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UPI/Digital Wallet Adoption And Sales Outcomes Among Retail Stores In Assam: A Technology Acceptance And Performance Analysis

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Abstract

This study examines the factors driving digital payment adoption among Kirana and micro-retail stores in Assam and investigates the relationship between adoption levels and sales performance outcomes. The study's approach used a cross-sectional survey of 312 Kirana and micro-retail stores across five districts in Assam was conducted using stratified sampling. The study employed the Technology Acceptance Model (TAM) framework, measuring perceived usefulness, perceived ease of use, perceived risk, and customer demand pressure as antecedents to adoption. Sales outcomes were measured through growth rates, ticket sizes, and stability indicators. The results indicate that perceived usefulness ($\beta=0.34$, $p<0.001$) and customer demand pressure ($\beta=0.28$, $p<0.001$) are the strongest predictors of digital payment adoption. Urban stores demonstrate significantly higher adoption rates ($M=68.4$) compared to rural counterparts ($M=45.2$, $p<0.001$). Adoption levels show positive associations with monthly sales growth ($r=0.42$, $p<0.001$) and sales stability ($r=0.35$, $p<0.001$). The study is limited to Assam's retail ecosystem and employs cross-sectional data. Longitudinal studies could strengthen causal inferences regarding adoption-performance relationships. Its practical implications suggest that financial service providers and policymakers can leverage findings to design targeted interventions, particularly focusing on usefulness demonstrations and addressing rural-urban adoption gaps.

Keywords: Digital payments, UPI adoption, Kirana retail stores, Technology acceptance, Sales performance.

1. Introduction

India's digital payment ecosystem has experienced unprecedented growth, with Unified Payments Interface (UPI) transactions reaching 131.95 billion in volume during 2023-24 (NPCI, 2024). This transformation has been particularly pronounced in the micro-retail sector, where traditional Kirana stores increasingly embrace digital payment technologies. However, adoption patterns and their business implications vary significantly across India's diverse regional contexts.

Assam, representing India's northeastern economy, presents a unique case study for digital payment adoption. The state's retail landscape is dominated by small-scale retail stores that serve as critical economic nodes in both urban centers and rural communities. While national studies have explored digital payment adoption broadly, region-specific evidence on adoption determinants and performance outcomes remains limited, particularly in economically transitioning states like Assam.

This research addresses two critical questions: (1) What factors drive digital payment adoption among Assam's Kirana and micro-retail stores? (2) Does digital payment adoption associate with improved sales outcomes? Understanding these relationships is crucial for financial service providers, policymakers, and retail development initiatives seeking to optimize digital payment strategies in regional contexts. The study contributes to the literature by providing empirical evidence from an understudied regional context, employing a comprehensive framework that links adoption determinants to performance outcomes, and offering actionable insights for stakeholders operating in similar emerging market environments.

2. Literature Review and Theoretical Framework

2.1 Technology Acceptance in Retail Payments

The Technology Acceptance Model (TAM), originally proposed by Davis (1989), provides a robust theoretical foundation for understanding digital payment adoption. TAM posits that perceived usefulness (PU) and perceived ease of use (PEOU) are primary determinants of technology acceptance and usage behaviour. In the context of digital payments, numerous studies have validated TAM's applicability (Venkatesh et al., 2003; Oliveira et al., 2016).

Recent research has extended TAM to incorporate context-specific factors relevant to digital payment adoption. Yang et al. (2021) demonstrated that perceived risk significantly moderates adoption intentions, while Singh and Srivastava (2020) highlighted the role of external pressures, particularly customer demand, in driving merchant adoption of digital payment systems.

2.2 Digital Payment Adoption in Emerging Markets

Emerging market studies reveal distinct adoption patterns compared to developed economies. Patil et al. (2020) found that Indian small retailers prioritize transaction speed and customer convenience over technological sophistication. Similarly, Gupta and Arora (2017) emphasized the importance of trust and risk perceptions in shaping adoption decisions among Indian micro-entrepreneurs.

Regional variations within India are particularly pronounced. While metropolitan areas demonstrate high adoption rates, smaller cities and rural areas lag significantly (RBI, 2023). This digital divide reflects infrastructure constraints, digital literacy gaps, and varying customer preferences across urban-rural contexts.

2.3 Performance Implications of Digital Payment Adoption

Limited research has examined the performance implications of digital payment adoption among small retailers. Existing studies suggest positive associations between digital payment acceptance and business performance indicators. Adhikary et al. (2021) found that digital payment adoption correlated with increased transaction volumes and customer satisfaction among urban retailers. However, the mechanisms linking adoption to performance outcomes remain underexplored. Potential pathways include improved transaction efficiency, expanded customer base, enhanced inventory management through digital transaction data, and reduced cash handling costs. Understanding these relationships is crucial for building business cases for digital payment adoption.

2.4 Hypotheses Development

Based on the literature review and TAM framework, the following hypotheses are proposed:

H1: Perceived usefulness is positively correlated with digital payment adoption levels.

H2: Perceived ease of use is positively correlated with digital payment adoption levels.

H3: Perceived risk is negatively correlated with digital payment adoption levels.

H4: Customer demand pressure positively predicts digital payment adoption, controlling for other TAM variables and demographic factors.

H5: Higher digital payment adoption levels are associated with superior sales performance outcomes (growth and stability).

H6: Digital payment adoption levels differ significantly between urban and rural store locations.

H7: Adoption levels vary significantly across store age categories and demographic characteristics.

3. Research Methodology

3.1 Research Design

This study employs a cross-sectional survey design to examine digital payment adoption and its performance implications among Kirana and micro-retail stores in Assam. The quantitative approach enables systematic testing of hypothesized relationships while providing generalizable insights for the target population.

3.2 Sampling Framework and Data Collection

The target population comprises Kirana and micro-retail stores operating in Assam. A stratified sampling approach was employed to ensure representative coverage across major geographic locations including four districts (Kamrup Metropolitan for Guwahati, Cachar for Silchar, Dibrugarh, Jorhat, and one rural block per district). The location type include urban vs. rural classification. The store age has been considered under three categories (<3 years, 3-10 years, >10 years). The sampling frame was constructed using business registration data from district commercial departments and local trade associations. A target sample size of 312 stores was determined based on statistical power requirements for multiple regression analysis (minimum 15-20 cases per predictor variable).

Primary data were collected through structured questionnaires and face-to-face interviews. Pre-testing was conducted with 25 store owners to refine question wording and ensure comprehension. Trained field investigators conducted interviews at store locations during business hours with each interview lasting approximately 20-25 minutes, covering adoption determinants, usage patterns, and sales performance indicators.

3.4 Measurement Instruments and Control Variables

The independent variables for this study include – **Perceived Usefulness (PU)** with four items measured on 5-point Likert scales (where, 1=strongly disagree, 5=strongly agree), for example, "Accepting UPI/digital payments helps me serve customers faster"; **Perceived Ease of Use (PEOU)** with four items measuring learning ease and operational simplicity, for example, "Learning to use UPI apps was easy for me"; **Perceived Risk (PR)** with four items capturing transaction and security concerns, for example, "I worry about failed transactions when accepting digital payments"; and **Customer Demand Pressure (CDP)** with three items measuring external adoption pressures, for example, "My customers frequently ask to pay through UPI/digital wallets."

The dependent variables include – **Digital Payment Adoption Level (ADOPT)** which represents a composite index combining three components namely, (i) Percentage of digital transactions in the past month (0-100%), (ii) number of digital payment modes accepted (UPI, wallets, QR codes, PoS terminals), (iii) frequency of digital payment usage (1=never to 5=very frequently); and **Sales Performance Outcomes**, that involves monthly sales growth, self-reported percentage change compared to same month previous year, average ticket size, categorical bands (₹0-100, ₹101-300, ₹301-500, >₹500), sales stability with 5-point scale (1=very unstable to 5=very stable).

Demographic and business characteristics including owner age, education level, store size (square footage), years in operation, and location type were collected as control variables.

3.5 Model Assumptions Assessment:

To ensure the validity of the statistical analyses conducted in this study, several key assumptions underlying the regression models were evaluated. Normality of continuous variables was assessed using Kolmogorov-Smirnov tests, which indicated that the distributions of these variables were consistent with the normality assumption ($p > 0.05$ for all tests). Linearity between predictor and outcome variables was verified through visual inspection of scatterplots, which demonstrated linear relationships across all relevant pairs. Homoscedasticity was confirmed by examining residual plots, which exhibited constant variance of residuals across levels of the predictors, satisfying the assumption of equal variances. Finally, multicollinearity among predictors was assessed using Variance Inflation Factor (VIF) values, with all VIFs below 3.0, indicating no evidence of excessive multicollinearity that would compromise the stability of the regression coefficients. These findings collectively support the appropriateness of the regression models employed in this study, ensuring robust and reliable statistical inferences.

4. Results

4.1 Sample Characteristics

The final sample comprised 312 stores with complete responses (response rate: 86.7%). Sample characteristics are presented in Table 1.

Table 1: Sample Demographics and Descriptive Statistics

Variable	Category	n	%	Mean	SD
Location	Urban	187	59.9	-	-
	Rural	125	40.1	-	-
Store Age	<3 years	89	28.5	-	-
	3-10 years	145	46.5	-	-
	>10 years	78	25.0	-	-
Owner Age		-	-	42.3	11.7
Owner Education	Below Secondary	78	25.0	-	-
	Secondary	134	42.9	-	-
	Graduate+	100	32.1	-	-
Store Size (sq. ft.)		-	-	245.6	132.4
Monthly Revenue (₹)	<50,000	112	35.9	-	-
	50,000-200,000	143	45.8	-	-
	>200,000	57	18.3	-	-

4.2 Scale Reliability and Descriptive Statistics

Table 2 presents reliability coefficients and descriptive statistics for key study variables.

Table 2: Scale Reliability and Descriptive Statistics

Scale	Items	Cronbach's α	Mean	SD	Min	Max
Perceived Usefulness (PU)	4	0.84	3.72	0.91	1.25	5.00
Perceived Ease of Use (PEOU)	4	0.79	3.45	0.87	1.50	5.00
Perceived Risk (PR)	4	0.73	2.68	0.94	1.00	4.75
Customer Demand Pressure (CDP)	3	0.76	3.58	1.02	1.00	5.00
Adoption Level (ADOPT)	3	0.81	58.3	24.6	8.0	95.0
Sales Growth (%)	1	-	12.4	18.7	-15.0	65.0
Sales Stability	1	-	3.24	1.13	1.00	5.00

All the scales demonstrated acceptable reliability ($\alpha>0.70$). The adoption level index showed good internal consistency and reasonable variation across the sample.

4.3 Correlation Analysis

Table 3 presents correlations between key study variables.

Table 3: Correlation Matrix

Variable	1	2	3	4	5	6	7
1. PU	1.00						
2. PEOU	0.52**	1.00					
3. PR	-0.31**	-0.28**	1.00				
4. CDP	0.48**	0.34**	-0.22**	1.00			
5. ADOPT	0.61**	0.47**	-0.39**	0.53**	1.00		
6. Sales Growth	0.38**	0.29**	-0.24**	0.31**	0.42**	1.00	
7. Sales Stability	0.32**	0.26**	-0.28**	0.29**	0.35**	0.51**	1.00

Note: *p<0.05, **p<0.01

These results support H1, H2, and H3, with significant correlations in predicted directions. Strong positive correlations between adoption and sales outcomes provide initial support for H5.

4.4 Regression Analysis: Adoption Determinants

Multiple regression analysis examined factors predicting digital payment adoption levels. Results are presented in Table 4.

Table 4: Multiple Regression Analysis - Adoption Determinants

Variable	Model 1	Model 2	Model 3 (Full)
	β (SE)	β (SE)	β (SE)
Perceived Usefulness	0.42** (0.08)	0.38** (0.08)	0.34** (0.09)
Perceived Ease of Use	0.23** (0.09)	0.21* (0.09)	0.19* (0.09)
Perceived Risk	-0.18* (0.07)	-0.16* (0.07)	-0.15* (0.07)
Customer Demand Pressure		0.31** (0.07)	0.28** (0.08)
Owner Age			-0.12 (0.08)
Store Size	-	-	0.16* (0.07)
Urban Location	-	-	0.22** (0.06)
R^2	0.52	0.59	0.64
Adjusted R^2	0.51	0.58	0.62
F-statistic	112.4**	110.8**	78.3**

Note: *p<0.05, **p<0.01; Standardized coefficients reported

The full model explains 64% of variance in adoption levels. Perceived usefulness emerges as the strongest predictor (β=0.34), followed by customer demand pressure (β=0.28) and location (β=0.22). This provides strong support for H1, H2, H3, and H4.

4.5 Regression Analysis: Performance Outcomes

Table 5 examines the relationship between adoption levels and sales performance outcomes.

Table 5: Multiple Regression Analysis - Performance Outcomes

Variables	Sales Growth	Sales Stability
	β (SE)	β (SE)
Adoption Level	0.38** (0.06)	0.31** (0.05)
Store Size	0.19* (0.07)	0.14* (0.06)
Owner Education	0.15* (0.06)	0.12 (0.06)
Urban Location	0.21** (0.07)	0.18* (0.06)
Store Age	0.08 (0.06)	0.16* (0.06)
R^2	0.31	0.24
Adjusted R^2	0.30	0.23
F-statistic	27.6**	19.4**

Note: *p<0.05, **p<0.01; Standardized coefficients reported

Results provide strong support for H5, with adoption levels significantly predicting both sales growth (β=0.38) and stability (β=0.31).

4.6 Group Comparisons and Association Tests

Urban and rural stores: The independent samples t-tests revealed significant differences between urban and rural stores, where, the adoption level represents urban (M=68.4, SD=22.3) and rural (M=45.2, SD=24.8), t(310)=8.47, p<0.001; while the sales growth shows urban (M=15.2%, SD=19.1) and rural (M=8.3%, SD=17.4), t(310)=3.21, p<0.01). These findings support H6, confirming significant urban-rural adoption gaps.

Store Age and Adoption Associations: Chi-square analysis examined associations between adoption levels (tertiles) and store characteristics:

- **Store Age × Adoption Level:** $\chi^2(4) = 16.84$, $p<0.01$
- **Education × Adoption Level:** $\chi^2(4) = 12.73$, $p<0.05$

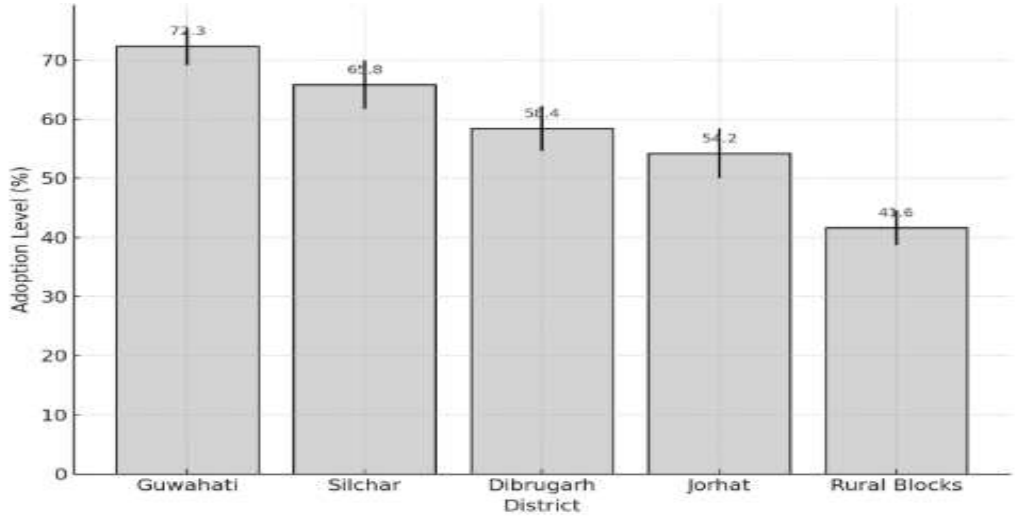
Chi-square tests of independence were conducted to examine associations between adoption levels (categorized into tertiles: low, medium, high) and store characteristics. The analysis revealed a statistically significant association between store age and adoption level, $\chi^2(4) = 16.84$, $p < 0.01$, indicating that the distribution of adoption levels varies significantly across store age categories. Similarly, a significant association was observed between education level and adoption level, $\chi^2(4) = 12.73$, $p < 0.05$, suggesting that adoption levels differ across education categories. These findings provide evidence that store age and education level are associated with adoption behaviours, contributing to the

understanding of factors influencing innovation adoption in retail contexts. Further analyses, including effect size calculations and post-hoc tests, are recommended to elucidate the nature and strength of these associations. Thus, the results provide partial support for H7, with younger stores and more educated owners showing higher adoption rates.

4.7 District-Level Variations

Figure 1 below presents the mean levels of digital payment adoption across the study districts, with standard errors represented as error bars. The results indicate that adoption levels were highest in Guwahati (M = 72.3, SE = 3.2), followed by Silchar (M = 65.8, SE = 4.1), Dibrugarh (M = 58.4, SE = 3.8), and Jorhat (M = 54.2, SE = 4.2). Rural blocks reported comparatively lower adoption levels (M = 41.6, SE = 2.9).

Figure 1: Digital Payment Adoption Levels by District



A one-way analysis of variance (ANOVA) revealed a statistically significant difference in adoption levels across the districts, $F(4, 307) = 23.6$, $p < 0.001$. This suggests that geographic location plays a substantial role in shaping the extent of digital payment adoption. Post-hoc tests revealed significant differences between all urban centers and rural blocks, with urban centers exhibiting considerably higher adoption compared to rural area while Guwahati demonstrating the highest adoption levels.

The findings highlight the uneven penetration of digital payment systems across regions, with metropolitan areas such as Guwahati leading adoption, while rural blocks lag behind. This disparity underscores the importance of targeted interventions and policy measures to bridge the digital divide, ensuring more equitable access and utilization of financial technologies.

5. Discussion

5.1 Key Findings and Theoretical Implications

This study provides novel empirical evidence on digital payment adoption determinants and performance outcomes within Assam's Kirana retail ecosystem. The findings contribute to technology acceptance literature by demonstrating TAM's applicability in a regional emerging market context while highlighting the importance of context-specific factors.

Among adoption determinants, perceived usefulness emerges as the primary adoption driver, suggesting that store owners prioritize tangible business benefits over technological features. This finding aligns with Davis's (1989) original TAM propositions while extending applicability to small-scale retail contexts in emerging markets. Customer demand pressure represents a significant external motivator, highlighting the role of market forces in technology adoption decisions. This finding extends Venkatesh et al.'s (2003) Unified Theory of Acceptance and Use of Technology (UTAUT) by demonstrating how customer expectations shape merchant technology choices. Perceived risk, while significant, shows a relatively moderate impact on adoption decisions. This suggests that Assam's retailers have developed confidence in digital payment systems, possibly reflecting improved infrastructure and positive peer experiences.

Performance implications indicate that the strong positive associations between adoption levels and sales outcomes provide important evidence for the business case of digital payment acceptance. The adoption-performance relationship appears robust across different outcome measures, suggesting multiple pathways through which digital payments enhance business performance.

These findings contribute to the limited literature on small business performance implications of financial technology adoption, providing empirical support for theoretical arguments about efficiency gains and customer satisfaction benefits.

5.2 Practical Implications

For financial service providers, results suggest that adoption interventions should emphasize concrete usefulness benefits rather than technical features. Training programs demonstrating time savings, customer convenience, and transaction tracking capabilities may prove more effective than feature-focused approaches. The significant urban-rural adoption gap indicates opportunities for targeted rural market development. Customized service delivery models addressing rural-specific concerns (connectivity, digital literacy, trust) could accelerate adoption in underserved areas.

For policymakers, the study reveals substantial regional variations in adoption patterns, suggesting the need for location-specific policy interventions. Rural development programs could incorporate digital payment adoption components to support small business modernization. The strong adoption-performance relationship provides evidence for policies promoting digital payment adoption as

economic development tools. Incentive structures encouraging adoption among small retailers could yield broader economic benefits.

For retail development organizations, results indicate that peer demonstration effects and customer pressure represent powerful adoption motivators. Programs facilitating peer learning and customer education about digital payment options could create mutually reinforcing adoption cycles.

5.3 Limitations and Future Research Directions

Several limitations should be acknowledged. The cross-sectional design precludes causal inferences about adoption-performance relationships. Longitudinal studies tracking stores over time could strengthen understanding of causal mechanisms. The study focuses on Assam's specific context, potentially limiting generalizability to other regions. Comparative studies across different Indian states or similar emerging markets would enhance external validity.

Self-reported sales data may introduce measurement bias. Future research could incorporate objective performance measures or third-party data sources to validate findings. The study does not examine specific digital payment technologies individually. Research comparing UPI, wallet, and QR code adoption determinants could provide more granular insights for service providers.

6. Conclusion

This study provides comprehensive empirical evidence on digital payment adoption and performance relationships among Assam's Kirana and micro-retail stores. The findings demonstrate that perceived usefulness and customer demand pressure are primary adoption drivers, while adoption levels show significant positive associations with sales performance outcomes. The research contributes to technology acceptance literature by extending TAM applications to regional small business contexts and providing novel evidence on adoption-performance relationships.

Practical implications suggest opportunities for targeted interventions by financial service providers, policymakers, and retail development organizations. The substantial urban-rural adoption gap and strong performance implications highlight both challenges and opportunities in Assam's retail digitization journey. Addressing these gaps through coordinated stakeholder efforts could accelerate digital payment adoption while supporting small business performance and regional economic development. Future research should examine longitudinal adoption patterns, compare different digital payment technologies, and explore adoption determinants in other emerging market contexts. Such studies would further strengthen the evidence base for digital payment policy and practice in developing economies.

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