integrated digital services and improve transaction convenience (Wai-kit Ng et al., 2024).

Furthermore, mobile payment can be categorized into NFC payment, QR code payment, and third-party payment systems. Under the trend of sustainable development and ESG (Environmental, Social, and Governance), mobile payment contributes to paperless transactions and reduced cash usage, thereby promoting resource conservation and improving payment efficiency (Gomber et al., 2017). In addition, digital payment services may enhance financial accessibility and financial inclusion, generating positive impacts on social and economic development (Ozili, 2018). Therefore, mobile payment has gradually become an important application within the digital economy.

Current Development of Mobile Payment in Taiwan

With the promotion of government policies and the rapid development of financial technology (FinTech), the adoption rate of mobile payment in Taiwan has continued to increase. Previous studies have indicated that Taiwanese consumers' awareness and usage of mobile payment services have grown significantly, and mobile payment has gradually become one of the primary payment methods. The development of mobile payment not only improves transaction efficiency but also transforms consumers' payment habits toward digitalization and cashless transactions. Major mobile payment platforms in Taiwan include LINE Pay, JKOPay, and Taiwan Pay.

Previous research has shown that more than 90% of Taiwanese consumers have used mobile payment services, and over 80% are regular users, indicating that mobile payment has become one of the dominant payment methods in Taiwan. In small-value consumption scenarios, the usage rate of mobile payment has surpassed that of cash, demonstrating a steady shift toward digitalized payment habits. According to statistics released by the Financial Supervisory Commission (FSC, 2026), the number of electronic payment accounts exceeded 35 million by the end of 2025, reflecting the widespread adoption of digital payment services in Taiwan.

Among the major platforms, LINE Pay remains one of the most widely recognized and frequently used services, while JKOPay also maintains high market recognition. Other platforms, such as Taiwan Pay and Apple Pay, also maintain substantial market presence in Taiwan (Market Intelligence & Consulting Institute [MIC], 2025). These findings indicate that mobile payment has become a preferred payment method, particularly among consumers aged 18–45. Previous studies have suggested that policy development should balance innovation and regulation to protect consumers and market security while encouraging technological innovation (Arner, Barberis, & Buckley, 2020). From an ESG

perspective, the widespread adoption of mobile payment may reduce environmental costs while improving digital financial accessibility and financial inclusion (Gomber et al., 2017; Ozili, 2018).

Technology Acceptance Model

The Technology Acceptance Model (TAM), proposed by Davis (1989), is one of the most widely used theoretical frameworks for explaining users' acceptance of information technology. The model suggests that perceived usefulness and perceived ease of use are the primary factors influencing users' adoption of technology. Perceived usefulness refers to the degree to which users believe that a system can improve their work performance or daily convenience, whereas perceived ease of use refers to the degree to which users perceive a system as free of effort and easy to learn.

Venkatesh and Davis (2000) further indicated that external variables influence users' behavioral intentions and actual usage behaviors through their effects on perceived usefulness and perceived ease of use. In the field of mobile payment research, TAM has been extensively applied, and common external variables include user interface, user experience, and trust. Within the context of a sustainable digital payment environment, users' perceptions of system trustworthiness and convenience may also affect their acceptance of digital payment services, thereby influencing their adoption behaviors. Oliveira et al. (2016) further demonstrated that perceived usefulness and perceived ease of use have significant effects on the adoption of mobile payment services. Therefore, this study adopts TAM as its theoretical foundation and incorporates additional external variables for further analysis.

User Interface

Tractinsky (1997) suggested that the quality of system interface design significantly affects users' evaluations and willingness to use a system. User interface refers to the medium through which users interact with a system, including screen design, operational procedures, and information presentation. In mobile payment systems, a concise and intuitive interface enhances usability, reduces cognitive load, and minimizes user errors during payment processes. Therefore, user interface is considered an important factor influencing perceived ease of use and perceived usefulness.

User Experience

Schrepp (2019) indicated that user experience is a critical factor in assessing the quality of digital products and services. User experience encompasses users' overall feelings and perceptions during system interaction, including operational smoothness, interaction design, and service quality. In mobile payment systems, convenient and efficient payment processes enhance user satisfaction and strengthen positive perceptions of the system. Therefore, user experience is considered an important determinant of perceived ease of use and perceived usefulness in mobile payment adoption.

Trust

In digital payment environments, trust is a pivotal factor influencing adoption behavior. Since mobile payment involves financial transactions and personal data, insufficient trust may reduce users' willingness to adopt the system. Gefen (2003) suggested that trust reduces perceived risks associated with online transactions and enhances adoption intentions. Trust is closely linked to system security measures and data protection mechanisms, which reinforce users' confidence in digital transactions. Providing a secure and reliable environment enhances users' trust, making it a key determinant in adoption and continued use of mobile payment services.

Sustainable Digital Payment Environment

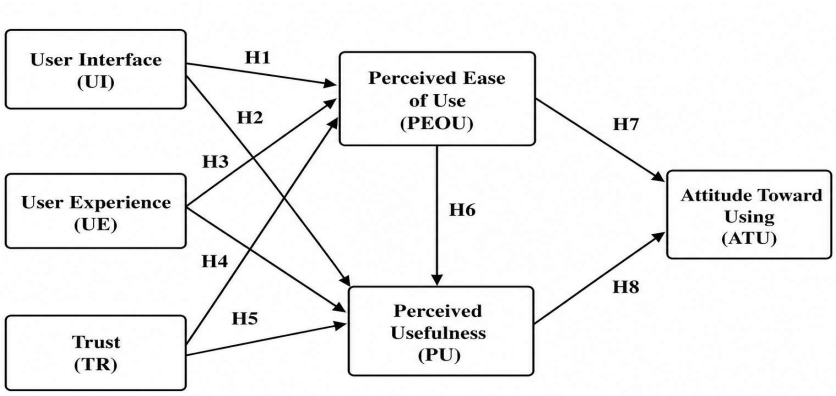
As issues related to sustainable development and ESG (Environmental, Social, and Governance) have received increasing attention, digital payment has gradually become an important tool for promoting sustainable finance. Compared with traditional cash transactions, mobile payment can reduce the use of paper currency and paper-based transaction documents, thereby lower resource consumption and promoting paperless transactions (Gomber, Koch, & Siering, 2017). In addition, digital payment improves financial accessibility and promotes financial inclusion through mobile devices (Ozili, 2018). Therefore, mobile payment is not only a payment tool, but also an important mechanism for advancing digitalization and sustainable development. Recent studies have indicated that financial technology (FinTech) and digital payment play important roles in sustainable development.

Previous studies demonstrated that FinTech development positively influences digital payment adoption and financial inclusion across Asian economies (Đặng et al., 2026). From the ESG perspective, digital payment can reduce resource consumption, promote financial inclusion, and encourage payment platforms to strengthen information security and risk management mechanisms to enhance transaction security and user trust (Arner, Barberis, & Buckley, 2020). Therefore, investigating mobile payment adoption behavior within a sustainable digital payment environment provides important implications for the digital payment and FinTech industries.

Methodology

Research Framework and Hypotheses

This study adopts the Technology Acceptance Model (TAM) proposed by Davie (1989) as its theoretical foundation. Based on the extended TAM perspective suggested by Venkatesh and Davis (2000), this study incorporates user interface, user experience, and trust as external variables to examine their effects on perceived ease of use and perceived usefulness which subsequently influence users' attitudes toward using mobile payment service. Based on the above theoretical perspectives, the research framework of this study is proposed, as illustrated in Figure 3-1. According to the proposed research framework, the following research hypotheses



3.1. This research model

are developed for empirical verification. The hypotheses proposed in this study are as follows:

H1: User interface has a significant positive effect on perceived ease of use.
H2: User interface has a significant positive effect on perceived usefulness.
H3: User experience has a significant positive effect on perceived ease of use.
H4: User experience has a significant positive effect on perceived usefulness.
H5: Trust has a significant positive effect on perceived usefulness.
H6: Perceived ease of use has a significant positive effect on perceived usefulness.
H7: Perceived ease of use has a significant positive effect on users' attitudes toward using.
H8: Perceived usefulness has a significant positive effect on users' attitudes toward using.

Operational Definitions

The operational definitions of the constructs used in this study are presented as follows. User Interface refers to the screen design, information presentation, and operational procedures of mobile payment applications. The quality of the interface influences users' perceptions and evaluations of the system (Tractinsky, 1997). User Experience refers to the overall feelings and perceptions generated during users' interactions with the system, including convenience, smoothness, and satisfaction (Schrepp, 2019). Trust refers to users' beliefs regarding the security and reliability of mobile payment systems and plays a critical role in influencing the adoption of online transaction (Mayer et al., 1995). Perceived Ease of Use refers to the degree to which users believe that a system is free of effort and easy to use. Perceived Usefulness refers to the degree to which users believe that a system can improve their efficiency and performance (Davis, 1989). Attitude Toward Using refers to users' overall evaluations

and behavioral tendencies toward the use of mobile payment services (Fishbein & Ajzen, 1975).

Data Collection and Analysis

A questionnaire survey method is used to collect research data, targeting consumers who had experience using mobile payment services. The questionnaires were distributed through online platforms to improve the efficiency and diversity of sample collection. To ensure the reliability and validity of the measurement scales, a pilot test was conducted prior to the formal survey. A total of 60 pilot-test questionnaires were collected, and the questionnaire items were revised according to the results of reliability analysis and factor analysis.

This study employed the statistical software SPSS for data analysis. The analytical methods included descriptive statistical analysis, reliability analysis, validity analysis, correlation analysis, and regression analysis. Reliability analysis was conducted using Cronbach's α to examine internal consistency. Validity analysis was evaluated through the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity to determine the suitability of the data for factor analysis. Correlation analysis was applied to examine the relationships among variables, while regression analysis was used to verify the proposed research hypotheses (Hair et al., 2010).

Sample Characteristics Analysis

A total of 267 questionnaires were collected in this study. After excluding respondents without experience using mobile payment services, 212 valid questionnaires remained for analysis, satisfying the basic requirements for statistical analysis, with an effective response rate of 79.4%. Regarding demographic characteristics, most respondents were female (56.8%), while males accounted for 43.2% of the sample. In terms of age distribution, most respondents were between 21 and 30 years old (70%), indicating that mobile payment services are primarily used by younger populations. Regarding educational background, most respondents held a university degree (72.3%). In terms of occupation, students (34.1%) and service industry workers (32.4%) represented the largest groups. With respect to usage behavior, most respondents had used mobile payment services for more than one year, and 36.3% had over three years of usage experience. Among the various mobile payment platforms, LINE Pay was the most widely used service (86.8%), indicating its high market penetration within Taiwan's mobile payment industry.

Reliability and Validity Analysis

This study used Cronbach's α to examine the internal consistency of the measurement scales. The results showed that the Cronbach's α values of all constructs ranged from 0.767 to 0.924, all exceeding the recommended threshold of 0.7, indicating that the measurement scales possessed satisfactory reliability. Regarding validity analysis, all KMO values (see table 1) were greater than 0.5, and Bartlett's Test of Sphericity reached a significant level ($p < 0.001$),

indicating that the data were suitable for factor analysis. Furthermore, factor loadings, composite reliability (CR), and average variance extracted (AVE) were examined. The results demonstrated that all constructs satisfied the criteria of AVE > 0.5 and CR > 0.6, indicating satisfactory convergent validity. In addition, the square root of the AVE for each construct exceeded the corresponding correlation coefficients, demonstrating adequate discriminant validity in this study (see table 2).

Table 1. KMO and Bartlett's test

Constructs	KMO measure of sampling adequacy	Bartlett's test of sphericity		
		Approximate chi-square	Degrees of freedom	Significance level
User Interface	0.837	676.614	6	<0.000
User Experience	0.500	22.759	1	<0.000
Trust	0.719	136.548	6	<0.000
Perceived Ease of Use	0.749	376.470	3	<0.000
Perceived Usefulness	0.758	427.222	3	<0.000
Attitude Toward Using	0.838	443.799	10	<0.000

KMO, Kaiser-Meyer-Olkin

Table 2. The Results Of Discriminant Validity

	UI	UE	TR	PEOU	PU	ATU
User Interface (UI)	**0.916**					
User Experience (UE)	0.634	**0.881**				
Trust (TR)	0.532	0.706	**0.901**			
Perceived Ease of Use (PEOU)	0.662	0.832	0.734	**0.869**		
Perceived Usefulness (PU)	0.513	0.619	0.569	0.61	**0.853**	
Attitude Toward Using (ATU)	0.632	0.804	0.744	0.829	0.701	**0.858**

Correlation Analysis

This study employed Pearson correlation analysis to examine the relationships among the research constructs. The results indicated that all variables were significantly and positively correlated with one another ($p < 0.001$). Among these relationships, user experience and perceived ease of use exhibited the highest correlation coefficient ($r = 0.832$), followed by perceived ease of use and attitudes toward using ($r = 0.829$), as well as user experience and attitude toward using ($r = 0.804$). In addition, trust demonstrated strong positive correlations with user experience ($r = 0.706$) and attitudes toward using ($r = 0.744$). Overall, the constructs showed moderate to high correlations, indicating

that the data met the requirements for further regression analysis.

Regression Analysis and Hypothesis Testing

To verify the proposed research hypotheses, this study employed simple linear regression analysis (see table 3) to examine the causal relationships among the variables (see table 3). The results indicated that user interface had significant positive effects on perceived ease of use ($\beta = 0.662$, $p < 0.001$) and perceived usefulness ($\beta = 0.513$, $p < 0.001$), thereby supporting H1 and H2. User experience also showed significant positive effects on perceived ease of use ($\beta = 0.832$, $p < 0.001$) and perceived usefulness ($\beta = 0.619$, $p < 0.001$), thereby supporting H3 and H4. Among all variables, user experience demonstrated the strongest influence on perceived ease of use. Trust had a significant positive effect on perceived usefulness ($\beta = 0.569$, $p < 0.001$), thereby supporting H5.

Furthermore, perceived ease of use had a significant positive effect on perceived usefulness ($\beta = 0.610$, $p < 0.001$), thereby supporting H6. At the behavioral level, both perceived ease of use ($\beta = 0.829$, $p < 0.001$) and perceived usefulness ($\beta = 0.701$, $p < 0.001$) exerted significant positive effects on users' attitudes toward using, thereby supporting H7 and H8. Overall, all proposed hypotheses were supported.

The findings indicate that user interface, user experience, and trust influence users' attitudes toward mobile payment services through perceived ease of use and perceived usefulness. These results further verify the applicability of the Technology Acceptance Model (TAM) in the context of mobile payment services and provide empirical evidence for understanding users' adoption behavior in a sustainable digital payment environment.

Table 3. The Results Of Regression Analysis

Constructs	B	R^2	Adj.R^2	t value	F value	P value
User Interface-Perceived Ease of Use	0.662	0.438	0.428	6.722	45.188	<0.001
User Interface-Perceived Usefulness	0.513	0.263	0.250	4.550	20.707	<0.001
User Experience-Perceived Ease of Use	0.832	0.591	0.686	11.4	129.965	<0.001
User Experience-Perceived Usefulness	0.619	0.383	0.372	6	35.995	<0.001
Trust-Perceived Usefulness	0.569	0.323	0.312	5.263	27.699	<0.001
Perceived Ease of Use-Perceived Usefulness	0.61	0.372	0.362	5.866	34.41	<0.001
Perceived Ease of Use-Attitude Toward Using	0.829	0.687	0.682	11.283	127.295	<0.001
Perceived Usefulness-Attitude Toward Using	0.701	0.491	0.482	7.476	55.896	<0.001

Conclusion

This study adopted the Technology Acceptance Model (TAM) to investigate the effects of user interface, user experience, and trust on mobile payment adoption behavior. The empirical results showed that all eight proposed hypotheses were supported, indicating strong explanatory power of the research model. Both user interface and user experience had significant positive effects on

perceived ease of use and perceived usefulness. Among these factors, user experience exerted the strongest influence on perceived ease of use, suggesting that smooth operational procedures and well-designed systems can significantly enhance users' evaluations of mobile payment services. In addition, trust had a significant positive effect on perceived usefulness, indicating that users value system security and reliability when evaluating mobile payment services.

Furthermore, perceived ease of use significantly affected perceived usefulness, demonstrating that operational convenience enhances users' perceptions of system value. Both perceived ease of use and perceived usefulness also had significant positive effects on users' attitudes toward usage, confirming the applicability of TAM in the mobile payment context. Overall, the findings indicate that interface design, user experience, and trust are key factors influencing mobile payment adoption behavior.

Research Contributions

The primary theoretical contribution of this study lies in extending the Technology Acceptance Model by incorporating three external variables: user interface, user experience, and trust, thereby enhancing the explanatory power of TAM within the context of mobile payment services. First, this study confirms the effects of user interface and user experience on perceived ease of use and perceived usefulness, highlighting the importance of human-computer interaction and user experience in technology adoption models. Second, this study incorporates trust into the research model and verifies its significant influence on perceived usefulness, thereby strengthening the applicability of TAM in digital financial environments. Furthermore, the findings support the critical roles of perceived ease of use and perceived usefulness in influencing users' attitudes toward usage, further validating the stability and extensibility of the TAM framework.

Research Limitations and Future Research Suggestions

Despite its contributions, this study still contains several limitations. First, the respondents were primarily younger users, which may limit the generalizability of the findings. Second, this study adopted a cross-sectional research design and could only reflect users' behaviors at a specific point in time. In addition, because this study employed a questionnaire survey method, the results may have been influenced by respondents' subjective perceptions. Future research may include respondents from different age groups or geographic regions to improve the representativeness of the findings. Longitudinal research designs may also be adopted to examine long-term changes in mobile payment usage behavior. Furthermore, future studies may incorporate additional influencing factors, such as social influence, price incentives, or perceived risk, to further enhance the explanatory power of the research model. Emerging technologies such as blockchain and digital currencies may also be integrated into future research on mobile payment development.

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