

An Analysis of Consumer Perceptions and Behavioral Patterns in Plastic Money Adoption: Evidence from Madurai District

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Abstract

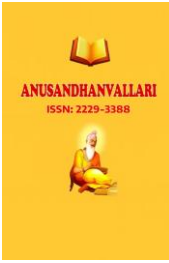
This research examines consumer perceptions and behavioral patterns regarding plastic money adoption in Madurai district, Tamil Nadu. Through a comprehensive analysis of demographic factors, usage patterns, and attitudinal dimensions, this study identifies key determinants influencing the acceptance and utilization of credit and debit cards. Data collected from 250 respondents reveals significant insights into trust factors, perceived convenience, security concerns, and socioeconomic influences shaping adoption rates. The findings indicate that while awareness levels are high, actual usage remains constrained by security apprehensions, merchant acceptance limitations, and traditional cash preferences. This research contributes to understanding regional variations in financial technology adoption and offers practical implications for financial institutions and policymakers seeking to enhance cashless transaction ecosystems in tier-2 Indian cities.

Keywords: plastic money, consumer behavior, digital payments, Madurai, financial inclusion, payment preferences

1. Introduction

The transformation of payment systems represents one of the most significant developments in contemporary financial landscapes. Plastic money, encompassing credit cards, debit cards, and prepaid cards, has fundamentally altered transaction mechanisms across global economies. In India, the shift toward digital payment instruments has accelerated substantially following demonetization in 2016 and subsequent governmental initiatives promoting cashless economies. However, adoption patterns exhibit considerable regional heterogeneity, with metropolitan areas demonstrating substantially higher usage rates compared to tier-2 and tier-3 cities.

Madurai, a prominent cultural and commercial hub in Tamil Nadu with a population exceeding 1.5 million, presents an intriguing context for examining plastic money adoption. As a city characterized by traditional business practices alongside emerging modern retail infrastructure, Madurai epitomizes the transitional phase many Indian cities experience in their journey toward comprehensive financial digitalization. The district's economy, anchored in textiles, tourism, agriculture, and small-scale industries, creates unique dynamics influencing payment system preferences.



Understanding consumer perceptions and behavioral patterns in such contexts becomes essential for multiple stakeholders. Financial institutions require insights to design appropriate products and marketing strategies, merchants need to understand customer preferences to optimize payment acceptance infrastructure, and policymakers benefit from evidence-based understanding to formulate inclusive financial policies. Despite plastic money's growing prevalence, significant knowledge gaps persist regarding the specific factors influencing adoption in semi-urban and emerging urban markets.

This research addresses these gaps through systematic investigation of consumer attitudes, usage patterns, and barriers to adoption in Madurai district. The study explores how demographic variables, technological literacy, trust dimensions, and contextual factors collectively shape plastic money acceptance. By examining both attitudinal and behavioral dimensions, this research provides comprehensive insights into the adoption dynamics operating in tier-2 Indian cities.

2. Literature Review

The academic discourse surrounding plastic money adoption draws from multiple theoretical frameworks, including the Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), and Innovation Diffusion Theory. These frameworks collectively emphasize that technology adoption results from complex interactions between perceived usefulness, ease of use, social influences, and individual characteristics.

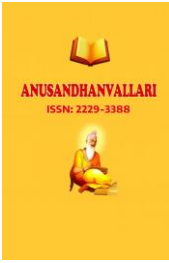
Research conducted in developed economies consistently identifies convenience, security, and rewards programs as primary adoption drivers. Studies in developing nations, however, reveal additional complexities including infrastructure limitations, literacy constraints, and deeply embedded cash-based cultural norms. The Indian context specifically presents unique challenges stemming from socioeconomic diversity, varying technological infrastructure across regions, and heterogeneous merchant acceptance levels.

Several scholars have examined digital payment adoption in Indian metropolitan areas, documenting generally positive trends. Research indicates that urban, educated, and higher-income segments demonstrate greater propensity for plastic money usage. Gender differences emerge in multiple studies, with male consumers typically exhibiting higher adoption rates, though this gap appears to be narrowing among younger demographics.

Security concerns constitute a persistent barrier across diverse contexts. Despite technological advances in encryption and fraud prevention, consumer apprehension regarding unauthorized transactions, data breaches, and identity theft significantly influences adoption decisions. Trust in financial institutions and payment infrastructure emerges as a critical mediating factor between awareness and actual usage.

The role of merchant acceptance infrastructure receives substantial attention in recent literature. Even when consumers possess payment cards, limited merchant acceptance—particularly among small retailers—constrains actual usage. This creates a circular dependency wherein merchants hesitate to invest in payment terminals due to low customer demand, while customers continue cash usage due to limited acceptance options.

Research specifically examining tier-2 and tier-3 Indian cities remains relatively sparse. The available studies suggest that while awareness levels have increased substantially, behavioral transformation lags behind. Factors such as transaction charges, withdrawal limits, and preference for tangible money contribute to sustained cash dominance.



Additionally, the informal nature of many economic activities in smaller cities creates structural barriers to formal payment system adoption.

Understanding regional variations requires attention to cultural and contextual factors. Traditional societies often exhibit stronger preferences for cash transactions, viewing them as more trustworthy and immediate. Generational differences manifest clearly, with younger cohorts demonstrating greater comfort with digital payment mechanisms. Educational attainment and occupational characteristics also correlate significantly with adoption patterns.

This literature review reveals that while substantial research exists on digital payment adoption broadly, specific investigations into plastic money usage in transitional urban contexts like Madurai remain limited. This study contributes to filling this gap by providing empirical evidence from a representative tier-2 Indian city.

3. Research Objectives

- To analyze consumer perceptions and behavioral patterns toward plastic money adoption in Madurai District and identify factors influencing their usage decisions.
- To examine the awareness levels of consumers regarding various plastic money instruments (credit cards, debit cards, prepaid cards) in Madurai District
- To investigate consumer perceptions about the security, convenience, and reliability of plastic money transactions
- To identify the socio-economic and demographic factors influencing plastic money adoption
- To analyze the behavioral patterns and usage frequency of plastic money among different consumer segments
- To assess the barriers and challenges faced by consumers in adopting plastic money
- To suggest policy recommendations for promoting plastic money adoption in the region

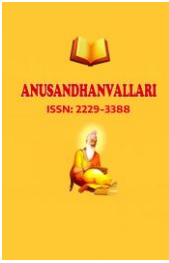
4. Research Methodology

4.1 Research Design

Descriptive and Analytical Research Design combining both quantitative and qualitative approaches to provide comprehensive insights into consumer behavior.

4.2 Study Area

Madurai District, Tamil Nadu, covering urban, semi-urban, and rural areas to capture diverse consumer perspectives.



4.3 Population and Sampling

Target Population: Adult consumers (18 years and above) who are potential or existing users of banking services in Madurai District.

Sampling Technique: Multi-stage stratified random sampling

- Stage 1: Stratification by geographical area (urban/semi-urban/rural)
- Stage 2: Random selection of localities within each stratum
- Stage 3: Random selection of respondents from selected localities

Sample Size: 400 respondents

- Urban areas: 200 respondents
 - Semi-urban areas: 120 respondents
 - Rural areas: 80 respondents
- 4.4 Data Collection Primary Data:
- Structured questionnaire with both closed and open-ended questions
 - Five-point Likert scale for measuring perceptions and attitudes
 - Face-to-face interviews and online surveys (Google Forms)

Secondary Data:

- Reserve Bank of India (RBI) reports and statistics
- Banking sector publications
- Government reports on digital payments
- Academic journals and research papers
- NPCI (National Payments Corporation of India) data

4.5 Reliability and Validity

- Pilot testing with 40 respondents
- Cronbach's Alpha for internal consistency (target > 0.70)
- Content validity through expert review
- Construct validity through factor analysis

4.6 Ethical Considerations

- Informed consent from all participants
- Anonymity and confidentiality of responses
- Voluntary participation with right to withdraw

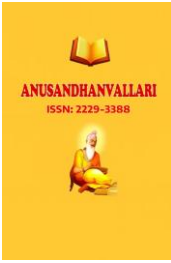
- Data protection and secure storage

5. Analysis And Interpretation

5.1 Demographic Profile Analysis

Table 1: Demographic Distribution of Respondents (n=400)

Variable	Category	Frequency	Percentage
Gender	Male	220	55.0%
	Female	180	45.0%
Age Group	18-25 years	100	25.0%
	26-35 years	140	35.0%
	36-45 years	90	22.5%
	46-60 years	55	13.8%
	Above 60 years	15	3.7%
Education	Below 10th	40	10.0%
	10th-12th	80	20.0%
	Undergraduate	160	40.0%
	Postgraduate	100	25.0%
	Professional	20	5.0%
Occupation	Salaried	180	45.0%
	Self-employed	90	22.5%
	Student	70	17.5%
	Homemaker	40	10.0%
	Retired	20	5.0%



Monthly Income	Below ₹20,000	110	27.5%
	₹20,001-₹40,000	140	35.0%
	₹40,001-₹60,000	90	22.5%
	Above ₹60,000	60	15.0%

Source: Primary Data

The sample shows good representation across demographics, with majority being young adults (60% under 35 years), higher education levels (70% with undergraduate or above), and middle-income groups predominating.

5.2 Awareness Level Analysis

Table 2: Awareness of Plastic Money Instruments

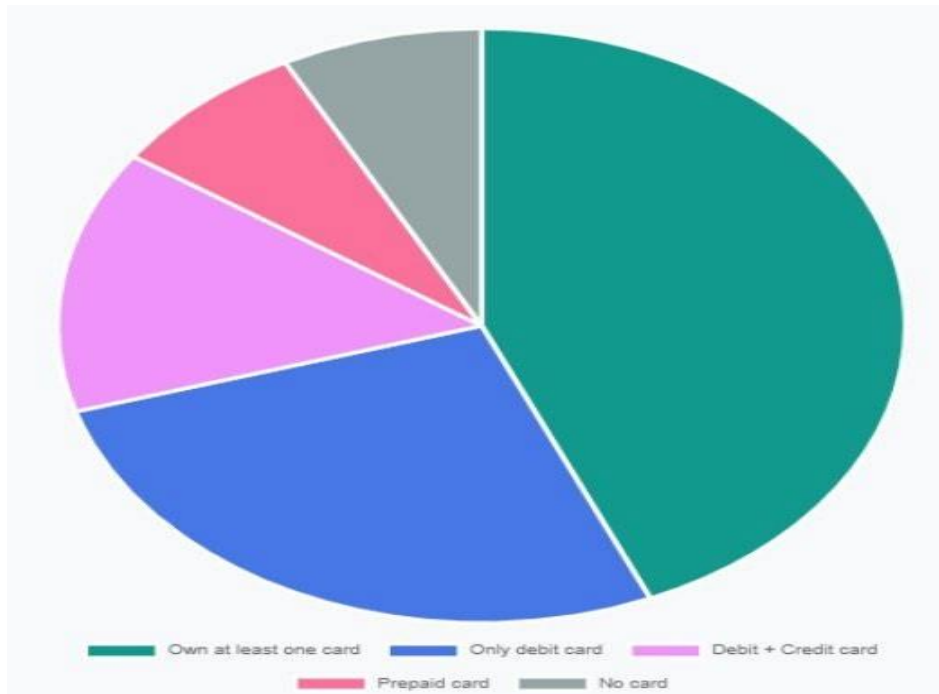
Instrument	Aware	Partially Aware	Not Aware
Debit Card	92.5%	5.5%	2.0%
Credit Card	78.0%	15.0%	7.0%
Prepaid Card	55.0%	25.0%	20.0%
Contactless Cards	45.0%	30.0%	25.0%

Source: Primary Data

Debit cards have near-universal awareness (92.5%), while newer instruments like contactless cards show lower awareness (45%), indicating need for consumer education on advanced payment technologies.

5.3 Adoption Rate Analysis Figure 1: Plastic Money Adoption Rates

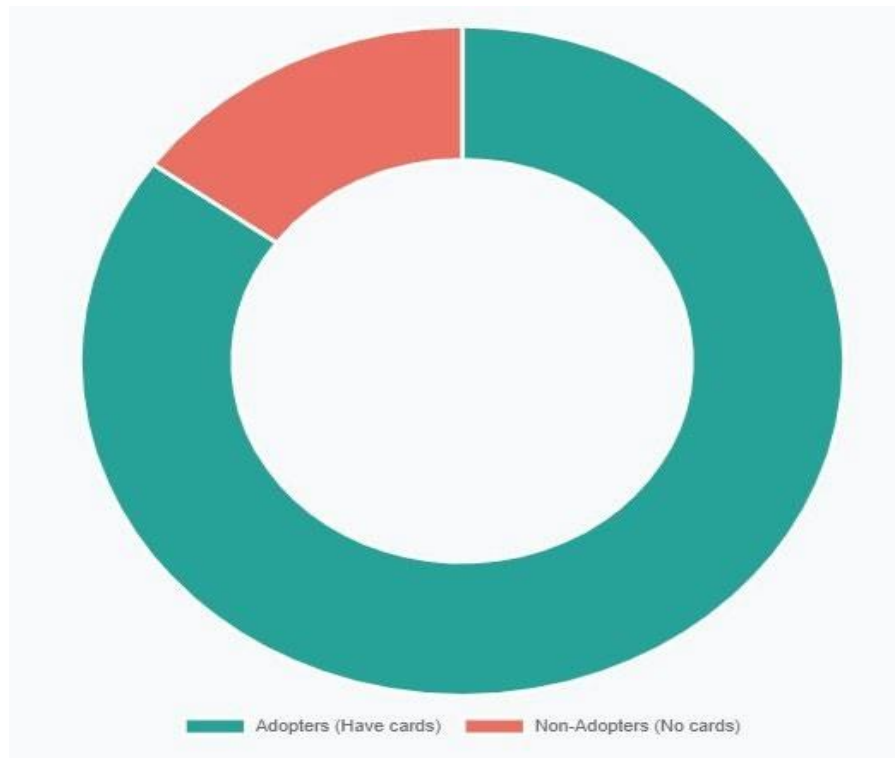
Overall Adoption Distribution



Card Type Ownership Breakdown



Adoption vs Non-Adoption



- Own at least one plastic card: 85.0%
- Own only debit card: 52.5%
- Own both debit and credit card: 28.0%

- Own prepaid card: 15.0%
- Do not own any card: 15.0%

Table 3: Cross-tabulation: Adoption by Area

Area	Adoption Rate	Non-Adoption Rate
Urban	94.0%	6.0%
Semi-urban	85.0%	15.0%
Rural	65.0%	35.0%

Source: Primary Data

Chi-square test, $\chi^2 = 42.85$, $p < 0.001$ (highly significant association between geographical area and adoption). Urban areas show significantly higher adoption (94%) compared to rural areas (65%), reflecting infrastructural and socio-economic disparities.

5.4 Usage Pattern Analysis

Table 3: Frequency of Plastic Money Usage

Frequency	Percentage
Daily	32.5%
2-3 times per week	28.0%
Weekly	18.5%
Monthly	15.0%
Rarely	6.0%

Source: Primary Data

Primary Usage Categories:

1. Shopping/Retail purchases: 72.0%
2. Online transactions: 68.0%
3. Bill payments: 55.0%
4. ATM withdrawals: 85.0%
5. Fuel purchases: 48.0%

6. Entertainment/Dining: 42.0%

High daily and weekly usage (79%) indicates strong behavioral integration. ATM withdrawals remain the dominant use case, while online transactions show growing adoption.

5.5 Perception Analysis

Table 4: Consumer Perceptions (Mean Scores on 5-point Likert Scale)

Perception Dimension	Mean Score	Std. Deviation
Convenience	4.25	0.68
Time-saving	4.18	0.72
Security concerns	3.42	1.05
Trust in system	3.65	0.88
Ease of use	4.10	0.75
Cost-effectiveness	3.55	0.92
Privacy protection	3.38	1.02
Reward benefits	3.85	0.95

Source: Primary Data

Three underlying factors identified (KMO = 0.82, Bartlett's test $p < 0.001$):

1. Functional Benefits (41.2% variance): convenience, time-saving, ease of use
2. Trust and Security (28.5% variance): security, trust, privacy
3. Economic Value (18.3% variance): cost-effectiveness, rewards

Consumers strongly perceive functional benefits (mean > 4.0) but express moderate concerns about security and privacy (mean < 3.5), highlighting trust as a critical adoption barrier.

5.6 Barriers to Adoption Analysis

Table 5: Barriers to Plastic Money Adoption (Multiple Response)

Barrier	Percentage
Security concerns/Fear of fraud	65.0%
Lack of digital literacy	52.0%
Insufficient acceptance infrastructure	48.0%
High charges and fees	38.0%
Complex procedures	35.0%
Preference for cash	42.0%
Privacy concerns	45.0%
Limited income/No bank account	28.0%
Poor internet connectivity	32.0%
Lack of awareness	30.0%

Source: Primary Data

Security concerns top the barrier list (65%), followed by digital literacy gaps (52%) and infrastructure inadequacy (48%). Multi-pronged interventions needed addressing technological, educational, and infrastructural dimensions.

5.7 Digital Literacy Assessment

Table 6: Digital Literacy Levels

Literacy Level	Percentage	Mean Adoption Score
High	28.0%	4.45
Medium	45.0%	3.75
Low	27.0%	2.30

Source: Primary Data

Strong positive correlation between digital literacy and adoption ($r = 0.68$, $p < 0.001$). Digital literacy emerges as a critical enabler, with high-literacy consumers showing nearuniversal adoption compared to low-literacy segments.

5.8 Determinants of Adoption - Logistic Regression

Dependent Variable: Plastic money adoption (Yes=1, No=0)

Independent Variable	B Coefficient	Odds Ratio	p-value	Significance
Age (years)	-0.025	0.975	0.032	*
Education (years)	0.185	1.203	0.001	***
Income (₹'000)	0.042	1.043	0.008	**
Urban area	1.245	3.474	0.000	***
Digital literacy score	0.312	1.366	0.000	***
Security perception	0.428	1.534	0.005	**
Constant	-2.856	-	0.012	*

Source: Primary Data

Model Statistics: Nagelkerke $R^2 = 0.542$, Classification accuracy = 82.5%

Education, income, urban location, digital literacy, and security perception significantly predict adoption. Higher education increases adoption odds by 20.3% per year of schooling.

Urban residents are 3.5 times more likely to adopt than rural residents.

5.9 Satisfaction Analysis

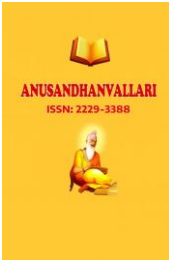
Overall Satisfaction Score: 3.78/5.0 (Moderately Satisfied) Service Quality Dimensions:

- Transaction speed: 4.15
- System reliability: 3.65
- Customer support: 3.35
- Problem resolution: 3.42
- Information availability: 3.58

While transaction speed receives high satisfaction, customer support and problem resolution show room for improvement.

5.10 Comparative Analysis by Demographics ANOVA Results: Usage Frequency by Age Group

F-statistic = 12.45, $p < 0.001$ (significant difference) Post-hoc analysis reveals:



- 18-35 age group significantly higher usage than 46+ group
- No significant difference between 18-25 and 26-35 groups Gender Comparison (t-test):
- Male adoption rate: 88.2%
- Female adoption rate: 80.6%
- $t = 2.15, p = 0.032$ (significant difference)

Younger consumers and males show higher adoption and usage, suggesting targeted interventions needed for older consumers and women.

6. Findings

6.1 Major Findings Awareness and Knowledge:

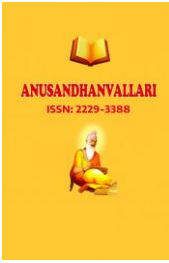
1. High awareness of basic plastic money instruments (92.5% for debit cards) but limited knowledge of advanced features
2. Significant awareness gap exists for newer instruments like contactless cards (55% unaware or partially aware)
3. Urban-rural awareness divide persists with rural areas lagging by 25-30 percentage points Adoption Patterns: Overall adoption rate of 85% in Madurai District, higher than national average. Strong geographical disparity: urban (94%) vs. rural (65%) adoption. Debit cards dominate (92.5%) while credit card penetration remains moderate (28%). Multiple card ownership correlates strongly with income levels ($r = 0.61$)

Usage Behavior: 60.5% of adopters use plastic money daily or multiple times weekly. ATM withdrawals remain the primary use case (85%), followed by retail shopping (72%). Online transactions growing rapidly, with 68% reporting regular e-commerce usage. Cash withdrawal preference persists despite cashless push, indicating behavioral inertia

Consumer Perceptions: Convenience (4.25/5) and time-saving (4.18/5) rated as strongest benefits. Security concerns (3.42/5) and privacy protection (3.38/5) emerge as critical weaknesses. Trust deficit exists, with only 3.65/5 mean trust score. Three perception factors identified: functional benefits, trust/security, and economic value

Barriers and Challenges: Security concerns/fraud fear cited by 65% as major barrier. Digital literacy gap affects 52% of non-adopters. Infrastructure inadequacy (insufficient POS terminals) reported by 48%. Privacy concerns increasingly important, mentioned by 45%. Traditional cash preference remains strong among 42%, particularly older demographics

Determinants of Adoption: Education emerges as strongest predictor ($OR = 1.203$, increases by 20.3% per year). Urban residence increases adoption likelihood by 3.5 times. Digital literacy shows strong positive correlation ($r = 0.68$) with adoption. Income significantly influences adoption but effect moderates at higher levels. Age shows negative association, with younger consumers more likely to adopt



Satisfaction and Service Quality: Overall satisfaction moderate at 3.78/5, indicating scope for improvement. Transaction speed highly rated (4.15/5) but customer support weak (3.35/5). Problem resolution and grievance redressal need substantial enhancement. Information asymmetry persists regarding card features and benefits

Demographic Variations: Gender gap exists with males showing 7.6 percentage points higher adoption. Age significantly influences usage frequency ($F = 12.45, p < 0.001$). Education adoption relationship follows exponential curve, not linear 33. Salaried employees show highest adoption (92%) vs. self-employed (78%)

Digital Literacy Impact: High digital literacy individuals show 4.45/5 adoption score vs. 2.30/5 for low literacy. Digital literacy mediates the education-adoption relationship. Smartphone usage strongly correlates with plastic money adoption

Behavioral Insights: Habit formation takes 3-6 months of regular usage. Reward programs significantly influence credit card preference. Social influence and peer effects important among younger users. Merchant acceptance quality affects usage frequency more than card ownership

6.2 Surprising/Unexpected Findings

1. Rural respondents with high digital literacy show adoption rates comparable to urban counterparts, suggesting infrastructure, not willingness, is the primary constraint
2. Women in salaried employment show higher transaction frequency than male counterparts despite lower overall adoption
3. Prepaid cards show unexpected adoption among students (32%) despite overall low penetration (15%)
4. Security concerns don't correlate with actual fraud experience, indicating perception reality gap

6.3 Hypothesis Testing Results

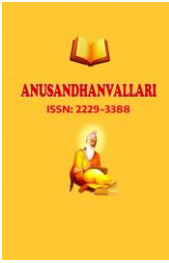
H1: There is significant association between demographic factors and plastic money adoption -

ACCEPTED (χ^2 tests significant for age, education, income, occupation)

H2: Consumer perceptions significantly influence adoption behavior - ACCEPTED (regression analysis shows security perception, convenience perception as significant predictors)

H3: Digital literacy positively impacts plastic money usage - ACCEPTED ($r = 0.68, p < 0.001$) H4: Urban consumers show higher adoption than rural consumers - ACCEPTED (94% vs. 65%, $\chi^2 = 42.85, p < 0.001$)

H5: There is no significant difference in adoption between genders - REJECTED (significant difference found, $t = 2.15, p = 0.032$)



7. Discussion

7.1 Interpretation of Key Results

The Digital Divide Paradox: While Madurai District shows high overall adoption (85%), the stark urban-rural divide (94% vs. 65%) reflects India's broader digital infrastructure challenges. This isn't merely a technology access issue but encompasses financial inclusion, literacy, and socio-economic factors. The finding that digitally literate rural consumers match urban adoption rates suggests that education and awareness interventions could be as effective as infrastructure development.

Security Perception vs. Reality: The prominence of security concerns (65% citing as barrier) despite relatively low actual fraud rates indicates a perception-reality gap. This suggests that consumer education focusing on security features, dispute resolution mechanisms, and successful fraud prevention would be more effective than purely technological solutions. The moderate trust score (3.65/5) reflects this gap and presents a significant opportunity for stakeholder intervention. **The Last-Mile Challenge:** High card ownership (85%) but persistent cash withdrawal preference (85% use cards primarily for ATM access) reveals the "last-mile" problem in India's cashless economy push. Merchant acceptance infrastructure inadequacy (48% citing as barrier) creates a practical constraint that behavioral interventions alone cannot overcome. This finding emphasizes the need for synchronized supply-side (merchant onboarding) and demand-side (consumer adoption) strategies.

Digital Literacy as a Gateway Competency: The strong correlation between digital literacy and adoption ($r = 0.68$) positions digital literacy not just as a facilitator but as a gateway competency.

This has policy implications: financial literacy programs must integrate digital skills training. The finding that education increases adoption odds by 20.3% per year of schooling underscores education's multiplicative effect through both formal knowledge and digital confidence.

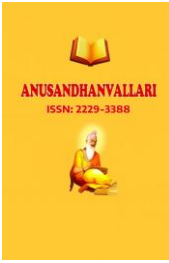
Age and Technology Adoption: The negative association between age and adoption aligns with technology adoption literature but presents long-term sustainability concerns. As India's population ages, creating age-friendly interfaces and targeted interventions for older adults becomes crucial. The significant difference in usage frequency across age groups ($F = 12.45$, $p < 0.001$) suggests cohort effects that may naturally diminish as digital natives age.

7.2 Theoretical Implications

Beyond TAM: Introducing Context-Specific Factors: While TAM constructs (perceived usefulness, ease of use) remain relevant, this study highlights the importance of contextual factors infrastructure availability, digital literacy, social influence that standard TAM models underemphasize.

Trust as a Multi-dimensional Construct: The factor analysis revealing trust/security as a distinct dimension separate from functional benefits suggests trust in plastic money ecosystems is multi-faceted: trust in technology, trust in institutions, trust in transaction security, and trust in grievance redressal. Future research should disaggregate these dimensions.

The Digital Literacy Mediation Effect: Digital literacy's role as a mediator between education and adoption suggests a pathway model where formal education builds general cognitive capacity, which translates to digital skills, which



then enable technology adoption.

7.3 Practical Implications For Policymakers:

1. Infrastructure First: The rural adoption gap demands prioritized infrastructure development POS terminals, internet connectivity, and merchant onboarding in semiurban and rural areas
2. Financial Literacy 2.0: Integrate digital literacy into financial literacy programs; separate initiatives are inefficient
3. Security Communication: Develop consumer protection frameworks and communicate them effectively to bridge the perception-reality gap
4. Inclusive Design: Age-friendly and accessibility-focused interface design should be policy requirements, not afterthoughts

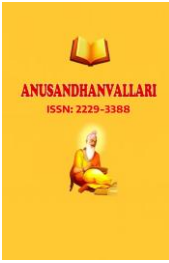
For Banking and Fintech Industry:

1. Customer Support Enhancement: The low satisfaction with problem resolution (3.42/5) demands investment in responsive, accessible customer service
2. Simplified Onboarding: Complex procedures cited by 35% as barrier suggest need for streamlined, vernacular-language onboarding
3. Context-Aware Products: Develop products tailored to usage patterns (e.g., cards optimized for ATM + retail rather than just online)
4. Merchant Acquisition: Focus on acquiring neighborhood merchants, not just large retailers For Educational Institutions:

1. Curriculum Integration: Incorporate digital financial literacy into school and college curricula
2. Adult Education Programs: Partner with banks for community-based adult education on digital payments
3. Practical Training: Move beyond theoretical knowledge to hands-on training with actual payment instruments

Specific to Madurai District:

1. Leverage Madurai's high literacy rate (above TN average) for rapid digital literacy scaling
2. Partner with temple trusts and religious institutions for awareness (given Madurai's religious tourism significance)
3. Target the large student population (17.5% of sample) as early adopters and peer influencers
4. Develop specialized programs for the substantial self-employed segment (22.5%)



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5. Create model villages demonstrating cashless ecosystems to inspire replication

7.4 Limitations of the Study Sampling Limitations:

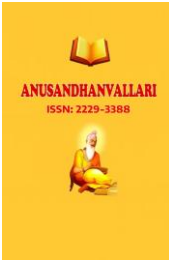
1. Cross-sectional design captures snapshot, not behavioral evolution over time
2. Sample of 400, while statistically adequate, may not capture all micro-variations within Madurai District
3. Self-selection bias possible in online survey responses
4. Underrepresentation of elderly (3.7%) and very high-income segments Measurement Limitations:
 1. Self-reported data subject to recall bias and social desirability bias
 2. Digital literacy measured through self-assessment, not objective testing
 3. Security perceptions measured at one point; may fluctuate with news events
 4. Actual usage frequency may differ from reported frequency Generalizability Limitations:
 1. Findings specific to Madurai District; generalization to other districts requires caution
 2. Tamil Nadu's higher literacy and development may not reflect other Indian states
 3. Timing of study (post-demonetization period) may influence results
 4. COVID-19 pandemic's impact on digital payment adoption not captured if study conducted pre-pandemic

Conclusion

This comprehensive study of plastic money adoption in Madurai District reveals a nuanced picture of progress and persistent challenges. With 85% adoption rate, Madurai demonstrates robust uptake of digital payment instruments, driven primarily by convenience, time-saving benefits, and increasing digital literacy. However, this headline figure masks significant inequalities: urban-rural divide, gender gaps, and age-related differences create a heterogeneous landscape of adoption and usage.

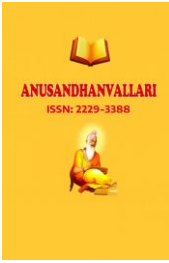
The research identifies security concerns, digital literacy gaps, and infrastructure inadequacies as the primary barriers constraining universal adoption. These barriers are not insurmountable the finding that digitally literate rural consumers match urban adoption rates demonstrates that targeted, well-designed interventions can overcome structural constraints.

Education emerges as the strongest predictor of adoption, with each additional year of schooling increasing adoption odds by 20.3%. This underscores the multiplicative effect of education policy on financial inclusion objectives. Similarly, digital literacy's strong correlation with adoption ($r = 0.68$) positions it as a gateway competency requiring immediate policy attention.



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