

Enablers of Multi-Currency Wallet Adoption : A TISM-Fuzzy MICMAC Approach

Ankita Singh ¹

G. P. Sahu ²

Abstract

Purpose : This study investigated the essential elements that affect multi-currency wallet adoption among developing nations and established their relationships. It also analyzed the relationship between factors influencing consumer choices in cross-border digital payment transactions.

Design/Methodology/Approach : Expert evaluation, literature review, and total interpretive structural modeling (TISM) have enabled researchers to develop and arrange critical enablers through a hierarchical structure. Fuzzy MICMAC analysis assessed the recognized enablers' driving and dependence power relationships through multiple interpretation models.

Findings : The research revealed 11 core factors: performance expectancy, perceived usefulness, effort expectancy, hedonic motivation, habit, ubiquity, facilitating conditions, social influence, perceived security, gamified payment, and behavioral intention. TISM demonstrated how the enablers were positioned at different levels of the hierarchy, yet Fuzzy MICMAC grouped them as dependent and independent linkage elements. Performance expectancy and perceived usefulness had the most significant influence on users; however, behavioral intention was the most influential factor.

Practical Implications : This study presented valuable strategic recommendations for managers and developers regarding which enablement factors can boost multi-currency wallet usage. The study outcomes can help government officials create plans to improve digital payment systems in emerging markets while implementing educational initiatives.

Originality/Value : We confirm that this study represents the initial research that merges TISM and fuzzy MICMAC for analyzing expert opinions on multi-currency wallet adoption. Future research could build this work as a basis for empirical methodology development along with the creation of new policies.

Keywords : multi-currency wallets, TISM, Fuzzy MICMAC, digital payments, financial technology adoption, consumer behavior, qualitative research

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Demographic changes in financial technology have substantially reshaped payment systems worldwide at the level of digital payment mechanisms. Essential commodity exchanges marked the first step in digital payments and developed into advanced electronic methods that replaced traditional cash-based transactions (Kumari & Mohanty, 2024; Mishra et al., 2025). Multi-currency wallets have emerged as a significant evolutionary development that allows users to make convenient currency-based transactions (Guru & Panda, 2024; Singh et al., 2020). Digital wallets have become prominent because they increase financial inclusion

¹Research Scholar (Corresponding Author), School of Management Studies, Motilal Nehru National Institute of Technology, Allahabad, Prayagraj - 211 004, Uttar Pradesh. (Email : ankitasinghkesharwani@gmail.com) ;

ORCID iD : <https://orcid.org/0000-0003-3748-9789>

² Professor, School of Management Studies, Motilal Nehru National Institute of Technology, Allahabad, Prayagraj - 211 004, Uttar Pradesh. (Email : gsahu@mnnit.ac.in)

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by allowing unbanked populations to easily use essential financial services, thus promoting cross-border transactions, the transition to a cashless society, and economic integration across borders (Panackal et al., 2024).

Multiple e-transaction services, including bill payments, shopping, and bookings, can be handled securely through digital wallets. These platforms enable users to manage digital funds for online payments conveniently. Digital payment methods facilitate e-commerce growth by providing better convenience and efficiency than conventional payment options (Ashique Ali & Subramanian, 2024; Kelkay et al., 2025; Ly et al., 2022). The pandemic intensified the momentum of digital wallet adoption, resulting in Indonesian digital wallet transactions ballooning from 10% in 2019 to 50% in 2020 (Dwijayanti et al., 2021). Although digital wallets deliver numerous advantages, users must recognize essential security threats, dependency issues, and potential excessive spending habits (Yang et al., 2023). Digital wallets display differences in design aspects among receipt mechanisms, funding methods, transaction procedures, and user interfaces (Kesumastuti, 2020). Digital wallets handle transactions rapidly, with ease and adaptability, so they have taken over physical money payment systems, according to Alam et al. (2021). Digital wallets among consumers and businesses received additional momentum from Malaysian government programs such as Shop Malaysia Online and ePENJANA (Othayoth & Khanna, 2024).

The research focuses on understanding the critical success factors influencing consumers' behavior and intention to use multi-currency wallets. This study examines three significant aspects of consumers who use multi-currency wallets :

- ✎ What key factors influence consumer behavior when adopting multi-currency wallets?
- ✎ How are these factors interrelated, as assessed by the MICMAC analysis?
- ✎ What hierarchical structure emerges from these influencing factors based on their driving power and dependence levels?

Accordingly, the objectives of the research are as follows:

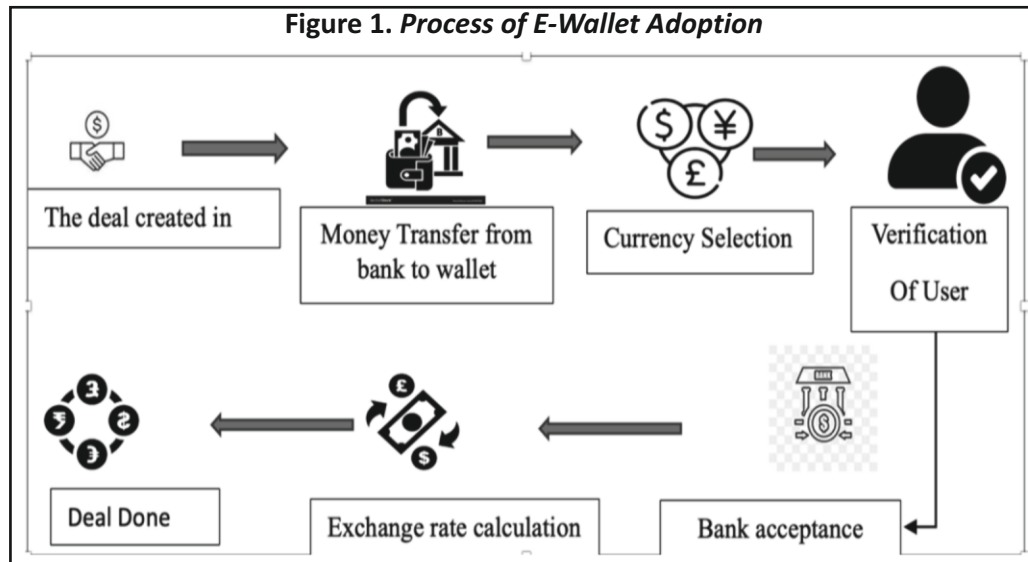
- ✎ To identify and analyze the key factors influencing the successful implementation of multi-currency wallets through literature review and expert consultation.
- ✎ Establish interrelationships among these factors using total interpretive structural modeling (TISM).
- ✎ Categorizing and ranking these influencing variables through fuzzy MICMAC analysis.
- ✎ Providing actionable insights and recommendations for financial institutions and policymakers to enhance sustainable adoption and usage of multi-currency wallets.

Literature Review

Although e-wallet acceptance and usage have surged recently, significant gaps remain, and adoption patterns vary across regions (Nayak & Kumar, 2025). Recent literature (2010–2025) has extensively explored e-wallet development and usage, offering insights that are highly relevant to this study.

Evolution of the Electronic Wallet

E-wallet technology originated from mobile phone-based payment systems and has quickly gained traction as an alternative to traditional payment methods (Kotni, 2024). Research indicates a clear shift toward digital payments globally, with studies highlighting significant determinants influencing user adoption, such as social intention and



ease of use (Alam et al., 2021; Sardana et al., 2023). For instance, WeChat Pay and Alipay have become dominant cashless payment platforms in China, reflecting broader societal shifts toward digital financial transactions (Chong & Ma, 2021). In Southeast Asia, particularly Malaysia, government initiatives have accelerated e-wallet adoption, pushing toward a cashless economy. Figure 1 depicts the e-wallet adoption process.

Electronic Wallet (E-Wallet)

An electronic wallet (e-wallet) is a digital application that facilitates secure and convenient financial transactions without cash or physical cards (Istijanto & Handoko, 2022; Kotni, 2024). Popular e-wallet services in Malaysia include Touch N' Go, Grab Pay, Boost, and Shopee Pay, which are widely used for various transactions and provide security through features such as OTP and biometric authentication (Gea & Al-Azhar, 2021; Liu et al., 2020; Ly et al., 2022). Increased smartphone penetration significantly contributes to e-wallet growth, as evidenced by transactions totaling IDR 17.5 trillion during pandemic-related restrictions in Indonesia (Tillmanns et al., 2025).

Types of E-Wallets

E-wallets are typically categorized into closed, open, semi-closed, crypto, IoT, and multi-currency wallets :

- ✧ Closed wallets are restricted to specific vendors or businesses and do not allow external transfers externally (Singh et al., 2024). Examples include Amazon Pay and Google Pay, which offer convenience but limited flexibility (Tian et al., 2024).
- ✧ The open wallets issued by banks offer broader transaction capabilities, including fund transfers to other wallets and banks, thus enhancing versatility and international usage convenience (Kilani et al., 2023).
- ✧ Semi-closed wallets, provided primarily by telecommunications and multinational corporations, are usable across multiple affiliated merchants but typically restrict funds transfer externally, often offering promotions and loyalty benefits (Grover & Kar, 2020).
- ✧ Crypto wallets facilitate transactions involving cryptocurrencies, such as Bitcoin and Ethereum, ensuring the secure storage, transfer, and management of digital assets (Suratkar et al., 2020).

☞ IoT wallets enable secure machine-to-machine (M2M) payments using blockchain, facilitating decentralized transactions across IoT devices (Niya & Stiller, 2022).

Concept of the Multi-Currency Wallet

Multi-currency wallets support the storage and management of various currencies within one platform, simplify cross-currency transactions, and manage diverse financial holdings. In India and globally, these wallets have increasingly facilitated international trade, currency exchanges, and convenient, secure management of multiple financial assets securely (Jørgensen & Beck, 2022). This literature review underscores the need for a deeper examination of consumer behavior toward multi-currency wallets, clearly highlighting the gap in the hierarchical understanding of adoption factors.

Conceptualization and Hypotheses

The technology acceptance model (TAM) is based on the idea that consumers' actions are determined by their rational evaluation of the advantages of using a specific technology. The concept is based on the TAM, which considers perceived usability and usefulness to have the most substantial relationships with adoption. TAM functions to explain the reasons behind human decisions regarding whether to use a particular technology when completing tasks. Academic researchers have implemented TAM in their studies of various technological systems, including spreadsheets, voicemails, and object-oriented technologies (Mastour et al., 2025). By analyzing and synthesizing the key aspects of eight separate theoretical frameworks, the unified theory of acceptance and use of technology (UTAUT) was created (AlKheder et al., 2023). Performance expectancy and effort expectancy enable circumstances and social impacts to be significant elements of the UTAUT theoretical framework (Aideed et al., 2025). In 2012, Venkatesh created UTAUT2, a more comprehensive version of the original, with three new constructs: hedonic incentives, habits, and price value. The UTAUT2 framework was used as the basic model in this study because of its incredible explanatory power and empirical replications (Mustafa et al., 2022).

However, in the case of behavioral intention (BI) to use a multi-currency wallet, a few factors may boost its explanatory value. The model's customization may also consider the multi-currency wallet's unique characteristics: performance expectancy (PE), effort expectancy (EE), facilitating conditions (FC), social influence (SI), hedonic motivation (HM), habit (HA), ubiquity (UB), BI, perceived usefulness (PU), and gamified payment (GP) are all included in the proposed theoretical framework. This study's hypotheses state that “PE,” “EE,” “FC,” “SI,” “HM,” “HA,” “UB,” “PU,” and “GP” influence “BI.”

Performance Expectancy (PE)

The extent to which customers anticipate technology will improve their ability to execute a tailored set of tasks is known as “performance expectancy.” PEs have evolved from five theoretical pillars: employee satisfaction, job compatibility, perceived usefulness, expected outcomes, and perceived advantages. PE is crucial for predicting the BI to use a multi-currency wallet (Ponsree & Naruetharadhol, 2025). Performance expectancy measures the extent to which consumers anticipate using technology to their advantage when performing a specific task (Bommer et al., 2022). Several studies have demonstrated that the influence of performance expectations on customer BI is statistically significant (Beerbaum et al., 2025).

Effort Expectancy (EE)

The level of user technological expectations regarding simplicity based on the required work effort represents effort expectancy (Ma, 2025). The phrase “the degree of ease/the effort associated with consumers' use of technology” defines EE. Effort expectation, which was identified through prior experiments, consists of three elements: perceived ease of use, complexity, and ease of use (Aslam et al., 2025). Usability is a key indicator of technology acceptance (Lu & Lin, 2025). Effort expectation is another statistically significant indicator of customer intentions.

Social Influence (SI)

Users evaluate the social impact through their beliefs about pertinent stakeholders, expecting them to utilize the technology, according to Reza et al. (2024). The definition of SI indicates that consumers experience this phenomenon when they discern that meaningful social relationships require them to utilize a specific technology. A “social norm” or “subjective norm” has been used by certain scholars to refer to social influence. Numerous academics have examined this issue and discovered that the intention of users to use a specific technology is positively influenced by family members, teachers, co-workers, seniors, friends, and peers. Numerous studies have shown that social impact statistically predicts BI (Baudier et al., 2023).

Facilitating Conditions (FC)

User quality, known as the enabling condition, reflects users' belief in how technological infrastructure functions with organizational and technical infrastructure (Negm, 2024). The definition of FC is consumers' perceptions of the resources and support available to perform a behavior, which is based on enabling circumstances, compatibility, and perceived behavioral control, three different variables of previous models (Sinulingga et al., 2024). The concept of “facilitating conditions” provides additional resources needed to support the performance of a particular behavior (Higueras-Castillo et al., 2023).

Hedonic Motivation (HM)

Hedonic motivation is the perceived enjoyment, amusement, happiness, or delight of using technology (Hakim et al., 2023). HM is a measure of how much people enjoy using technology, independent of performance behavior. Moreover, it is believed that while employing a multi-currency wallet, hedonic incentives are a good indicator of behavioral intent (Esawe, 2022). Research shows that HM generates statistically relevant effects on user intentions and that if a person loves using technology, there is a greater possibility that they would do so (Kelkay et al., 2025).

Habit (HA)

In this regard, people's reflective or instinctive behaviors resulting from their experiences and learning are called habits (HA). Some authors have emphasized the need for a longer time to form habits with modern technologies (Papathomas et al., 2025). HB has been frequently used to predict the intention to adopt new technologies such as digital wallets (Aideed et al., 2025). A perceptual construct is a habit. The author demonstrates how technology users are susceptible to persuasion when introducing fresh, equivalent technology. End users' intentions may be diverted by habit, which is an essential predictor that significantly affects behavioral intention statistically significantly (Chan et al., 2025).

Ubiquity (UB)

Wallet services rely heavily on ubiquity because they enable customers to perform tasks at any time and location without requiring a wired network (Aaradhi & Chakraborty, 2024; Li & Lay, 2024). Therefore, the most significant advantage of a multi-currency wallet service is the time-saving convenience made possible by ubiquitous services. In the literature on multi-currency wallets, ubiquity has been deemed the main benefit of assisting customers in better evaluating wallet services. Studies state that when making purchases, consumers should consider the accessibility and ease of use of technology. They assert that people are more likely to accept and embrace technology as it becomes more prevalent (Jafar et al., 2024). What individuals feel means for their arrangements to utilize innovation arrives at a comparative resolution. The benefits of its widespread use include consistency, promptness, rapidity, mobility, adaptability, information retrieval, and accessibility (Ma & Ismail, 2025). The pervasiveness of the problem affects how people evaluate outcomes, how much effort they are willing to put in, and how frequently they use technological solutions. This is because ubiquity can be carried out anytime, anywhere.

Perceived Usefulness (PU)

The perceived usefulness of the multi-currency wallet framework is the degree to which customers believe that using it to make payments through an e-wallet application will improve their work efficiency (Anshari et al., 2021; Gilbert & Gilbert, 2025). When customers perceive a tool to be highly effective, they may anticipate a correlation between its reliability and use. Individuals evaluate how helpful something will be based on their belief system to enhance their performance, and the outcomes of this confidence are referred to as perceived benefits (Baig & Yadegaridehkordi, 2025). The PU level of perceived usefulness has a positive and significant effect on customer intentions.

Gamified Payment (GP)

By applying game elements to essential circumstances, gamification can boost user engagement and improve beneficial user-service habits. Indeed, gamification may be successfully implemented in business, as seen in the frequent flyer programs provided by major airlines and Starbucks's partnership with the location-based social networks Foursquare and Nike (Kumari & Mohanty, 2024; Machado et al., 2025). Gamification has been successfully applied in many settings to enhance user learning experiences. Digital wallets are an industry that has embraced gamification as a technological innovation to boost user engagement because it is essential for digital payments, particularly in online learning environments (Najafi et al., 2025). Gamification uses game concepts and aspects such as advertising, classroom instruction, and wellness to promote user awareness, engagement, and loyalty in contexts other than games.

Perceived Security (PS)

Perceived security is the perception that a user remains in front of potential danger when performing financial transactions. Client users evaluate the degree of security when selecting a safe payment mechanism. Perceived security was measured based on the user's sense of safety when performing financial transactions. In the context of a multi-currency wallet, whether mobile or online, security is a crucial factor, as it significantly influences the users' behavioral intention (de Blanes Sebastián et al., 2023). A positive attitude toward using a multi-currency wallet and the intention to do so are positively influenced by the perception of the wallet's level of security

(Zolfaghari et al., 2025). Investigations on multi-currency wallet payments have shown numerous occasions in which a positive link exists between perceived security, performance expectation, and effort expectancy. This association has gained continuous support (Lee & Pan, 2023).

Behavioral Intention to Use (BIU)

The term BIU refers to “a person's intentions to perform a variety of behaviors” and is one definition of the term “behavioral intention” (Higuera-Castillo et al., 2023). According to Hassan et al. (2023), behavioral intention has positive effects on actual technology use in both the technology acceptance model (TRA) and the technology adoption model (TPB). The hypotheses received theoretical support from social psychology models. User behavior can be predicted most accurately based on behavioral intention using the UTAUT2 model. Research has confirmed that behavioral intention drives usage behavior, especially in multi-currency wallet environments. Table 1 shows the enablers that enable the adoption of the multi-currency wallet.

Table 1. Enablers Enabling the Adoption of Multi-Currency Wallet

Code	Enablers	Description	Reference
E1	Performance Expectancy	Consumers expect the easy and quick performance of particular tasks to contribute positively towards adopting a multi-currency wallet.	(Beerbaum et al., 2025; Bommer et al., 2022; Ponsree & Naruetharadhol, 2025)
E2	Effort Expectancy	In light of available knowledge, the minimum effort given to the technology positively affects the consumers' behavioral intention.	(Aslam et al., 2025; Lu & Lin, 2025; Ma, 2025)
E3	Facilitating Conditions	Availability of required resources, i.e., internet and mobile devices with consumers, ensures the positive adoption of a multi-currency wallet.	(Higuera-Castillo et al., 2023; Negm, 2024; Sinulingga et al., 2024)
E4	Gamified Payment	The rewards and games will enhance the user experience using technology. It will have a positive effect on the adoption of multi-currency wallets.	(Machado et al., 2025; Najafi et al., 2025)
E5	Social Norms	The adoption of multi-currency wallets by the surrounding people positively influences them to adopt multi-currency wallets.	(Baudier et al., 2023; Reza et al., 2024)
E6	Habit	A perceptual construct is a habit. The purpose of end users may be misdirected by habit, which is a substantial predictor and statistically significant influence on behavioral intention.	(Aideed et al., 2025; Chan et al., 2025; Papathomas et al., 2025)
E7	Perceived Usefulness	Consumers' belief that using multi-currency wallets will improve the quality of work and personal life positively affects the adoption of multi-currency wallets.	(Baig & Yadegaridehkordi, 2025; Gilbert & Gilbert, 2025)
E8	Ubiquity	Freedom to perform financial transactions anytime and anywhere enables the customer to adopt a multi-currency wallet.	(Jafar et al., 2024; Li & Lay, 2024; Ma & Ismail, 2025)
E9	Hedonic Motivation	A multi-currency wallet offers the consumer a feeling of joy or happiness while using financial services.	(Esawe, 2022; Hakim et al., 2023; Kelkay et al., 2025)
E10	Perceived Security	One's perspective on a multi-currency wallet's level of security favors one's disposition towards and propensity to use the wallet.	(de Blanes Sebastián et al., 2023; Lee & Pan, 2023; Zolfaghari et al., 2025)
E11	Behavior Intention to Use	The definition of behavioral intention is "a person's intentions to engage in a range of behaviors."	(Hassan et al., 2023; Higuera-Castillo et al., 2023)

Total Interpretive Structural Modeling (TISM) and “Fuzzy MICMAC”

Total interpretive structural modeling (TISM) is an advanced version of interpretive structural modeling (ISM) that overcomes the inherent limitations of unclear interpretation and lacks causal links between identified variables (Barve & Nayak, 2023; Daga et al., 2025; Himanshu et al., 2025; Singh, 2024). Integrating interpretive logic from experts makes TISM a modeling approach that develops an explanatory knowledge base that shows both variable connection directions and explanation rationale (Bhardwaj et al., 2025; Saini & Kharb, 2025; Yadav et al., 2025). Understanding complex relationships becomes more complete with TISM because it uses digraphs and interpretive matrices to represent visual interaction patterns. The systematic TISM framework assists in addressing ambiguous aspects and establishes better reliability for expert assessment insights, resulting in its effectiveness for exploratory research on multi-currency wallet adoption (Joseph et al., 2023; Upadhyaya & Sijoria, 2024).

TISM provides better advantages than ISM through its methodology.

- ✦ Specific expert interpretations improve interpretive clarity by being explicitly included in the methodology.
- ✦ Navigation systems of relationships improve communication pathways between experts and lead to consensus development.
- ✦ A systematic integration mechanism that accepts inputs from various authorities.
- ✦ Better theoretical grounding and explanatory capability of the developed models.

Fuzzy MICMAC Data Analysis

Type of Research

This research employs a qualitative methodology, utilizing TISM combined with Fuzzy MICMAC analysis, to investigate and understand the factors influencing consumer intentions towards adopting multi-currency wallets.

Study Design

✦ **Methods of Data :** Primary data were collected through structured interviews and consultations with experts and stakeholders in the financial services sector, specifically individuals experienced in digital payment systems and multi-currency wallets. Secondary data were gathered through an extensive review of relevant literature published between 2010 and 2025.

✦ **Technique of Sampling :** Experts participated in the study through purposive sampling because they demonstrated extensive expertise in financial technology and digital payments combined with their understanding of consumer behavior. The sample frame includes senior executives, financial analysts, and academic researchers in digital finance. The sample consisted of 12 experts who were deemed sufficient for qualitative interpretive analysis.

✦ **Justification of the Sample :** Framework purposive sampling included highly knowledgeable participants, ensuring robust and insightful qualitative data that directly aligns with research objectives and enhances the validity of interpretive structural modeling.

Instruments and Reliability

Structured interview schedules explicitly developed for this study were used for data collection. The interviews were semi-structured, including predefined questions, to explore the factors influencing consumer adoption of multi-currency wallets. Reliability was ensured through expert validation of the interview questions, and consensus was achieved via iterative feedback loops. Although quantitative reliability measures such as Cronbach's alpha were not applicable due to their qualitative nature, internal consistency and interpretive validity were assured through cross-verification by expert panels.

Analysis Software

The analysis was conducted using a specialized analytical software, SmartISM Software, to implement the TISM and Fuzzy MICMAC methodologies. This software efficiently facilitates complex data interpretation and ensures accurate hierarchical modeling and fuzzy analysis.

Geographical Scope and Time Frame

The geographical scope of the study encompassed selected Asian economies, primarily Malaysia, Indonesia, and India. Data collection and analysis were conducted between January 2024 and December 2024.

Hypotheses

Given the qualitative nature of this study, explicit hypothesis testing was not performed in quantitative terms. Instead, the study was structured around exploring and establishing qualitatively hierarchical and interpretive relationships among variables. However, precise research questions guided this study.

- ✦ **RQ1** : What are the key elements influencing consumer adoption of multi-currency wallets?
- ✦ **RQ2** : How are these factors interrelated, as identified through MICMAC analysis?
- ✦ **RQ3** : What hierarchical structure emerges from these influencing factors based on their driving power and dependence levels?

Total Interpretive Structural Modeling (TISM)

TISM is utilized for its capability to interpret and establish hierarchical structures among complex, interrelated variables, addressing ambiguities present in traditional ISM by providing clear explanations of relationships through expert interpretation. The steps involved are:

- ✦ Identification and validation of key factors influencing multi-currency wallet adoption.
- ✦ Establishing contextual relationships through structured expert consultations.
- ✦ Developing pairwise interpretive logic and creating a self-interaction matrix.
- ✦ Formulating preliminary and final reachability matrices.
- ✦ Performing level partitioning to structure variables hierarchically.
- ✦ Developing interpretive matrices and corresponding digraphs.

Fuzzy MICMAC Analysis

Fuzzy MICMAC extends traditional MICMAC by using fuzzy logic to measure varying degrees of relationship strength between elements and categorizing factors into autonomous, dependent, linkage, and driving quadrants (Akash et al., 2025; Mohamadabadi et al., 2025). This analysis identifies and prioritizes variables based on their relative driving and dependence powers to guide strategic decision-making effectively, as described in Figure 2. These methodologies provide a comprehensive qualitative approach to address the study objectives and facilitate insightful consumer behavior analysis toward multi-currency wallet adoption. The relevant research fields are listed in Table 2.

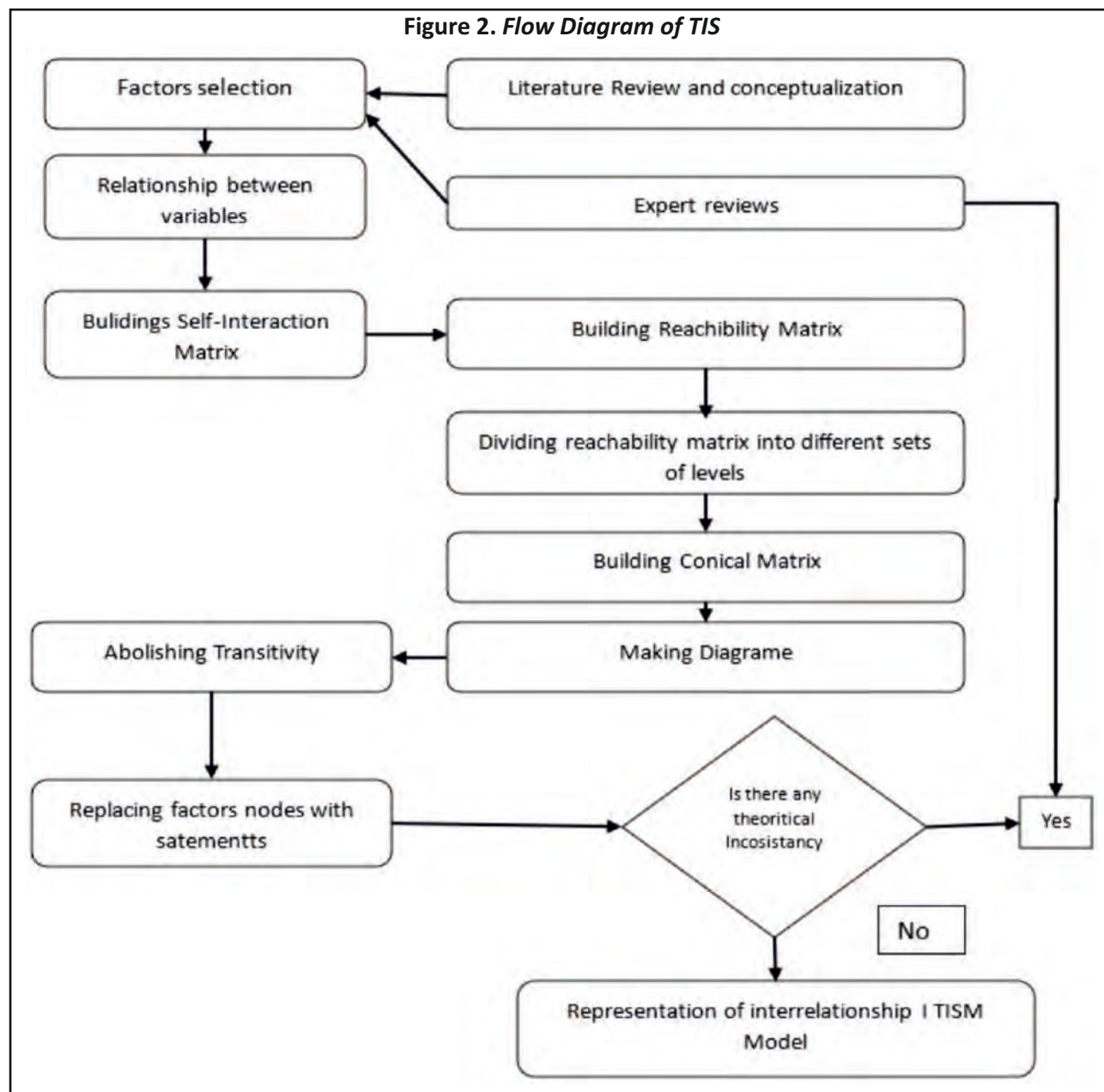


Table 2. Implementation of TISM and Fuzzy MICMAC

Sources	Applications
Akash et al. (2025)	The m-TISM and MICMAC methods enable governments and industry leaders to choose aspects for systematic and structured circular economy implementation, especially in textile production.
Bhardwaj et al. (2025)	Total interpretive structural modeling (TISM) with modifications and extensive literature review to identify and minimize AI's negative aspects.
Daga et al. (2025)	The paper's hierarchical TISM analysis shows how variables that minimize ESG greenwashing interact.
Himanshu et al. (2025)	It aims to identify factors influencing this adoption and establish their interrelationships using a TISM-MICMAC approach.
Mohamadabadi et al. (2025)	Online meal delivery service customer experience aspects are understood and structured using TISM.
Yadav et al. (2025)	This study reveals essential precursors enabling successful partnerships between healthcare executives and academicians.
Saini & Kharb (2025)	A research paper on environmental, social, and governance (ESG) reporting focusing on identifying enablers for adopting ESG practices in India.

Research Methodology Application

Examining the Mechanisms that Contribute to Multi-Currency Wallet Adoption

Based on a literature analysis and expert assistance, 15 enablers for the adoption of multi-currency wallets were identified for this study. After three expert-led brainstorming sessions, 10 enablers were ultimately chosen for the study. The study considered the opinions of 10 specialists, including:

- ✎ Digital wallet customers
- ✎ Technical wallet services provider
- ✎ Merchant services provider for the wallet
- ✎ Academicians

Building the Digraph using the Connections Between the Factors that Make Multi-Currency Wallet Adoption Possible

An integrative approach to ISM to build an interpretative matrix for each paired comparison across various enablers supporting the adoption of a multi-currency wallet, TISM uses a structural self-interaction matrix. Table 3 presents the structural self-interaction matrix created using expert advice. The final reachability matrix was created, as shown in Table 4. The transitivity principle uses the final reachability matrix, as demonstrated in Step 3 of Section 2. The level partitioning of the enablers is shown in Table 5. After incorporating all enablers into the hierarchical model, the reachability and antecedent sets must be executed for each. The assignment of levels for each factor proceeds by evaluating the intersection values and the reachability sets. The final section in Table 6 presents the enablers ranked using the fuzzy MICMAC analysis. The development of the TISM model followed this process. The deployment process of a multi-currency wallet includes various connecting elements, as shown in Figure 3.

Table 3. Structural Self-Interaction Matrix

Factors (i/j)	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1
B1	A	A	A	A	A	A	A	A	C	1
B2	A	A	A	A	A	A	A	A	1	
B3	D	D	D	D	D	D	B	1		
B4	D	D	D	D	D	A	1			
B5	D	B	B	B	B	1				
B6	B	A	A	A	1					
B7	D	D	D	1						
B8	B	C	1							
B9	D	1								
B10	1									

Table 4. Final Reachability Matrix

Factors (i/j)	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	Driving Power
B1	1	1	1	1	1	1	1	1	1	1	1	11
B2	1	1*	1	0	1	1*	0	1*	0	1	0	7
B3	1	1	1	0	1*	1	0	1	1	0	0	7
B4	1	1	1*	0	1*	1	0	1	0	0	0	6
B5	1	1	1	1	1*	1	1	1	1	1	0	10
B6	1	1	1	0	1*	1	0	1	0	0	0	6
B7	1	1	1	0	1	1	0	1	0	0	0	6
B8	1	1	1	1	1*	1*	0	1	0	0	0	7
B9	1	1	1	0	1*	1*	0	1	0	0	0	6
B10	1	1	1	0	1*	1	0	1*	0	0	0	6
B11	1	0	0	0	0	0	0	0	0	0	0	1
Dependence Power	11	10	10	3	10	10	2	10	3	3	1	

Note. * Transitivity value.

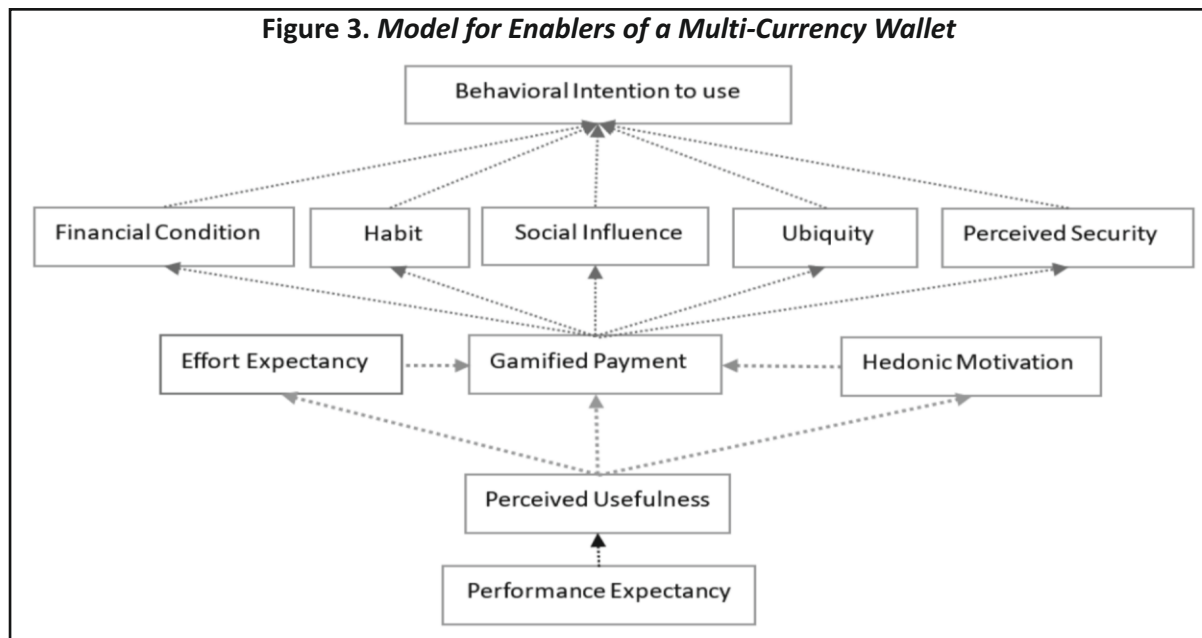
Table 5. Level Partitioning of Enablers

Enablers	Reachability Set	Antecedent Set	Intersection Set	Level
B1	B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, B11	B1	B1	5
B2	B2, B4, B6, B7, B9, B10, B11	B1, B2, B5	B2	3
B3	B3, B4, B6, B7, B9, B10, B11	B1, B3, B5	B3	3
B4	B4, B6, B7, B9, B10, B11	B1, B2, B3, B4, B5, B6, B7, B8, B9, B10	B4, B6, B7, B9, B10,	2
B5	B2, B3, B4, B5, B6, B7, B8, B9, B10, B11	B1, B5	B5	4
B6	B4, B6, B7, B9, B10, B11	B1, B2, B3, B4, B5, B6, B7, B8, B9, B10	B4, B6, B7, B9, B10	2
B7	B4, B6, B7, B9, B10, B11	B1, B2, B3, B4, B5, B6, B7, B8, B9, B10	B4, B6, B7, B9, B10	2
B8	B4, B6, B7, B8, B9, B10, B11	B1, B5, B8	B8	3
B9	B4, B6, B7, B9, B10, B11	B1, B2, B3, B4, B5, B6, B7, B8, B9, B10	B4, B6, B7, B9, B10	2

B10	B4, B6, B7, B9, B10, B11	B1, B2, B3, B4, B5, B6, B7, B8, B9, B10	B4, B6, B7, B9, B10	2
B11	B11	B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, B11	B11	1

Table 6. Ranking of Enablers Using Fuzzy MICMAC Analysis

Driving Power	11	<i>B1</i>											
	10	<i>B5</i>											
	9												
	8	Independent Variables					Linkage Variables						
	7	<i>B8, B3, B2</i>											
	6						<i>B10, B9, B7,B6, B4</i>						
	5												
	4												
	3	Autonomous Variables					Dependent Variables						
	2												
	1						<i>B11</i>						
Dependence Power		0	1	2	3	4	5	6	7	8	9	10	11



Determining the Variables Influencing the Behavioral Intention to Use the Multi-Currency Wallet Using the Fuzzy MICMAC Analysis

The initial step in Part 2 divides the component into four areas using fuzzy MICMAC analysis: independent, linkage, autonomous, and dependent. The last figure in Figure 3 shows the fuzzy MICMAC partition for enabling the utilization of the enablers. The analysis derived the ranking of the enablers using the fuzzy MICMAC method. Table 7 presents the rankings of the enablers obtained from fuzzy MICMAC analysis.

Table 7. Fuzzy MICMAC Rank Analysis

Notation	Enablers	Weight	Rank
<i>B1</i>	Performance Expectancy	3.33	1
<i>B2</i>	Effort Expectancy	1.66	3
<i>B3</i>	Facilitating Conditions	0.16	9
<i>B4</i>	Social Influence	0.6	10
<i>B5</i>	Hedonic Motivation	0.25	8
<i>B6</i>	Habit	0.55	7
<i>B7</i>	Ubiquity	0.66	6
<i>B8</i>	Perceived Usefulness	0.75	5
<i>B9</i>	Gamified Payment	1.5	4
<i>B10</i>	Perceived Security	2	2
<i>B11</i>	Behavioral Intention to Use	0.5	11

Results and Discussion

This study focuses on understanding the fundamental elements that promote individual users and dealers to use multi-currency wallets in developing countries. The research utilized TISM alongside fuzzy MICMAC to connect 11 important characteristics through modeling as part of its answer to research questions RQ1 through RQ3. Emerging economies thrive through multi-currency wallets, enabling people to execute financial deals over borderlines. These wallets serve to make international resources available to individuals and businesses, which increases foreign reserves and economic participation. Through a literature review and expert feedback, the study identified PE and EE as key factors with HM and HA, among others, for RQ1 analysis to determine customer adoption of multi-currency wallets. TISM established a five-step hierarchical system to analyze RQ2. The primary determinant of use behavior appears to be the BI to use at level 1.

According to the fuzzy MICMAC analysis, behavioral intention to use is placed in the dependent quadrant. SI, UB, FC, PS, and habitat served as dual operational variables according to fuzzy MICMAC at Level 2. Research Factor 3 contained substantial independent influencing factors, including EE, GPs, and HM, which showed moderate linkages. PU and PE at Levels 4 and 5 appeared in the independent quadrant of the fuzzy MICMAC analysis, thus confirming their vital influence on adoption. Fuzzy MICMAC successfully validated the structural elements from TISM modeling and established relationships between the driving and dependent components, as per RQ3. PE and PU were entered as independent variables that demonstrated high driving power while showing low reliance. The other two independent variables, GP and HM, combined with EE, also displayed high forces of drive but minimal dependency. The analysis of BI classified it as a statistically dependent variable alongside weak driving power.

The driving force between social context and ubiquity, enabling conditions, and perceived security and habits were decisive in this analysis. Autonomous factors were not observed in the analyzed studies. The proposed model includes various essential relationships. The level of social influence leads to higher effort expectancy, whereas ubiquity enhances the perceived usefulness of elements. The functional aspects of multi-currency wallets directly enhance hedonic motivation, while gamified payments have extraordinary strengthening effects on driving behavior. The collected data reveal the motivations and processes through which users use multi-currency wallets. Gamification and utility work as motivating elements that create behavioral changes through incentive rewards and usability benefits because of the observed transitive patterns. Many potential solutions have emerged after this observation period. Officials should support digital development while teaching people about multi-currency

wallets because of their safety features and advantages. Marketers should launch specific marketing campaigns that focus on user-friendly interfaces, gaming mechanics, and demonstrations of popular opinions to boost customer participation. Developing user-friendly interfaces and ubiquitous systems will enhance system motivation and perceived usefulness, as observed by users. Financial institutions must make efforts to deliver convenient and secure services to their clients. This study contributes by developing multi-currency wallet adoption models with linkable characteristics. The study results can help guide the procedures for developing digital payment systems by correlating them with research topics while presenting actionable outcomes.

Implications

Managerial Implications

These study results provide valuable direction to executives in the market who work to enhance multi-currency wallet approval rates. Decision makers can use the hierarchical model built with TISM and fuzzy MICMAC to prioritize performance expectancy and its two sub-components, perceived usefulness and behavioral intention, among the essential influencing factors. Managers should create focused strategies by identifying key driving variables to enhance user experience and simplify interfaces while adding gamified elements for user motivation. Marketing campaigns become more effective by analyzing linkage variables, from which social influence, ubiquity, and facilitating conditions lead professionals to create promotional strategies that effectively target user motivation. Practitioners should handle the implementation of educational campaigns and awareness programs to demonstrate the benefits of international digital payments to increase user adoption rates.

Theoretical Implications

This study adds value to the theoretical knowledge by demonstrating how TISM and fuzzy MICMAC techniques can be used in digital payment technologies. The research structures how essential multi-currency wallet adoption factors interact and what roles they hold in relative importance. This study creates impactful new models of technology acceptance and fills previous interpretative gaps in research that have rarely achieved complete clarity in their analysis. Combining hedonic motivation elements with gamification mechanics, the research model develops more advanced emotional and experiential predictive abilities than the original utilitarian models, including TAM and UTAUT. Transitive relationship identification generates theoretical constructs used in fintech adoption research that are more complex and clear while adding substantial value.

Policy Implications

This study provides decisional recommendations that regulatory authorities and governmental bodies must implement to develop digital financial inclusion. The government should support innovation in multi-currency wallet development by helping expand the necessary infrastructure, providing regulatory transparency, and supporting private-public cooperation. Specific areas in which policies have the potential to increase adoption include security measures, easy accessibility, and ubiquitous access to developing countries. Programs that build trust together with education in finance and international digital trade will provide the essential tools needed to grow the involvement and participation of the digital economy. This work is a foundation for developing specific intervention strategies that harmonize with digital transformation objectives and the nation's financial accessibility targets.

Conclusion

This structured qualitative study examines multi-currency wallet use characteristics using TISM and fuzzy MICMAC. The analysis of 11 primary enablers revealed complex interdependencies and a hierarchical structure indicating each factor's driving and reliant capacity. Managers, lawmakers, and developers may use the study's methodology to enhance the adoption and design of multi-currency wallets. PE and PU serve as independent variables, whereas BI remains a critical dependent variable. Key influences and effects included social influence, ubiquity, and facilitating conditions. These studies provide usability, marketing, and policy options to increase user adoption.

Limitations and Directions for Future Research

This study provides valuable information on multi-currency wallet acceptability but has limitations. First, qualitative research and expert opinions, however rich in interpretive detail, may limit the generalizability to broader user populations. Second, the sample size was limited to a few relevant specialists who may not sufficiently reflect regional or user demographic viewpoints. Third, this study focuses on developing nations. Therefore, the findings may not apply to developed banking systems with an extensive digital infrastructure. Finally, fintech adoption is dynamic. Thus, new technology or consumer behaviors may modify the enabling relevance. Future research could employ quantitative methods such as user surveys or behavioral data analysis to validate facilitators and links. Customer adoption patterns can be demonstrated through longitudinal research. A comparison of developing and rich countries may reveal different adoption incentives. Researchers may analyze how legal frameworks and cultural factors impact multi-currency wallet acceptance to better understand it.

Authors' Contribution

The study's fundamental concept and qualitative design emerged from Ankita Singh, who implemented methods from TISM and fuzzy MICMAC. The researcher conducted literature studies, after which expert opinions were gathered as primary data while creating the analytical models. Prof. G. P. Sahu supervised this study and contributed to methodological critical analysis, analytical result verification, and significant manuscript revision. The authors jointly evaluated the research data and took responsibility for the development and approval of each published version of the paper.

Conflict of Interest

The authors declare the absence of organizational affiliations and financial and non-financial relationships with the entities concerned with the manuscript content.

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About the Authors

Ankita Singh is a Senior Research Scholar at the School of Management Studies, Motilal Nehru National Institute of Technology, Allahabad. She has 3.5 years of experience as a Research Scholar.

Prof. G. P. Sahu has over 10 years of teaching and supervision experience in information technology, FinTech, and digital marketing at the School of Management Studies, Motilal Nehru National Institute of Technology, Allahabad.