



Analysis of Consumer Preferences in Digital Payment: Integration of TAM and TPB Model to Enhance Technology Adoption

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Abstract

This study investigates consumer preferences towards digital payments in Indonesia, employing the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB). Digital banking technologies, notably digital payments, offer several advantages, including convenience, flexibility, low costs, integrated features, and transaction efficiency. However, these technologies also encounter significant challenges, such as security risks, trust issues, and digital literacy gaps. To explore these dynamics, this research utilizes a conclusive design with a cross-sectional method and analyzes data through Structural Equation Modeling (SEM). The results confirm the majority of the proposed hypotheses, showing strong positive effects on factors like perceived usefulness, usability, resistance, risk perception, compatibility, and digital literacy. Notably, ease of interaction with the system is mainly shaped by user awareness. On the other hand, moderating factors such as communication, satisfaction, and trust have minimal impact and do not support the hypotheses. The results underscore that user-perceived value, system simplicity, social influence, and personal attitudes play essential roles in driving technology acceptance. The study recommends that digital payment providers focus on enhancing user perceptions of functional value and intuitive design. Emphasizing clear advantages and fostering a supportive social environment can strengthen user adoption and long-term loyalty in the Indonesian market.

Analisis Preferensi Konsumen dalam Pembayaran Digital: Integrasi Model TAM dan TPB untuk Meningkatkan Adopsi Teknologi

Abstrak

Studi ini menyelidiki preferensi konsumen terhadap pembayaran digital di Indonesia, menggunakan Technology Acceptance Model (TAM) dan Theory of Planned Behavior (TPB). Teknologi perbankan digital, khususnya pembayaran digital, menawarkan beberapa keuntungan, termasuk kemudahan, fleksibilitas, biaya rendah, fitur terintegrasi, dan efisiensi transaksi. Namun, teknologi ini juga menghadapi tantangan yang signifikan, seperti risiko keamanan, masalah kepercayaan, dan kesenjangan literasi digital. Untuk mengeksplorasi dinamika ini, penelitian ini menggunakan desain konklusif dengan metode cross-sectional dan menganalisis data melalui Structural Equation Modeling (SEM). Hasilnya mengonfirmasi sebagian besar hipotesis yang diajukan, yang menunjukkan efek positif yang kuat pada faktor-faktor seperti utilitas yang dirasakan, kemudahan penggunaan yang dirasakan, resistensi, persepsi risiko, kompatibilitas, dan literasi digital. Kemudahan interaksi dengan sistem terutama dibentuk oleh kesadaran pengguna. Di sisi lain, faktor moderasi seperti komunikasi, kepuasan, dan kepercayaan memiliki dampak minimal dan tidak mendukung hipotesis. Hasil ini menggarisbawahi bahwa nilai yang dirasakan pengguna, kesederhanaan sistem, pengaruh sosial, dan sikap pribadi memainkan peran penting dalam mendorong penerimaan teknologi. Studi ini merekomendasikan agar penyedia pembayaran digital berfokus pada peningkatan persepsi pengguna terhadap nilai fungsional dan desain yang intuitif. Menekankan keunggulan yang jelas dan membangun lingkungan sosial yang suportif dapat memperkuat adopsi pengguna dan loyalitas pengguna di pasar Indonesia.

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INTRODUCTION

The utilization of digital technology provides convenience in various areas, including the banking sector. One form of digital technology utilization is e-banking, which offers flexibility and ease of use despite variations in charged fees (Harahap et al., 2020). Administrative costs have become the foundation for e-banking development. Examples include the development of online payment gateways (e.g. Midtrans, Faspay, Espay, and Xendit) (Almasri & Ahmad, 2020), national and international payment gateways (for Visa and Mastercard users) (Kumar et al., 2020), and the development of the National Non-Cash Movement (GNNT) along with the Quick Response Code Indonesia Standard (QRIS) system. These developments increasingly facilitate e-banking users' transactions through more active digital payment methods (Lestari et al., 2023).

The successful development of e-banking services has proven attractive to users, particularly digital payment users (Ahdiat, 2023). E-banking's innovative growth as a digital payment method has gained popularity and increased usage frequency. This trend is attributed to digital payments offering greater convenience and reduced administrative fees (Yusuf et al., 2023; Hermawan et al., 2024), providing efficiency and flexibility in usage (Zulaiha et al., 2024), and featuring integration with various debit and credit cards (Świecka et al., 2021).

However, the advantages experienced by users in using digital payments come with their challenges. Edu (2024) state that while digital payments offer convenience and comfort, security risks remain the primary challenge. Digital payment users tend to take longer to consider and make decisions regarding digital payment usage (Anand, 2024). Several previous stu-

dies indicate that the challenges faced by digital payment service providers are not merely focused on user security but also encompass consumer behavior, trust, socio-cultural conditions, and digital literacy (Rachmawati et al., 2020; Elhajjar & Ouaida, 2020; Sultan et al., 2020; Poudel & Sapkota, 2022; Tribhan, 2024; Ramdhani, 2024). These various influencing factors highlight the complexity of consumer decisions in adopting digital payments, indicating the need for further investigation into user preferences.

The research gaps regarding the preferences of factors influencing digital payment usage comprise previous researchers tending to neglect the role of moderating factors such as satisfaction, trust, and communication, only highlighting ease of use and security factors. Some research focuses solely on mobile banking or other banking services, and research locations primarily are in Nepal and India, which have different characteristics in terms of socio-cultural and socio-economic aspects compared to Indonesia. Thus, this study seeks to address these gaps by examining consumer preferences that shape digital payment usage in Indonesia, incorporating both key influencing variables and less-explored moderating factors. To accomplish this, the study integrates the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB), providing a comprehensive lens through which user preferences and behaviors are analyzed.

TAM is frequently employed to analyze factors influencing the acceptance of new technology, while TPB is an approach aimed at predicting and explaining human behavior in specific contexts. Both models highlight two main components influencing an individual's intention to use technology: usefulness and usability. In digital payment adoption, TAM provides a comprehensive framework for understanding the factors influencing in-

dividual acceptance of new technology (Marikyan & Papagiannidis, 2024). TPB is influenced by three main factors: attitude toward behavior, subjective norms, and perceived behavioral control. Kammeyer-Mueller et al. (2024) exhibit that attitude toward behavior reflects an individual's positive or negative evaluation of an action, while subjective norms refer to the perception of social pressure to perform or not perform that behavior. By combining these two models, this study aims to identify key preferences and behavioral drivers that influence digital payment usage and understand how users respond to contextual and psychological factors in the Indonesian market.

Hypothesis Development

The research model combines the complete TAM framework (TAM 1; TAM 2, and TAM 3) and TPB (Figure 1). This research model encompasses all primary variables while adding new dimensions to deepen the understanding of user technology adoption processes, as Elhajjar & Ouaida (2020) and Sultan & Wong (2014) suggested. The addition of moderating va-

riables affords opportunities to understand the conditions that either facilitate or hinder the transformation of digital payment usage intentions into actual behavior. The visualization of the research model illustrates how the framework is integrated systematically and coherently. Thus, this visualization strengthens the theoretical explanation and accommodates the interpretation of research findings.

The hypotheses developed in this study are adapted from Elhajjar & Ouaida (2020) research to examine the influence of digital literacy, resistance, perception of risk, compatibility, and awareness on perceived usefulness and perceived ease of use. Additionally, the study adapts Sultan & Wong (2014) research model to investigate the effects of attitude, subjective norms, and perceived behavioral control on behavioral intention, as well as the moderating factors of communication, satisfaction, and trust in understanding the relationship between behavioral intention and behavior within the context of digital payment technology adoption. Twenty-five hypotheses were constructed to address the research objectives.

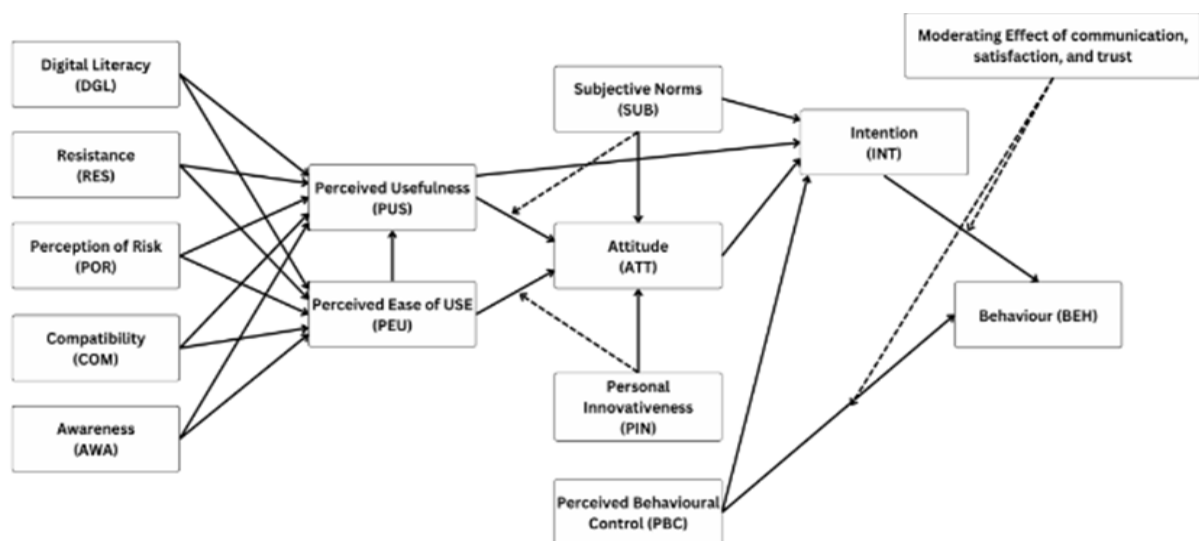


Figure 1. Research Model Elhajjar & Ouaida (2020) and Sultan & Wong (2014)

Digital literacy is conceptualized as an individual's capacity to effectively locate, evaluate, and utilize information through digital technologies. This competency encompasses understanding and applying digital tools essential for daily activities, particularly in digital payment systems (Wulansari et al., 2024). Users exhibiting high digital literacy demonstrate enhanced comprehension of application functionalities, including transaction management and security protocols (Nguyen et al., 2024). Previous research has established a positive correlation between digital literacy and perceived usefulness and ease of use of technology (Elhajjar & Ouaida, 2020). Based on this theoretical foundation, the following hypotheses are proposed:

- H1: Digital literacy has a positive effect on perceived usefulness in using digital payments.
- H2: Digital literacy has a positive effect on perceived ease of use in the use of digital payments.

Resistance to new technology, specifically digital payment systems, typically emerges when individuals experience anxiety or uncertainty about technological changes. This opposition stems from multiple factors, including uncertainty about technological benefits, privacy concerns, and perceptions that the technology is excessively sophisticated or incompatible with user needs (Abraham et al., 2024; Mgiba & Shukla, 2024). The resistance toward new technology influences how individuals evaluate its benefits after adoption (Elhajjar & Ouaida, 2020). When users overcome this initial resistance, their perspectives can transform, ultimately leading to the recognition of digital payment benefits. Therefore, the following hypotheses are proposed:

- H3: Resistance has a positive effect on perceived usefulness in the use of digital payments.

- H4: Resistance has a positive effect on perceived ease of use in the use of digital payments.

Risk perception encompasses concerns regarding personal data security, potential transaction errors, and fraudulent activities associated with emerging technologies such as digital payments (Wu & Wang, 2005; Kishara et al., 2024). Elevated risk perception frequently leads to user hesitation in technology adoption. However, when practical experience demonstrates that these risks are manageable or minimal, individuals tend to reevaluate the technology's benefits and usability (Elhajjar & Ouaida, 2020; Maulana et al., 2024). Users initially expressing concerns about digital payment security may develop increased confidence upon recognizing the system's robust security measures. Therefore, risk perception influences:

- H5: Perception of Risk has a positive effect on Perceived Usefulness in the use of digital payments.
- H6: Perception of Risk has a positive effect on Perceived Ease of Use in the use of digital payments.

Compatibility represents the degree to which emerging technologies, particularly digital payment systems, align with users' needs, values, and lifestyle patterns (Hernandez & Mazzon, 2007). When individuals perceive technology as relevant and supportive of their daily activities, they recognize its benefits more (Herawan et al., 2024). Users who perceive digital payment systems as transaction facilitators or enablers of efficient lifestyle management exhibit enhanced appreciation of the technology's benefits and usability. Research demonstrates that stronger alignment between technology and user preferences correlates with heightened perceptions of usefulness and ease of use (Elhajjar & Ouaida, 2020). Therefore, the following hypotheses are proposed:

- H7: Compatibility has a positive effect on perceived usefulness in the use of digital payments.
- H8: Compatibility has a positive effect on perceived ease of use in the use of digital payments.

Awareness denotes the degree to which individuals comprehend and recognize the existence and advantages of emerging technologies (Alnemer, 2022). Users demonstrating high awareness levels typically exhibit more favorable perceptions regarding technological benefits, including security features and operational simplicity (Kuah et al., 2024). A comprehensive understanding facilitates increased user confidence and technological proficiency, enhancing usability perceptions (Baliawan et al., 2024; Maulana et al., 2024). Moreover, elevated awareness diminishes usage barriers through expedited user adaptation to technological functionalities (Elhajjar & Ouaida, 2020). Based on these findings, the following hypotheses are formulated:

- H9: Awareness has a positive effect on perceived usefulness in the use of digital payments.
- H10: Awareness has a positive effect on perceived ease of use in the use of digital payments.

Perceived Usefulness implies the belief that a specific technology can enhance user performance and efficiency (Syifa & Santoso, 2024). In digital payments, benefits such as speed, convenience, and security can influence users' attitudes toward this technology (Baliawan et al., 2024). The higher the perceived benefits, the more positive users' attitudes become, and the greater their intention to continue using the technology (Ayaz & Yanartaş, 2020; Nguyen et al., 2024). These researches indicate that the higher the perceived benefits, the more positive users' attitudes toward digital payments become, and di-

gital payments that provide perceived benefits can drive users' intentions in digital payment adoption. Therefore, the following hypotheses are proposed:

- H11: Perceived usefulness has a positive effect on attitude in the use of digital payment.
- H12: Perceived usefulness has a positive effect on intention in the use of digital payments.

Perceived ease of use points out the extent to which technology can be used without excessive effort. In TAM, perceived ease of use directly enhances perceived usefulness (Syifa & Santoso, 2024). A simple and intuitive interface can reinforce positive user experiences, making them more confident in the technology's value in supporting their needs (Poonam, 2021). Furthermore, digital payment users can experience technology positively and support its use when the application offers quick and straightforward processes (Li-ana & Fadli, 2024). Based on these considerations, the following hypotheses are proposed:

- H13: Perceived ease of use has a positive effect on perceived usefulness in the use of digital payments.
- H14: Perceived ease of use has a positive effect on attitudes in the use of digital payments.

Subjective norms suggest social influences on technology adoption, such as family or friend support (Bechler et al., 2021). Subjective norms can originate from various sources, such as support from social environments, emerging trends, or recommendations from respected or influential individuals (Anderson, 2023; Seguya et al., 2023; Christian et al., 2024). Positive social encouragement enhances users' attitudes and intentions toward digital payment technology (Elhajjar & Ouaida, 2020). Therefore:

H15: Subjective norms have a positive effect on attitudes in the use of digital payments.

H16: Subjective norm has a positive effect on intention in the use of digital payment.

Personal innovation reflects an individual's tendency to try new technologies (Dirwan & Latief, 2024). Innovative individuals tend to have more positive attitudes toward digital payments (Ganiem et al., 2024), thus being more likely to view technology as something interesting and challenging. In digital payments, users with high personal innovation adopt and explore new features more quickly (Sharma et al., 2023). Therefore, it can be concluded that personal innovation has a strong relationship with digital payments in enhancing user efficiency and life convenience (Elhajjar & Ouaida, 2020). The proposed hypotheses are:

H17: Personal Innovativeness has a positive effect on Attitude in the use of digital payment platforms.

Positive attitudes toward technology emerge from perceived benefits, ease of use, and social support (Syifa & Santoso, 2024; Baliawan et al., 2024; Kushwaha, 2024). A positive attitude becomes the primary determinant in shaping an individual's intention to use technology. Thus, a positive attitude mirrors digital payment users' confidence in delivering expected value and benefits (Elhajjar & Ouaida, 2020; Sultan et al., 2020). Based on this description, the proposed hypothesis is:

H18: Attitude has a positive effect on Intention in using digital payment platforms.

Perceived behavioral control determines the extent to which digital payment users believe their applications have the ap-

propriate capabilities and resources. Users who believe they have complete control and can effectively operate the technology are more likely to intend to use it. When perceived behavioral control is high, the intention and behavior of technology usage increases (Sultan et al., 2020). The hypothesis used is:

H19: Perceived behavioral control has a positive effect on intention in the use of digital payments.

H20: Perceived behavioral control has a positive effect on behaviour in the use of digital payments.

Intention refers to an individual's tendency to perform an action (Chawla & Joshi, 2019). Intention is a primary factor in determining behavior, as it reflects the motivation to act (Sultan et al., 2020). The stronger a person's intention, the more likely they are to use it. The proposed hypothesis is:

H21: Intention has a positive effect on behavior in the use of digital payments.

Personal innovativeness, which relates to an individual's proclivity to adopt new technology, might amplify the impact of ease of use on attitudes (Desmatuti et al., 2024). Personal innovativeness functions as a moderator that provides additional positive influence, such as viewing ease of use as an opportunity to explore more technological benefits, which in turn enhances attitudes toward digital payment. In the context of digital payment, personal innovativeness plays a crucial role, particularly when new technology is introduced, as innovative users tend to be more responsive to intuitive features and simple interfaces, which reinforces their belief in the technology's relevance. The hypothesis is:

H22: Personal innovativeness moderates the influence of the relationship

between perceived ease of use and attitude in the use of digital payments.

Perceived Benefits are beliefs that technology helps users meet their needs more efficiently, which influences attitudes toward that technology (Syifa & Santoso, 2024). However, the impact of perceived benefits on attitude can be strengthened by Subjective Norms, which are individual perceptions of social pressure or views of significant others regarding technology use (Bechler et al., 2021). In TPB, subjective norms influence individual attitudes, especially in social environments that support technology. These studies show that subjective norms increase the influence of perceived advantages on attitude by giving a social endorsement for technological benefits. When someone observes that their surroundings encourage the usage of digital payment systems, they will have a more positive attitude toward that technology. Hence, the proposed hypothesis is:

H23: Subjective norms moderate the relationship between the influence of perceived benefits on attitudes in the use of digital payments

Communication, happiness, and trust all play crucial moderating roles in the relationship between digital payment platform users' intentions and behavior. Effective communication, such as clear information delivery and education about digital payment capabilities and security, can improve the relationship between intention and behavior. User happiness also has an impact because if users are satisfied with their experience with digital payments, they are more likely to continue using them, increasing the possibility that that intention becomes actual behavior. Trust, a crucial element in technology adoption, reduces uncertainty and strengthens users' commitment to the technology

(Sultan & Wong, 2012). Based on this explanation, the proposed hypothesis is:

H24: Communication, satisfaction, and trust moderate the influence of perceived behavioral control on behavior in the use of digital payments.

H25: Communication, satisfaction, and trust moderate the influence of intention on behavior in the use of digital payments.

METHOD

A conclusive design tests the relationships between variables affecting digital payment user preferences. The single cross-sectional method was chosen to obtain a snapshot of conditions at a single point in time. Data was collected through questionnaires using a 7-point Likert scale and analyzed using Structural Equation Modeling (SEM), which allows researchers to test relationships between variables simultaneously.

The study integrates two conceptual frameworks. The first framework investigates how variables, including digital literacy, resistance, and risk perception, influence perceived usefulness and perceived ease of use, which in turn affect user attitudes and intentions. The second framework examines the impact of attitude, subjective norms, and perceived behavioral control on behavioral intention, with communication, satisfaction, and trust as moderating variables. This integrated approach provides a comprehensive understanding of factors influencing digital payment platform adoption and the moderating effects on intention-behavior relationships.

The research focuses on digital payment platform users in Indonesia, where rapid growth has been facilitated by increased internet penetration, smartphone adoption, and governmental support.

Purposive sampling was employed to select participants who had been active users within the previous six months and met specific criteria. The final sample size ranged from 300 to 600 respondents, with 400–500 considered optimal based on SEM guidelines, which recommend a minimum of 10–20 respondents per parameter estimated. This aligns with common rules of thumb for SEM to ensure statistical power and model stability. Data collection proceeded through online surveys using 7-point Likert scale questionnaires to assess user perceptions, attitudes, and intentions—initial questionnaire validation involved testing with 30 respondents to ensure comprehensibility, validity, and reliability. SEM analysis was utilized to examine variable relationships.

RESULT AND DISCUSSION

The initial analysis evaluated the measurement model through validity and reliability assessments to ensure instrument quality and response consistency. As

shown in Table 1, all constructs were assessed using Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). To improve readability, significant thresholds are highlighted, Cronbach's Alpha and CR values above 0.70 and AVE above 0.50 indicate satisfactory reliability and convergent validity.

The communication, trust, and satisfaction variables in Table 1 are moderating variables. Table 1 also shows that all AVE values for these variables are above 0.5, indicating acceptable validity. Similarly, Cronbach's Alpha and Composite Reliability values for all variables are above 0.6, indicating satisfactory reliability.

Table 2 illustrates that Perceived Ease of Use (PEU) exhibits the highest R-square value (0.651), indicating that 65.1% of its variance is explicable through Awareness (AWA), Compatibility (COM), and Resistance (RES), demonstrating robust predictive capacity.

The model accounts for 64.7% of the variance in user attitudes toward technology, attributable to PEU and Perceived Use-

Table 1. Reliability and Validity of Main-Test Variables

Variables	Cronbach's Alpha	Composite Reliability	AVE
Attitude	0.905	0.933	0.778
Awareness	0.849	0.909	0.768
Behaviour	0.84	0.904	0.758
Compatibility	0.875	0.914	0.727
Digital Literacy	0.822	0.894	0.738
Intention	0.903	0.932	0.774
Perceived Behaviour Control	0.925	0.943	0.769
Perceived Ease of Use	0.907	0.931	0.729
Personal Innovativeness	0.855	0.912	0.775
Perception of Risk	0.907	0.935	0.781
Perceived Usefulness	0.855	0.912	0.775
Resistance	0.904	0.933	0.777
Subjective Norms	0.854	0.911	0.774
Moderating Effect (Communication, trust, satisfaction)	0.944	0.952	0.621

Source: Processed Data (2025)

Variables

Source: Processed Data (2025)

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These findings substantiate the research model's strong predictive validity in explaining substantial variance across dependent variables while acknowledging the potential for model enhancement through additional predictor incorporation.

The analysis of the hypothesis testing results from Table 3 reveals a combination of significant and non-significant effects within the proposed model. The majority of the research hypotheses (22 out of 25) are statistically significant, with p-values below 0.05 and t-values above 1.96, indicating strong support for many hypothesized relationships. Significant positive

effects are observed in several key paths, for instance, digital literacy shows a strong impact on both Perceived Usefulness (PUS) and Perceived Ease of Use (PEU), with p-values of 0.000. Likewise, resistance, compatibility, and perceived behavioral control also demonstrate significant positive effects on PUS and PEU, reinforcing the model's predictive validity. However, a few hypotheses are not supported by the data, such as the relationship between Awareness and PUS, as well as the moderating effects of Subjective Norms and the combination of Communication, Trust, and Satisfaction on certain relationship.

Discussion

The discussions are organized into four clusters to focus on key areas that drive the adoption and use of digital payment systems: User competence and perception cluster, resistance and risk cluster, social and behavioral influence cluster, and adoption and engagement outcomes cluster. This approach facilitates a more structured analysis by addressing user competence, resistance, social influences, and adoption outcomes that comprehensively discuss the factors influencing digital payment adoption in Indonesia.

Table 3. Hypotheses Test

	Hypothesis	t value	p-value
H1	Digital Literacy -> Perceived Usefulness	3.448	0.000*
H2	Digital Literacy -> Perceived Ease of Use	3.909	0.000*
H3	Resistance -> Perceived Usefulness	3.332	0.000*
H4	Resistance -> Perceived Ease of Use	3.522	0.000*
H5	Perception of Risk -> Perceived Usefulness	2.479	0.007*
H6	Perception of Risk -> Perceived Ease of Use	2.878	0.002*
H7	Compatibility -> Perceived Usefulness	3.584	0.000*
H8	Compatibility-> Perceived Ease of Use	3.463	0.000*
H9	Awareness -> Perceived Usefulness	0.668	0.252
H10	Awareness -> Perceived Ease of Use	4.542	0.000*
H11	Perceived Usefulness -> Attitude	4.377	0.000*
H12	Perceived Usefulness -> Intention	3.751	0.000*
H13	Perceived Ease of use -> Perceived usefulness	2.907	0.002*
H14	Perceived Ease of Use -> Attitude	5.773	0.000*
H15	Subjective Norm -> Attitude	3.215	0.001*
H16	Subjective Norm -> Intention	3.819	0.000*
H17	Personal Innovativeness -> Attitude	4.892	0.000*
H18	Attitude -> Intention	3.869	0.000*
H19	Perceived Behavioural Control -> Intention	4.369	0.000*
H20	Perceived Behavioural Control -> Behavior	2.965	0.002*
H21	Intention -> Behavior	3.597	0.000*
H22	Personal Innovativeness x Perceived Ease of Use -> Attitude	3.769	0.000*
H23	Subjective Norm x Perceived Usefulness -> Attitude	0.258	0.398
H24	Moderator x Intention -> Behavior	0.163	0.435
H25	Moderator x Perceived Behavioural Control -> Behavior	1.292	0.098

*Significant at $\alpha = 0.05$ ($p < 0.05$)

Source: Processed Data (2025)

User Competence and Perception

Digital literacy significantly shapes users' perceptions of digital payment systems, playing a crucial role in how they perceive these technologies' usefulness and ease of use digital (Wulansari et al., 2024; Elhajjar & Ouaida, 2020). The analysis underscores that individuals with higher digital literacy are more likely to find digital payment systems both beneficial and user-friendly. This influence of digital literacy is critical as digital payment platforms become increasingly integral to daily transactions, necessitating efficient navigation by users (Elhajjar & Ouaida, 2020; Le Nguyen et al., 2024). Enhanced digital literacy not only reduces barriers to adoption by boosting user confidence but also facilitates smoother interactions with digital payment systems, leading to a more positive evaluation of the system's benefits.

Given the pivotal role of digital literacy, service providers should prioritize educational initiatives to enhance this competency. By providing interactive support materials and targeted educational programs, they can fully empower users to exploit digital payment technologies' potential. This strategic focus on improving digital literacy is essential for fostering greater acceptance and sustained use of digital payment systems, ultimately enhancing the overall user experience.

PUS and PEU are also critical in shaping user attitudes and intentions toward digital payment systems. These constructs are deeply influenced by users' digital literacy, among other factors, and play a central role in the adoption process. When users find digital payment systems easy to navigate, they are more likely to perceive them as beneficial. This positive relationship suggests that users who recognize tangible benefits from using digital payment systems will likely develop more favorable attitudes toward their adoption.

Additionally, the simpler a digital payment system is to use, the more positively users will view it. These insights highlight the necessity of designing intuitive and user-friendly digital payment platforms to enhance users' perceptions of usefulness and ease of use.

Resistance and Risk

The resistance and risk cluster examines two critical factors affecting user interaction with digital payment systems: user resistance and risk perception. These elements significantly shape the adoption of digital payment technologies, necessitating thorough analysis.

Resistance to digital payment technologies often originates from users' initial hesitations or reluctance, influenced by unfamiliarity or previous negative experiences (Elhajjar & Ouaida, 2020; Maulana et al., 2024). This resistance affects both these systems' PUS and PEU. Overcoming resistance through educational campaigns and user-friendly designs can significantly enhance users' appreciation of the benefits and efficiencies of digital payments, such as increased convenience and security. Research supports that users often find the technology easier to use and more beneficial than anticipated once they overcome their initial resistance (Kishara et al., 2024).

On the other hand, risk perception involves users' assessments of potential threats, such as security breaches or financial losses, which can deter adoption if the perceived risks outweigh the benefits. Effective management of these perceptions, through robust security measures and clear communication about protections, can alleviate user concerns, enhance confidence, and encourage adoption. Positive user experiences can transform perceptions, making the technology appear less risky and more user-friendly, thereby increasing its perceived usefulness and ease of use.

Both resistance and risk perception are fundamental in shaping the landscape of digital payment adoption. Addressing these factors through targeted interventions can facilitate smoother transitions for users from traditional to digital payment methods and eventually enhance user engagement and satisfaction with digital payment platforms.

Social and Behavioral Influence Cluster

Subjective norms pertain to the perceived social pressures exerted by significant others that may influence an individual's decision to engage in specific behaviors. The findings reveal a robust correlation between subjective norms and both attitudes and intentions toward digital payment adoption. Specifically, the results indicate that subjective norms significantly predict user attitudes (H15: $p=0.001$, $t=3.215$) and intentions (H16: $p < 0.001$, $t=3.819$). These outcomes align with the premises of the Theory of Reasoned Action, posited by (Bechler et al., 2021), which underscores the influence of social factors on behavioral intentions. The observed impact suggests that in environments where digital payments are socially endorsed, individuals are more likely to adopt and advocate for these technologies.

Personal innovativeness, defined as an individual's propensity to embrace and utilize new technologies, significantly affects attitudes toward digital payment systems. The document reports a strong positive effect of personal innovativeness on attitudes (H17: $p < 0.001$, $t=4.892$). This finding supports Dirwan' Diffusion of Innovations theory, which categorizes individuals based on their readiness to adopt new technologies, from early adopters to laggards (Dirwan & Latief, 2024). Additionally, personal innovativeness is found to moderate the relationship between perceived ease of use and attitudes (H22: $p < 0.001$, $t=3.769$), indicating that for inno-

vative individuals, the ease of using digital payment systems significantly enhances favorable attitudes. This suggests that personal traits can amplify the positive perceptions of technology's usability, thereby facilitating greater acceptance and integration into daily use.

The analysis within the social and behavioral influence cluster underscores the pivotal roles of subjective norms and personal innovativeness in the adoption process of digital payment systems. The influence of social pressures and personal traits informs user attitudes and intentions and provides strategic insights for stakeholders aiming to enhance the penetration of digital payment technologies. Effective strategies might include leveraging social proof and influencer endorsements to alter subjective norms positively. Furthermore, accommodating the spectrum of personal innovativeness in technology design could cater to a broader demographic, ensuring that both technologically adept individuals and less innovative users find digital payment systems accessible and easy to adopt. Integrating insights from subjective norms and personal innovativeness into the deployment and promotion of digital payment systems can significantly enhance user adoption rates and overall engagement with these technologies. Stakeholders are encouraged to consider these psychological and social dimensions in their strategic planning to maximize the effectiveness of their initiatives in the digital payments landscape.

Adoption and Engagement Outcomes Cluster

This cluster focuses on understanding the ultimate outcomes of the adoption process concerning digital payment systems, specifically examining constructs such as attitude, intention, and behavior. These outcomes are crucial as they encapsulate the culmination of various fac-

tors previously discussed in other clusters. This cluster employs a comprehensive approach to analyze how users perceive and utilize digital payments, which in turn affects their overall engagement with these technologies.

Attitude towards digital payments is shaped by users' perceived usefulness and ease of use of technology. The hypothesis testing results from the document indicate that perceived usefulness has a strong positive effect on attitude (H11: $p=0.000$, $t=4.377$), suggesting that the more users recognize the tangible benefits of digital payments, the more favorable their attitudes become. Similarly, perceived ease of use also significantly influences attitude (H14: $p=0.000$, $t=5.773$), indicating that user-friendly and intuitive interfaces enhance positive perceptions towards technology.

Intention to use digital payments is another critical outcome influenced by attitudes and perceived behavioral control. The findings show that attitude directly and significantly impacts intention (H18: $p=0.000$, $t=3.869$), affirming that positive attitudes towards digital payments can strongly motivate users to engage with the technology. Additionally, perceived behavioral control, which reflects users' perceptions of their ability to use technology, also significantly influences intention (H19: $p=0.000$, $t=4.369$), highlighting the importance of users feeling capable of using digital payments. Behavior, or the actual use of digital payment systems, is directly influenced by intention (H21: $p=0.000$, $t=3.597$), demonstrating that a strong intention to use digital payments often translates into actual usage. This relationship is pivotal as it connects the theoretical constructs of attitude and intention with the practical outcome of behavior. The effect of perceived behavioral control on behavior (H20: $p=0.002$, $t=2.965$) further underscores the importance of users

feeling they have the necessary resources and capabilities to use digital payments effectively.

The cluster analysis also explores how various factors interrelate and influence these outcomes. For instance, personal innovativeness significantly enhances the relationship between perceived ease of use and attitude (H22: $p=0.000$, $t=3.769$), suggesting that individuals open to new technologies are more likely to develop positive attitudes towards digital payments if they find the technology easy to use.

Moreover, subjective norms play a significant role in shaping both attitude and intention (H15, H16), indicating that social influences from peers and close contacts can profoundly affect users' engagement with digital payments. This social component is critical in understanding how digital payment technologies are adopted within different communities and social settings.

CONCLUSION AND RECOMMENDATION

The conclusion highlights a distinctive interaction of significant and non-significant effects within the integrated TAM and TPB framework, without reiterating earlier detailed analyses. It is evident that user competence, particularly digital literacy, plays a crucial role in shaping perceptions of usefulness and ease of use, significantly affecting user attitudes towards digital payments. The positive impacts of digital literacy, resistance, compatibility, and perceived behavioral control on these perceptions are statistically significant, with p -values well below the 0.05 threshold, underscoring their importance in the adoption process. These findings suggest that enhancing digital literacy and addressing user resistance could be key strategies in promoting broader acceptan-

ce and usage of digital payment systems.

On the other hand, some hypothesized relationships are not statistically supported, such as the influence of awareness on perceived usefulness and the interaction between subjective norms and perceived usefulness on attitude. These non-significant results indicate potential gaps in the current understanding and application of digital payment systems, suggesting that mere awareness cannot alter perceptions significantly and that other factors may play more critical roles in shaping attitudes.

Moreover, the significant moderating effect of personal innovativeness on the relationship between perceived ease of use and attitude emphasizes the importance of individual traits in technology adoption. To strengthen the theoretical and practical contributions of future research, it is recommended to employ longitudinal designs to capture behavioral changes over time and to validate findings through experimental approaches. Such strategies could offer deeper insights into causal mechanisms and the long-term impacts of digital literacy, resistance, and other key variables in digital payment adoption.

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