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A Proposed Framework for the Adoption of Digital Payments in Rural Areas

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Abstract

Digital payment technologies have rapidly evolved in recent years, yet their adoption in rural areas remains limited due to infrastructural constraints, cultural practices, and social influences. Existing research has predominantly focused on urban or formal sectors, leaving a gap in understanding the unique factors shaping digital payment adoption in rural communities. This study addresses that gap by proposing a conceptual framework grounded in the Diffusion of Innovation (DOI) theory to explore the adoption of digital payment systems in rural contexts through a qualitative lens. Drawing from a comparative analysis of three widely used adoption models—Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), and DOI—the study identifies DOI as the most contextually appropriate. DOI's emphasis on communication patterns, social systems, and innovation attributes makes it particularly suitable for rural environments. The proposed framework aims to guide future qualitative research by capturing how rural users experience, interpret, and respond to digital payment innovations. By situating adoption within local social realities, the framework supports the development of inclusive strategies tailored to rural communities and contributes to the promotion of digital financial inclusion in these settings.

Keywords: Digital Payment, Rural Adoption, Diffusion of Innovation, Technology Acceptance, Financial Inclusion

Introduction

Digital payment systems have experienced a rapid growth across the world (Hung et a., 2024), transforming the way individuals and businesses conduct transactions. Initially, digital payments were primarily dominated by card-based methods such as credit and debit cards, which have since become standard alongside other established methods like credit transfers and direct debits (Bhuiyan et al., 2024). However, advancements in technology and the widespread use of smartphones have contributed to the rise of mobile payment systems as a preferred alternative (de Ridder & Burnies, 2024). Contemporary digital payment options now include mobile money platforms, QR code-based systems, contactless technologies such as

near-field communication (NFC), peer-to-peer transfer applications, e-wallets, and wearable payment solutions (Munikrishnan et al., 2024). Notably, the Covid-19 pandemic accelerated the shift toward digital payments as the demand for contactless transactions became increasingly important (Bhuiyan et al., 2024). According to the World Bank (2022), over 40% of adults in low and middle-income countries utilized cards, phones, or the internet for in-store or online payments for the first time since the onset of the pandemic. Thus, these developments reflect a growing reliance on digital payment systems globally.

Despite the rapid growth and widespread adoption of digital payments, many rural communities in developing countries continue to rely heavily on cash transactions (Putrevu & Mertzanis, 2024). For instance, in Malaysia, although government-led initiatives such as DuitNow QR have sought to promote the adoption of digital payments, many rural businesses and consumers remain hesitant due to concerns over security and fraud, unfamiliarity with cashless technologies, and confusion stemming from by the variety of available payment options (Munikrishnan et al., 2024). These challenges pose significant obstacle to inclusive financial innovation and limit the broader integration of rural economies into the digital economy landscape. While digital payment adoption has been extensively examined in urban settings, research focusing on informal consumers in rural areas remain limited (Ding et al.,2025). These individuals often face a unique set of challenges that are ranging from infrastructural and technological limitations to sociocultural resistance and digital illiteracy that are insufficiently captured in existing literature. As a result, the specific behaviours, perceptions, and adoption patterns of rural users are often neglected in mainstream digital payment research. This underrepresentation hinders the development of inclusive financial strategies that effectively address the need of marginalized populations. A more comprehensive understanding of how rural individuals perceive, interact and adopt digital payment technologies is crucial for developing systems that promote inclusive and equitable participation in the digital economy.

Therefore, this paper aims to propose an ideal framework for evaluating the adoption of digital payments systems, particularly in rural areas. The framework is grounded in innovation theory and focuses on identifying and analysing the main factors influencing individuals' intentions to adopt digital payments systems. The proposed framework intends to improve digital participation, which in turn enhances financial inclusion, reduces digital inequality and supports the transition of rural communities into the digital economy. This effort not only bridges the urban-rural divide in financial access but also reinforces broader initiatives aimed at enhancing economic inclusion, strengthening rural livelihoods and promoting smart rural transformation. The proposed framework is expected to serve as a conceptual tool to guide future research and provide valuable insight for policymakers, financial institutions, and technology providers in designing more inclusive, resilient, and sustainable digital financial ecosystems tailored to rural populations.

Literature Review

Digital Payment

The growth and expansion of digital payment systems have been significantly facilitated by advancements in internet and wireless technologies (Trianto et al., 2023). Initially, the transactions were primarily conducted through Point-of-Sale (POS) systems using credit or debit cards (de Ridder & Burnie, 2024). Today, digital mobile applications and online

platforms, such as mobile wallets and QR code systems, have transformed the way payments are made (Shah et al., 2024). Digital payment generally refers to the electronic transfer of funds using digital devices, particularly smartphones, often through internet-based platforms (Hussain et al., 2024; Bhuiyan et al., 2024). Researchers have use various terms interchangeably to describe digital payment systems, including “cashless payments”, “e-money”, and “online transfers” (Dimitrova et al., 2022). The broader digital payment ecosystems encompass a range of tools like wrapper services, e-money systems, credit platforms, blockchain-based currencies, and distributed ledger technology (Putrevu & Mertzanis, 2024). However, in practice, the most common and widely recognized forms typically include mobile payment systems such as bank transfers, mobile money, and QR code payment alongside payments cards like credit, debit, and prepaid cards (Hussain et al., 2024).

Adoption of Digital Payments

The use of digital payments systems has grown rapidly worldwide as individuals and businesses move away toward faster, safer and more convenient payment methods. Individuals prefer digital payments because they offer greater convenience, quicker transactions, and easier access compared to cash (Brown et al., 2024). In addition, the wide availability of smartphones, better internet access, and the rapid growth of online shopping platforms have accelerated adoption. Advances in technology have made payment apps more secure, reliable, and easier to use and the government initiatives to boost financial inclusion, along with the widespread use of digital services, have further contributed to this trend (Linh, 2025). However, despite these advantages, challenges remain that prevent widespread adoption. According to Jain and Jain (2024), these challenges fall into four main categories: technological, economic, psychological, and regulatory. Technological issues include lack of access to smartphones or stable internet connections, while economic barriers involve the high cost of devices or transaction fees. Psychological factors relate to low trust in digital systems and resistance to change. Regulatory problems, such as unclear laws or weak enforcement, also slow down adoption. Additionally, Brown et al. (2024) also highlighted the concerns about security and the cost of setting up digital systems, particularly for small businesses.

Rural Area and Digital Payment Challenges

Rural areas are typically defined as regions with small populations and limited urban infrastructure, though definitions vary by country (Dasgupta et al., 2014; Ayala Wineman et al., 2020). Compared to urban environments, digital payment adoption in rural areas poses distinct challenges. Despite the recognized advantages of digital payments such as affordability, accessibility, broad availability, and risk reduction (Ding et al., 2025), rural communities often face infrastructural disparities. These include limited internet connectivity and unreliable digital infrastructure, which significantly hinder access to digital financial services. Additionally, low levels of digital literacy, particularly among older adults and informal business operators, further complicate the secure and the effective use of such technologies (Sinay et al., 2021). These barriers contribute to the complex and context-specific nature of digital adoption in rural settings. Brunhta & Subhaitani (2024) emphasize that adoption in these areas is frequently influenced by digital illiteracy, a lack of trust in digital systems, and resistance or outright rejection due to economic uncertainty. These issues are particularly pronounced in regions where limited access to traditional banking services which places where digital payment could otherwise play a crucial role in promoting financial

inclusion (Ding et al., 2025; Brunhta & Subhaitani, 2024). Collectively, these barriers reflect a wider digital divide that affects how rural communities participate in the digital economy.

Theoretical Framework

This study uses and contrasts three well-known theoretical models, the Diffusion of Innovation (DOI) theory, the Unified Theory of Acceptance and Use of Technology (UTAUT), and the Technology Acceptance Model (TAM) to create a thorough understanding of the adoption of digital payments in rural areas. These models are frequently used to describe how user behavior relates to the adoption and acceptance of technology. In rural settings, these models aid in shedding light on the elements that support or impede the adoption of digital payment systems in where access to infrastructure, technology, and digital literacy may be restricted. Every framework offers distinct insights into the attitudes, incentives, and actions of users when embracing new technologies like digital wallets, mobile money, and QR code payments. Thus, this study compares these three models in order to determine which theoretical framework is most suited for analyzing the obstacles and factors unique to the adoption of digital payments in rural areas.

Technology Acceptance Model

The Technology Acceptance Model (TAM), developed by Davis (1989), emphasizes two main factors that influence user acceptance of technology: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). PU refers to the degree to which a person believes that using a technology will enhance their performance while PEOU refers to the degree to which the person believes that using the technology will be free of effort (Sang, 2023). In rural settings, TAM explain why users or business adopt digital payments if users believe it helps improve business efficiency or reduce time handling cash. However, TAM assumes adoption decision are made individually and rationally, overlooking the influence of community norms, social relationship and infrastructural challenges common in rural areas. TAM also fails to account for cultural barriers and the role of trial and observation in adoption, which are critical in small, tight-knit communities.

The Unified Theory of Acceptance and Use of Technology (UTAUT),

UTAUT expands upon TAM by incorporating Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions (Venkatesh et al., 2003). These are particularly relevant in rural settings where word-of-mouth, community leaders, and peer recommendations play a vital role in shaping perceptions (Al-Qudah et al., 2024). Social influence may be more pronounced in close-knit rural communities, and facilitating conditions such as mobile network availability can also significantly determine the adoption (Munikrishnan et al., 2024). UTAUT is broader than TAM but still primarily focused on individual intentions and system-related factors. In the context of rural digital payment adoption, UTAUT is useful for recognizing the importance of social influence (e.g., peers, customers, or community leaders that encouraging the use of digital payment) and facilitating conditions (e.g., access to smartphones, internet connectivity, and support systems). However, UTAUT was primarily developed for structured environments like workplaces or urban settings, where there is formal training, support, and consistent infrastructure (Ding et al., 2025). In contrast, rural settings often work in informal, low-resource environments where technology adoption spreads through observation, trust, and word-of-mouth, rather than direct training or formal support.

Diffusion of Innovation

The diffusion of innovation (DOI) theory, developed by Rogers (1962) offers a broader, social-system-focused approach. It emphasizes how innovation spread over time through communication channels, social systems, and individual perceptions of the innovation (Call & Herber, 2022). Five main attributes influence adoption: relative advantage, compatibility, complexity, trialability, and observability. DOI is particularly relevant to rural digital payment adoption where users or businesses may first observe others using digital payments, test it informally, and adopt only if the users see the clear advantages. The role of community leaders, peer influence, and word-of-mouth is important in such environments, DOI accommodates these social and environmental influences better than TAM and UTAU, which primarily focus on internal cognitive or behavioural factors. According to Guo and Huang (2024), compatibility with existing practices (e.g., traditional cash transactions) and observability of benefits (e.g., seeing peers successfully use QR payments) are critical to driving adoption. Thus, the role of opinion leaders and interpersonal communication further aligns with rural social structures, making DOI an essential lens for understanding community-level adoption dynamics.

While TAM and UTAUT offer valuable insights into individual-level factors affecting adoption, they are less effective in explaining community-based, informal, and culturally embedded adoption patters found in rural communities. In contrast, DOI considers both individual perceptions and broader social dynamics, making it more applicable for studying rural vendors who often rely on peer behaviour, gradual observation, and informal experimentation before adopting new technologies.

Therefore, this study argues that DOI theory offers the most appropriate foundation for developing a framework to analyse digital payment adoption in rural contexts. By focusing on innovation attributes and the broader social system, DOI enables a more nuanced exploration of the social, cultural, and technological variables that shape adoption behaviours in rural areas.

Research Methodology

This study adopts a qualitative, literature-based conceptual approach to develop a framework for understanding digital payment adoption in rural areas. The methodology is grounded in a systematic review and comparative synthesis of established innovation and technology adoption theories, particularly the Diffusion of Innovation (DOI) theory, Technology Acceptance Model (TAM), and the Unified Theory of Acceptance and Use of Technology (UTAUT). The focus is on adapting these frameworks to the socio-cultural and infrastructural realities of rural communities.

To ensure academic rigor, relevant literature was identified through targeted keyword searches across peer-reviewed databases including Scopus, Web of Science, and Google Scholar and search terms included “digital payment adoption,” “Diffusion of Innovation,” “rural technology use” and “technology acceptance in rural areas.” Inclusion criteria were limited to empirical or conceptual studies published within the last five years and focused on digital payment services in developing or rural contexts. This process ensured the inclusion of current, contextually relevant findings. Although DOI is traditionally applied in quantitative diffusion studies, it is well-suited to qualitative adaptation due to its emphasis on social

systems, communication patterns, and perception-based constructs. This study conceptually reinterprets DOI through a rural lens by elaborating on how its five core attributes—Relative Advantage, Compatibility, Complexity, Trialability, and Observability—manifest in informal and low-infrastructure communities. While this paper presents a conceptual framework, it is designed to guide future empirical research. A qualitative analytical strategy such as thematic analysis or open coding will be employed in subsequent phases to validate the framework through primary data collection methods such as interviews, focus groups, or ethnographic observation. This ensures methodological continuity between the theoretical foundation and its practical application, allowing the model to evolve through grounded and context-specific insights.

A Proposed Conceptual Framework

The conceptual framework developed in this study is grounded in the Diffusion of Innovation (DOI) theory, which has been identified as the most contextually appropriate model for rural digital payment adoption (see Conceptual Justification). The framework highlights five main innovation attributes—Relative Advantage, Compatibility, Complexity, Trialability, and Observability—and integrates them with communication channels and social system influences to reflect how adoption unfolds in rural communities (see Figure 1).

Table 1
Comparison of the Conceptual Framework

		Theoretical Framework		
No.	Criteria	TAM	UTAUT	DOI
1	Theoretical Focus	Emphasizes perceived usefulness and perceived ease of use in determining acceptance (Davis, 1989).	Focuses on performance expectancy, effort expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003).	Explores how innovations spread within a social system over time, including adoption stages and social influence (Rogers, 2003)
2	Strength	Frequent use in to examines how technology affects people's behaviors and intentions to adopt a new innovation (Lee et al., 2025)	A comprehensive approach to understanding technology adoption, as it incorporates both individual psychological perceptions and external factors. ((Lee et al., 2025)	Gives a complete view by looking at social, cultural, and communication factors, which are important for understanding how a community adopts new ideas (Guo & Huang, 2024)
3	Context Suitability	Useful for general technology adoption studies, but it may not cover specific factors in certain contexts (Ding et al., 2025)	Best suited for organizational (Ding et al., (2025).	Explains how people adopt innovations at different stages which are from early adopters to late adopters and laggards over the influence of time and social norms. (García-Avilés, 2020)

Source: Authors' own creation

The proposed framework positions the five core innovation attributes—relative advantage, compatibility, complexity, trialability, and observability—within a broader sociocultural context shaped by communication channels and social systems. These elements

interact with the individual's adoption journey, which unfolds through stages such as awareness, interest, evaluation, trial, and adoption. By framing these stages qualitatively, the study seeks to explore how individuals interpret, negotiate, and respond to digital payment innovations within their everyday realities.

This approach recognizes that digital payment adoption in rural communities is not solely determined by access to technology. Instead, it is a multifaceted process influenced by perceptions of trust, cultural acceptance, and the influence of social actors such as family members, peers, and local opinion leaders. For example, a village elder endorsing mobile payments may play a pivotal role in shaping collective attitudes, while hands-on exposure to low-risk, easy-to-use systems may reduce perceived and foster familiarity.

As a qualitative framework, it offers a lens through which researchers can investigate lived experiences, social interactions, and contextual nuances that influence adoption behaviors. It also guides inquiry into how rural users understand, discuss, and make sense of digital payments in their local settings.

Conceptual Justification

The comparative analysis of the three theoretical models -TAM, UTAUT, and DOI- reveals that the Diffusion of Innovation (DOI) theory offers the most comprehensive lens for examining digital payment adoption in rural settings. The DOI framework provides a nuanced understanding of how innovations spread across different stages of adoption, particularly in environments where social influence, community dynamics, and cultural values significantly shape adoption behavior (García-Avilés, 2020). While the Technology Acceptance Model (TAM) has been widely applied to study technology adoption, its focus is largely limited to perceived usefulness and ease of use (Lee et al., 2025). This narrow emphasis often neglects the broader sociocultural and infrastructural factors critical in rural environments, such as trust in technology, word-of-mouth influence, and informal support systems. Likewise, although the Unified Theory of Acceptance and Use of Technology (UTAUT) expands on TAM by integrating constructs such as social influence and facilitating conditions, it was primarily developed for organizational settings. As such, it may not adequately address the decentralized, non- institutionalized nature of technology adoption processes common in rural and informal economies (Lee et al., 2025). In contrast, the DOI theory explicitly accounts for external and social factors through constructs like communication channels, social system, time of adoption, and perceptions of innovation attributes. These elements are particularly salient in rural contexts, where peer influence, community endorsement, and cultural compatibility often determine the success or failure of a new technology.

The proposed conceptual framework, grounded in the Diffusion of Innovation (DOI) theory, highlights five core innovation attributes that influence the adoption of digital payment systems: Relative Advantage, Compatibility, Complexity, Trialability, and Observability. These attributes shape how individuals in rural communities perceive and respond to digital payment technologies. For instance, Relative Advantage in rural areas is assessed not only in terms of efficiency or speed but also based on how well the technology aligns with cultural values such as security, familiarity, and trust. Then, compatibility reflects the extent to which digital payment methods fit existing practices, such as cash transactions or local trade norms meanwhile complexity captures the perceived difficulty of using digital payments, which is

often heightened in rural settings by limited digital infrastructure, low literacy, and unfamiliar user interfaces. Other than that, trialability which the ability to test technology without financial risk is especially important in low-literacy communities, where it helps reduce fear and build confidence. Lastly, the observability or the visibility of tangible benefits is amplified through social interactions in markets, gatherings, and informal discussions, where early adopters can serve as influential role models.

These elements then jointly shape how individuals move through the Adoption Decision Process, the core mechanism within DOI theory that explains how innovations are evaluated and either adopted or rejected. The main aspect of this process is the time of adoption, which varies depending on individuals' exposure, social influence, and perceived relevance of technology. According to Rogers (1995), DOI theory identifies five adopter categories: Innovators, Early Adopters, Early Majority, Late Majority, and Laggards. In rural contexts, Early Adopters are often more educated or socially connected individuals which play a vital role by demonstrating the use of digital payments and encouraging the broader community acceptance. The Early Majority and Late Majority tend to adopt after observing successful use cases and gaining social reassurance, while Laggards may delay adoption due to strong resistance to change, lack of access, or adherence to traditional norms. Recognizing these adopter categories provides a deeper understanding of the gradual and uneven diffusion of digital payments in rural areas, where trust, social visibility, and peer influence significantly shape adoption behavior.

Overall, the proposed framework (see Figure 1) presents a socio-technological ecosystem in which innovation attributes interact with local communication practices and social structures, offering a grounded understanding of digital payment adoption. It serves as a foundation for future empirical research, particularly in diverse rural contexts, where variables such as education, income levels, gender norms, and cultural attitudes toward financial technology may significantly mediate the adoption process. By deepening the exploration of DOI constructs within these community dynamics, researchers and practitioners can refine the model and design more effective, context-sensitive strategies to promote inclusive digital payment ecosystems.

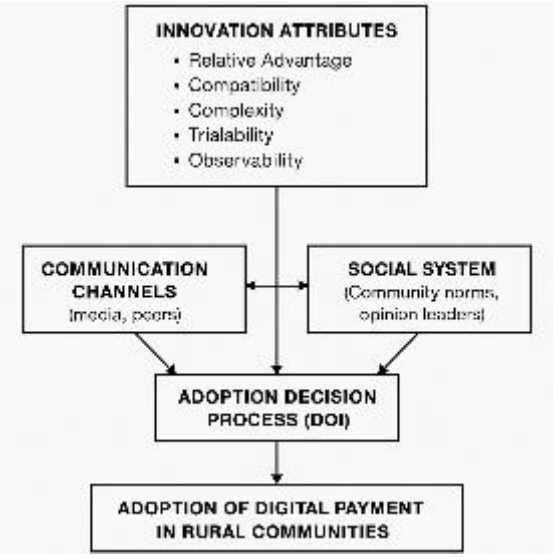

Figure 1. The Proposed Conceptual Framework

Sustainability Contribution

The proposed conceptual framework extends beyond digital payment adoption by contributing to sustainable development, particularly in financial inclusion, digital equity, and rural transformation. Grounded in the Diffusion of Innovation (DOI) theory, it identifies how innovation attributes such as relative advantage, compatibility, and observability interact with rural social systems to influence adoption. This supports SDG 1 (No Poverty) and SDG 9 (Industry, Innovation, and Infrastructure) by addressing digital divides in rural communities. By emphasizing trialability and peer influence, the framework promotes bottom-up, community-driven diffusion rather than top-down interventions, aligning with SDG 10 (Reduced Inequalities). Such an approach will empower local users, including low-income or informal businesses through informal knowledge sharing. Ultimately, digital payment adoption can enhance transactional efficiency, stimulate entrepreneurship, and improve rural economic resilience. The framework thus serves as both a theoretical guide and a practical tool to advance inclusive, sustainable rural digital development.

Limitation and Scope of the Future Research

This study presents a conceptual framework for understanding digital payment adoption in rural areas, grounded in the Diffusion of Innovation (DOI) theory. The scope is limited to a theoretical exploration based on a literature-driven, qualitative synthesis of existing models—DOI, TAM, and UTAUT—with a particular emphasis on rural applicability. Several limitations should be acknowledged. First, the absence of primary data collection means that the framework remains conceptual and untested in real-world settings. Second, the broad rural focus may overlook country-specific regulatory, technological, or sociocultural variations that could affect adoption outcomes. Third, while DOI is conceptually adapted for qualitative purposes, the paper does not detail a specific coding or analytical strategy that would be used in empirical phases. These limitations highlight the need for future research involving context-specific case studies, empirical validation, and methodological refinement to improve the applicability and impact of the proposed model.

Conclusions

This study presents a conceptual framework for understanding digital payment adoption in rural areas, grounded in the Diffusion of Innovation (DOI) theory. Unlike models such as TAM and UTAUT, DOI accounts for social, cultural, and communicative factors that are especially relevant in rural contexts. It highlights adoption as a socially embedded process shaped by trust, peer influence, and local communication norms. The framework offers both theoretical and practical value which will be guiding the researchers while also informing targeted strategies for NGOs, policymakers, and marketers to promote inclusive digital transformation. Specifically, it can support community-based digital literacy programs, peer-led demonstrations, and trust-building campaigns that resonate with rural values. Furthermore, it contributes to sustainable development by advancing digital inclusion, economic participation, and technological equity. Future research should focus on validating the framework across diverse rural contexts and exploring how contextual factors such as infrastructure, education, and cultural norms can influence the adoption. With refinement, the model can serve as a valuable tool for driving sustainable and inclusive digital development.

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