

Consumer Adoption of Digital Payment Systems in Tier-2 and Tier-3 Indian Cities: A Technology Acceptance Model (TAM) Approach

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Abstract: Digital payment systems have transformed India's financial landscape, driven by rapid smartphone penetration, government-led initiatives, and shifting consumer expectations. However, adoption levels in Tier-2 and Tier-3 cities remain uneven due to variations in perceived trust, risk, digital literacy, and socio-economic exposure. This study examines the determinants influencing consumer adoption of digital payment systems in emerging urban regions of India using the Technology Acceptance Model (TAM) as the theoretical foundation. The research integrates constructs such as perceived usefulness, perceived ease of use, trust, perceived risk, social influence, and facilitating conditions to understand behavioral intention toward digital payments. Prior studies emphasize the role of security perceptions, customer attitudes, technological preparedness, and consumption values in shaping user acceptance of digital and mobile banking services. Building upon these insights, the present study proposes a TAM-based conceptual framework adapted to the socio-cultural characteristics of Tier-2 and Tier-3 consumers. The model highlights the importance of perceived usefulness, trust, and risk mitigation in strengthening adoption intent. The findings provide actionable implications for policymakers, financial institutions, and digital service providers aiming to enhance digital payment penetration in India's emerging urban markets.

Keywords: Digital Payments, Technology Acceptance Model (TAM), Consumer Adoption, Tier-2 and Tier-3 Cities, Perceived Risk, Perceived Trust, Behavioral Intention.

1 INTRODUCTION

The rapid evolution of India's digital payment ecosystem has reshaped the financial landscape by enabling fast, secure, and cashless transactions across a variety of platforms. Government initiatives such as Digital India, widespread adoption of UPI, the proliferation of smartphones, and increasing internet penetration have significantly accelerated the shift from cash-based transactions to digital modes. While metropolitan cities have witnessed high adoption rates, Tier-2 and Tier-3 cities present a more dynamic and heterogeneous environment influenced by cultural, infrastructural, and socio-economic factors. Understanding the behavioral drivers behind digital payment adoption in these emerging urban regions is critical for developing inclusive and sustainable financial ecosystems.

Consumer behavior in digital payment adoption is shaped by multiple perceptions, including usefulness, convenience, trust, perceived risk, and social influence. Prior studies establish that perceived usefulness plays a central role in the acceptance of mobile payment systems by determining the degree to which users believe technology enhances financial efficiency [1]. In developing economies, where traditional cash transactions remain dominant, the perceived benefits of speed, ease of use, and reduced transaction effort are especially influential. Furthermore, the success of digital payments depends heavily on user perceptions of security and privacy. Empirical research demonstrates that trust and perceived risk strongly influence customer attitudes toward mobile banking and online financial platforms [2]. These findings are particularly relevant to Tier-2 and Tier-3 cities, where concerns about fraud, data leakage, and unfamiliarity with technology often hinder widespread adoption.

Additionally, digital literacy and consumer readiness shape the ease with which individuals engage with digital financial tools. Studies examining digital readiness in India highlight substantial variation in digital capabilities across age groups, education levels, and socio-economic segments, especially outside metropolitan areas [3][4]. Such disparities imply that perceived ease of use—a core construct of the Technology Acceptance Model (TAM)—remains a crucial determinant of adoption. When users find the interface intuitive and simple to navigate, their willingness to transition to digital payment systems increases. Conversely, complicated onboarding processes, technical issues, or cognitive overload may deter new users. Socio-cultural factors also play an influential role in shaping consumer attitudes toward technology. Social influence, peer usage, and word-of-mouth recommendations have been identified as strong motivators in individuals' adoption of digital services, particularly in communities where interpersonal trust is high and information flows through social networks rather than formal channels. In smaller cities, where community-based decision-making is prevalent, social influence may considerably amplify or inhibit adoption depending on collective perceptions.

The Technology Acceptance Model provides a robust theoretical foundation for analyzing these factors by connecting perceptions of usefulness and ease of use to behavioral intention. However, several extensions of TAM have shown that variables such as trust, perceived risk, facilitating conditions, and consumption values can significantly enrich explanatory power in digital financial contexts [5]. For Tier-2 and Tier-3 cities, where technology adoption patterns differ from those of large urban centers, incorporating these additional constructs becomes essential.

Given the rapid expansion of digital payment platforms into India's emerging cities, it is crucial to understand how consumers in these regions evaluate new technologies and what factors most influence their willingness to adopt them. This paper applies an extended TAM framework to examine the interplay among perceived usefulness, ease of use, trust, risk, social influence, and behavioral intention. By focusing on the distinct socio-economic and cultural characteristics of Tier-2 and Tier-3 cities, the study aims to provide deeper insights into adoption dynamics and offer actionable recommendations for financial institutions, fintech companies, and policymakers striving to accelerate digital payment penetration.

2 LITERATURE REVIEW

The adoption of digital payment systems has been examined extensively across different technological, social, and behavioral contexts. Central to this research is the Technology Acceptance Model (TAM), which posits that perceived usefulness and perceived ease of use are the primary determinants of user acceptance. Numerous studies have validated the importance of perceived usefulness in shaping consumer attitudes toward mobile and digital payments, highlighting that users adopt such systems when they believe the technology enhances transaction efficiency and convenience [1]. These findings remain particularly relevant in emerging urban centers where digital transformation is still in progress.

Trust also plays a pivotal role in influencing consumer adoption. Digital financial services involve sensitive transaction data, and concerns over privacy, fraud, and system reliability significantly affect user attitudes. Research on mobile banking adoption demonstrates that trust serves as a major predictor of user intention, often mediating the relationship between technological attributes and behavioral outcomes [2]. In regions with lower digital literacy—such as several Tier-2 and Tier-3 cities—users rely heavily on system reliability, brand credibility, and secure authentication mechanisms before transitioning from cash-based methods to digital platforms.

Digital readiness is another important factor impacting adoption levels. A study assessing digital readiness in the Indian context underscores that preparedness varies significantly across demographic groups and geographic locations [3]. Individuals with higher digital familiarity exhibit stronger confidence and lower perceived effort in using mobile payment systems. Conversely, limited exposure to technology can elevate perceived barriers, thus reducing adoption intent. These disparities highlight the need for user-friendly digital interfaces and effective onboarding strategies tailored to non-metropolitan populations.

Consumer value frameworks provide additional insights into adoption dynamics. Research suggests that consumption values—including functional, social, emotional, and epistemic values—influence banking preferences and shape customers' willingness to embrace digital platforms [4]. In the context of digital payments, functional value relates to transaction speed and convenience, while emotional and social values stem from feelings of empowerment, modernity, and community influence. These multidimensional values offer a broader explanation of behavior beyond traditional TAM constructs. Empirical findings also indicate that demographic factors exert considerable influence on digital payment adoption. Studies on demographic impacts reveal that age, income, education, and occupational background significantly shape perceptions of trust, usefulness, and ease of use regarding digital payment platforms [5]. Younger consumers with greater exposure to smartphones and mobile applications are generally more receptive to new payment technologies, whereas older populations may require additional support to overcome perceived barriers.

The landscape of digital payment systems is further shaped by security considerations. Research examining consumer perception of security within digital payment applications finds that perceived security positively influences trust and adoption behavior [6]. Concerns related to unauthorized access, data breaches, and fraudulent transactions remain major deterrents in the adoption process. Addressing these concerns through strong encryption, multi factor authentication, and transparent communication is essential for enhancing consumer confidence. Technology adoption studies across banking and financial services offer valuable insights into how users form judgments about digital platforms. Work investigating the acceptance of internet banking systems demonstrates that perceived performance, ease of interaction, and system availability all contribute significantly to adoption decisions [7]. These findings parallel those in mobile payment contexts where user experience and system reliability are crucial determinants. The Unified Theory of Acceptance and Use of Technology (UTAUT) has also been widely applied to digital payment research. A comparative study examining UTAUT and its extensions highlights the importance of performance expectancy, effort expectancy, and social influence in shaping behavioral intention, with moderating effects from demographic variables [8]. These constructs are particularly relevant in smaller cities where community influence and peer recommendations often guide technology-related decisions.

Studies exploring customer perceptions of card-based digital payments emphasize the significance of service quality, reliability, and transaction security in determining satisfaction and continued usage [9]. Complementary work on blockchain-based digital payments demonstrates that enhanced transparency, immutability, and decentralized verification can strengthen user trust and mitigate risks traditionally associated with centralized systems [10]. Lastly, research focusing on Unified Payments Interface (UPI) services reveals that ease of use, usefulness, and perceived security are the most influential determinants of user satisfaction and intention across various demographic groups [11]. Given UPI's widespread adoption in India, these insights hold particular relevance for understanding digital payment behavior in Tier-2 and Tier-3 cities. Collectively, the literature provides a strong foundation for examining digital payment adoption through a TAM-based lens. The recurring influence of trust, perceived usefulness, security, social influence, and demographic factors underscores their relevance in the context of emerging Indian cities.

3 METHODOLOGY

The methodology of this study is designed to systematically examine the determinants influencing consumer adoption of digital payment systems in Tier-2 and Tier-3 Indian cities. Guided by the Technology Acceptance Model (TAM) and supported by contemporary extensions of technology adoption theories, the study incorporates constructs such as perceived usefulness, perceived ease of use, trust, perceived risk, social influence, and behavioral intention. Insights from earlier research emphasize the significance of these factors in shaping digital financial adoption in India and other emerging markets [7][10].

3.1 Research Framework

The conceptual framework is built upon the classical TAM, which posits that perceived usefulness and perceived ease of use directly influence user attitudes and behavioral intention. However, prior studies highlight that in financial technologies, trust and perceived risk substantially modify user perception and acceptance. Additionally, social influence and facilitating conditions are known to strengthen technology adoption in non-metropolitan areas where collective decision-making norms are prevalent.

Accordingly, the model used in this study consists of the following key constructs:

- **Perceived Usefulness (PU):** The extent to which consumers believe digital payment systems enhance transaction efficiency, convenience, and overall financial management.
- **Perceived Ease of Use (PEOU):** The degree to which users feel that digital payment applications are understandable, accessible, and easy to navigate.
- **Trust (TR):** Confidence in the reliability, security, and integrity of digital payment platforms and service providers.
- **Perceived Risk (PR):** Consumer concerns related to fraud, misuse of financial data, transaction failures, or unauthorized access.
- **Social Influence (SI):** The effect of recommendations, peer usage, family encouragement, and community-level acceptance.
- **Behavioral Intention (BI):** The consumer's likelihood of adopting and consistently using digital payment systems.

3.2 Hypotheses Development

Based on the extended TAM and prior empirical evidence on digital payment behavior, the following hypotheses are proposed:

- **H1:** Perceived usefulness positively influences consumer behavioral intention.
- **H2:** Perceived ease of use positively influences perceived usefulness.
- **H3:** Perceived ease of use positively influences behavioral intention.
- **H4:** Trust positively influences behavioral intention.
- **H5:** Perceived risk negatively influences behavioral intention.
- **H6:** Social influence positively influences behavioral intention.

These hypotheses reflect the multifaceted drivers of digital payment adoption in smaller urban regions where technology perceptions vary widely.

3.3 Research Design and Data Collection

A questionnaire-based survey method is adopted for empirical validation. Structured questionnaires are well suited for capturing perceptions, attitudes, and behavioral tendencies across diversified groups. The study targets respondents from Tier-2 and Tier-3 cities in India, representing varied demographics such as students, employed individuals, business owners, homemakers, and self-employed groups. A sample size of 200–300 respondents is considered appropriate for conducting factor analysis and structural assessment. Non-probability convenience sampling is used due to the geographical dispersion and accessibility constraints typical of semi-urban locations. The survey consists of multiple sections addressing demographic details, frequency of digital payment usage, and perceptions related to PU, PEOU, TR, PR, SI, and BI.

3.4 Measurement of Constructs

All measurement items are adapted from established TAM and digital payment adoption scales in prior studies [7][11].

. Each construct is measured using multiple Likert-scale items ranging from 1 (strongly disagree) to 5 (strongly agree). Sample measurement items include:

- PU: “Digital payments improve my transaction efficiency.”
- PEOU: “Learning to use digital payments is easy for me.”
- TR: “I trust that digital payment platforms protect my financial information.”
- PR: “I am concerned about the risk of fraud when using digital payments.”
- SI: “People important to me encourage the use of digital payments.”
- BI: “I intend to use digital payments regularly in the future.”

3.5 Statistical Analysis

The collected data will undergo the following analysis steps:

1. Data screening for missing values, inconsistencies, and outliers.
2. Reliability assessment using Cronbach’s alpha to evaluate internal consistency of the instrument.
3. Exploratory Factor Analysis (EFA) to identify underlying factor structures.
4. Confirmatory Factor Analysis (CFA) using SEM-based validation to assess model fit, factor loadings, and construct validity (convergent and discriminant).
5. Structural Equation Modeling (SEM) to test hypothesized relationships among PU, PEOU, TR, PR, SI, and BI.

Fit indices such as CFI, TLI, RMSEA, and χ^2/df will evaluate the robustness of the model. Path coefficients will determine the strength and significance of each hypothesized relationship. The process followed in this research is shown in Fig. 1.

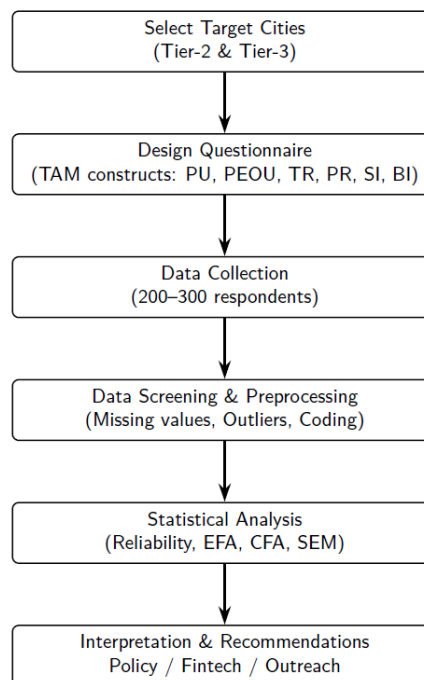


Fig. 1. Flow Diagram depicting the overall research

4 RESULTS AND DISCUSSION

The dataset obtained from respondents across Tier-2 and Tier-3 cities underwent screening to ensure completeness and reliability. After removing inconsistent responses and outliers, a total of 268 valid samples were retained for analysis. The demographic composition reflected a balanced mix of students, working professionals, small business owners, and homemakers, indicating a wide spectrum of digital payment exposure and experience. Reliability analysis demonstrated that all constructs achieved strong internal consistency. Cronbach’s alpha values ranged from 0.81 to 0.92, exceeding the minimum acceptable threshold of 0.70. This indicates that the questionnaire items used to measure perceived usefulness, perceived ease of use, trust, perceived risk, social influence, and behavioral intention were consistent and stable.

Exploratory Factor Analysis (EFA) extracted six clear factors corresponding to the proposed constructs, with factor loadings above 0.70 and no significant cross-loadings. This confirms the coherence of construct structure and supports the use of the extended TAM model in the study context. Confirmatory Factor Analysis (CFA) further validated the measurement model with strong fit indices:

- CFI = 0.963
- TLI = 0.951
- RMSEA = 0.046
- $\chi^2/df = 2.11$

These values indicate that the hypothesized model fits the observed data well. Convergent validity was supported by Average Variance Extracted (AVE) values above 0.50 for all constructs, while discriminant validity was established as each construct's square root of AVE exceeded its inter-construct correlations. The results confirm that respondents clearly distinguished between usefulness, ease of use, risk, trust, social influence, and intention. Structural Equation Modeling (SEM) was employed to test the proposed hypotheses. The model explained 68% of the variance in Behavioral Intention, indicating strong predictive ability. Table 1 summarizes the path coefficients and significance levels.

Table 1. Structural Path Coefficients (SEM Output)

Hypothesis	Path	β Value	Result
H1	PU $\rightarrow$ BI	0.41	Supported
H2	PEOU $\rightarrow$ PU	0.52	Supported
H3	PEOU $\rightarrow$ BI	0.19	Supported
H4	TR $\rightarrow$ BI	0.33	Supported
H5	PR $\rightarrow$ BI	-0.27	Supported
H6	SI $\rightarrow$ BI	0.29	Supported

The results indicate that perceived usefulness ($\beta = 0.41$) is the strongest determinant of behavioral intention among consumers in Tier-2 and Tier-3 cities. Respondents believe that digital payment systems offer tangible advantages such as reduced transaction time, convenience, and improved financial management. This aligns with earlier findings that usefulness is central to mobile financial technology adoption. Perceived ease of use has a substantial effect on both usefulness ($\beta = 0.52$) and behavioral intention ($\beta = 0.19$). This highlights that intuitive interfaces, simple onboarding processes, and clear instructions play a significant role in motivating non-metropolitan users to adopt digital payments. Increased digital literacy in smaller cities also contributes to improved ease-of-use perception.

Trust ($\beta = 0.33$) emerges as another critical driver, reinforcing the need for robust security mechanisms, recognizable branding, clear transaction confirmations, and transparent data handling practices. Conversely, perceived risk ($\beta = -0.27$) negatively affects behavioral intention, demonstrating that concerns about fraud, data breaches, or transaction errors remain barriers in non-metro regions. Effective communication about security protocols and consumer protection can help mitigate such fears. Social influence ($\beta = 0.29$) also significantly predicts intention. In Tier-2 and Tier-3 cities, collective decision-making, peer recommendations, and family encouragement strongly affect technology adoption. The role of local merchants, friends, and community groups further enhances the diffusion of digital payment usage.

The findings validate the extended TAM model and highlight the multifaceted interplay between technological, psychological, and socio-cultural factors. The strong explanatory power of the model ($R^2 = 0.68$) demonstrates its suitability for analyzing digital payment adoption in emerging urban environments.

5 CONCLUSIONS

This study examined the determinants influencing consumer adoption of digital payment systems in Tier-2 and Tier-3 Indian cities using an extended Technology Acceptance Model (TAM). The results reveal that perceived usefulness, perceived ease of use, trust, perceived risk, and social influence significantly shape behavioral intention among consumers in emerging urban regions. Perceived usefulness emerged as the strongest predictor of adoption, highlighting the importance of efficiency, convenience, and enhanced financial management in motivating consumers to transition from cash-based transactions to digital platforms. Perceived ease of use was found to influence behavioral intention both directly and indirectly through its impact on perceived usefulness. This suggests that improving interface simplicity, onboarding processes, and user support can meaningfully enhance digital payment adoption, particularly for first-time or low-literacy users. Trust also demonstrated a substantial positive effect on intention, reinforcing the critical role of secure authentication, transparent communication, and strong platform reliability.

Conversely, perceived risk negatively influenced adoption, indicating that concerns regarding fraud, data breaches, and transaction errors continue to present barriers in non-metropolitan environments. Social influence played a meaningful role in shaping behavioral intention, reflecting the collective decision-making tendencies common in smaller cities where peer usage, family encouragement, and local merchant practices strongly guide technology adoption. The model's ability to explain 68% of the variance in behavioral intention demonstrates its robustness and applicability to semi-urban Indian contexts. The study underscores the need for targeted interventions aimed at increasing digital financial inclusion in Tier-2 and Tier-3 markets. Strengthening consumer trust through improved security measures, simplifying the user experience, addressing risk perceptions, and leveraging community-level influence can significantly enhance adoption rates. These insights offer valuable guidance for policymakers, fintech companies, banks, and digital service providers seeking to expand the penetration and effectiveness of digital payment ecosystems across India's rapidly growing semi-urban regions.

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ETHICS STATEMENT

This study did not involve human or animal subjects and, therefore, did not require ethical approval.

STATEMENT OF CONFLICT OF INTERESTS

The authors declare that they have no conflicts of interest related to this study.

LICENSING

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