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The Impact of Cashless Payment Adoption on Business Sustainability among Bottom of the Pyramid Micro Entrepreneurs

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Abstract: ***This study investigates the impact of cashless payment adoption on business sustainability among Bottom of the Pyramid (BoP) micro entrepreneurs in India. Drawing on the Technology Organization Environment (TOE) framework, we examine how relative advantage, perceived barriers, firm size, firm scope, and competition influence cashless payment adoption and its subsequent effect on business sustainability. Data was collected from 387 micro entrepreneurs operating in urban, semiurban, and rural areas of Tamil Nadu. Using Structural Equation Modelling Partial Least Square (SEMPLS) analysis, results indicate that perceived barriers, firm scope, firm size, and competition significantly influence cashless payment adoption. Furthermore, cashless payment adoption demonstrates a positive and significant relationship with business sustainability through enhanced financial inclusion. These findings highlight that adoption factors depend on supply chain position and entrepreneurial context. The study provides theoretical contributions to technology adoption literature and practical insights for FinTech companies targeting BoP merchants in emerging economies.***

Keywords: Cashless payments, Business sustainability, Bottom of the Pyramid, Micro entrepreneurs, TOE framework, Digital payments, India

1. Introduction

1.1 Background

The global financial landscape has undergone transformative change through the widespread adoption of digital payment systems. India's Digital India and Financial Inclusion initiatives have accelerated this transition, with the Unified Payments Interface (UPI) ecosystem processing billions of transactions annually. For Bottom of the Pyramid, micro entrepreneurs—individuals operating small scale businesses with limited resources—cashless payment adoption represents both an opportunity and a challenge for business sustainability.

BoP micro entrepreneurs typically operate in informal sectors with daily revenues ranging from ₹200 to ₹2,000, serving low- income consumers in urban slums, semiurban towns, and rural villages. Traditional cash- based transactions pose challenges including security risks, limited financial tracking, restricted access to formal credit, and operational inefficiencies. Cashless payment systems offer potential solutions through enhanced transaction security, improved financial recordkeeping, increased access to digital credit, and streamlined operational processes.

1.2 Research Problem

Despite government initiatives promoting digital payments, BoP micro entrepreneurs exhibit varying rates of cashless payment adoption. Understanding the factors influencing adoption and their impact on business sustainability remains critical for policymakers, financial institutions, and technology providers.

The research gaps include: (1) insufficient examination of how cashless payment adoption affects business sustainability among BoP micro entrepreneurs, (2) limited application of the TOE framework in this context, and (3) inadequate understanding of how supply chain position influences adoption factors.

1.3 Research Objectives

This study addresses three primary objectives:

- To identify the factors influencing cashless payment adoption among BoP micro entrepreneurs using the TOE framework
- To examine the impact of cashless payment adoption on business sustainability
- To analyze how adoption factors vary based on entrepreneurial context and supply chain position

1.4 Research Contributions

This study contributes to literature and practice in four ways:

- **Theoretical contribution:** Extends the TOE framework to BoP micro entrepreneur contexts, demonstrating how technology, organization, and environment factors interact in resource constrained settings
- **Empirical contribution:** Provides empirical evidence from Tamil Nadu, India, with 387 micro entrepreneur responses across urban, semiurban, and rural areas
- **Practical contribution:** Offers insights for FinTech companies developing strategies and pricing models for BoP merchants in emerging economies
- **Policy contribution:** Informs policymakers about barriers and drivers of cashless payment adoption among vulnerable entrepreneurial populations

The remainder of this paper is organized as follows: Section 2 presents the literature review and theoretical framework. Section 3 describes the research methodology. Section 4 presents results and analysis. Section 5 discusses findings and

implications. Section 6 concludes with limitations and future research directions.

2. Literature Review and Theoretical Framework

2.1 Cashless Payment Systems: Definition and Evolution

Cashless payment systems encompass digital transaction methods including mobile payments, QR codes, digital wallets, Unified Payments Interface (UPI), and card- based transactions that eliminate physical currency exchange. Recent innovations include wearable payment devices and contactless transactions, enhancing user convenience and security. India's cashless payment ecosystem has evolved rapidly since demonetization in 2016, with UPI becoming the dominant platform processing over 10 billion monthly transactions by 2024. For BoP consumers and entrepreneurs, mobile payments represent the primary access point due to widespread smartphone adoption and low data costs.

2.2 Bottom of the Pyramid Micro Entrepreneurs

BoP micro entrepreneurs represent the lowest economic tier in the global economic pyramid, characterized by:

Characteristic	Description
Revenue	Daily income ₹200₹2,000
Scale	15 employees, often familyrun
Location	Urban slums, semiurban towns, rural villages
Sector	Retail, food services, handicrafts, agriculture
Resources	Limited capital, informal operations

These entrepreneurs serve BoP customers who similarly exhibit low income, limited financial access, and consumption patterns focused on essential goods. The BoP segment has shown increased mobile payment usage, creating a digital payment ecosystem serving lowincome populations.

2.3 Business Sustainability in Micro Enterprises

Business sustainability for micro entrepreneurs encompasses three dimensions:

- **Financial sustainability:** Profitability, revenue growth, and financial stability
- **Operational sustainability:** Efficient processes, resource management, and adaptability
- **Longterm viability:** Capacity to continue operations and withstand economic shocks

For BoP micro entrepreneurs, sustainability is particularly critical due to limited financial buffers and high vulnerability to economic disruptions. Digital payments support sustainability by reducing reliance on physical currency, improving operational efficiency, and enhancing access to formal financial services.

2.4 Digital Payments and Financial Inclusion

Financial inclusion access to formal financial services including savings, credit, insurance, and payments serves as a critical mediator between cashless payment adoption and business sustainability. Digital payment systems facilitate financial inclusion through:

- **Transaction documentation:** Creating verifiable transaction histories
- **Credit access:** Enabling digital credit based on payment data
- **Savings integration:** Connecting to formal savings instruments
- **Insurance access:** Facilitating microinsurance subscriptions

Research demonstrates positive and significant correlation from cashless payments to MSME sustainability through financial inclusion mediation. For BoP entrepreneurs, financial inclusion represents a pathway from informal to formal economic participation, enhancing longterm sustainability.

2.5 Technology Organization Environment (TOE) Framework

The TOE framework explains technology adoption through three contextual dimensions:

Technology Dimension: Characteristics of the technology itself

- *Relative advantage:* Perceived benefits over existing practices
- *Compatibility:* Alignment with existing values and experiences
- *Innovativeness:* Novelty and cuttingedge nature

Organization Dimension: Firm specific characteristics

- *Firm size:* Number of employees and revenue scale
- *Firm scope:* Range of products/services and market reach
- *Resources:* Available capital and technical capabilities

Environment Dimension: External contextual factors

- *Competitive pressure:* Industry competition intensity
- *External support:* Government policies and infrastructure
- *Market characteristics:* Customer demographics and preferences

The TOE framework has been successfully applied to mobile payment adoption in MSMEs, demonstrating that relative advantage, compatibility, innovativeness, and competitive pressure positively influence adoption.

2.6 Previous Research on Cashless Payment Adoption

Research on cashless economy from SME perspectives identifies opportunities, threats, barriers, and drivers but notes research gaps regarding enterprises of different scales. Future research should concentrate on identifying barriers and drivers from businesses' perspectives. The seminal study by Singh, Srinivasan, and Diatha (2024) examined cashless payment adoption in BoP retail supply chains using TOE framework, finding that perceived barriers, firm scope, firm size, and competition influence adoption, with supply chain position affecting factor significance. Studies on BoP consumers examine digital payment awareness, mindfulness, and continued intention to use mobile payments, identifying key antecedents for sustained usage. Research demonstrates

positive and significant relationships between mobile payment adoption and firm performance in MSMEs. Digital payment adoption shows positive effects on financial performance by reducing transaction costs and improving efficiency.

2.7 Research Gaps

Despite existing research, critical gaps remain:
1) Limited focus on BoP *micro entrepreneurs* specifically, rather than general SMEs or BoP *consumers*
2) Insufficient examination of cashless payment adoption's impact on *business sustainability* as distinct from financial performance
3) Limited application of TOE framework in Tamil Nadu, India context
4) Inadequate understanding of mediation effects through financial inclusion

3. Research Methodology

3.1 Research Design

This study employs a quantitative research design using survey methodology to examine relationships between TOE framework factors, cashless payment adoption, and business sustainability. The design follows established approaches for technology adoption research.

3.2 Theoretical Model

Based on the TOE framework and previous research, we propose the following conceptual model:

Hypotheses:
- **H1:** Relative advantage positively influences cashless payment adoption among BoP micro entrepreneurs
- **H2:** Perceived barriers negatively influence cashless payment adoption
- **H3:** Firm size positively influences cashless payment adoption
- **H4:** Firm scope positively influences cashless payment adoption
- **H5:** Competition positively influences cashless payment adoption
- **H6:** Cashless payment adoption positively influences business sustainability
- **H7:** Financial inclusion mediates the relationship between cashless payment adoption and business sustainability

3.3 Variable Measurement

Technology Factors:
- *Relative advantage:* 5item scale measuring perceived benefits (transaction speed, security, cost reduction)
- *Perceived barriers:* 4item scale measuring obstacles (technical complexity, security concerns, transaction costs)

Organization Factors:
- *Firm size:* Number of employees (categorical: 1, 23, 45)
- *Firm scope:* Range of products/services and customer base diversity

Environment Factors:
- *Competition:* 4item scale measuring competitive pressure intensity

Outcome Variables:
- *Cashless payment adoption:* Frequency and extent of digital payment usage (binary adoption + frequency scale)
- *Business sustainability:* 6item scale measuring financial stability, operational efficiency, and longterm viability
- *Financial inclusion:* 4item scale measuring access to formal savings, credit, and financial services

3.4 Sampling and Data Collection

Population: BoP micro entrepreneurs in Tamil Nadu, India operating retail, food service, handicraft, or agriculture businesses

Sampling Method: Purposive sampling technique with stratification by location (urban, semiurban, rural)

Sample Size: 387 respondents (determined using power analysis for SEMPLS with minimum 10 observations per parameter)

Location Distribution:
- Urban (Madurai city): 155 respondents (40%)
- Semiurban (towns within 50km): 140 respondents (36%)
- Rural (villages): 92 respondents (24%)

Data Collection Procedure:
- Identified micro entrepreneur clusters through local business associations
- Trained 12 field enumerators fluent in Tamil
- Conducted face to face interviews using structured questionnaires
- Obtained informed consent and explained research purpose
- Verified responses through crosschecking key variables

3.5 Data Analysis Methods

Analytical Approach: Structural Equation Modeling using Partial Least Square (SEMPLS)

Analysis Steps:
- Descriptive statistics for demographic variables
- Reliability testing (Cronbach's alpha, composite reliability)
- Validity testing (convergent validity, discriminant validity)
- Path coefficient estimation for hypothesis testing
- Mediation analysis for financial inclusion
- Bootstrapping (5,000 subsamples) for significance testing

Significance Level: $p < 0.05$

3.6 Ethical Considerations

- Ethical approval obtained from institutional review board
- Informed consent obtained from all participants
- Participant anonymity maintained through coded identification

- Data stored securely with access restricted to research team
- Participants informed of right to withdraw at any time

4. Results and Analysis

4.1 Descriptive Statistics

Demographic Profile of Respondents:

Variable	Category	Frequency	Percentage
Gender	Male	245	63.30%
	Female	142	36.70%
Age	1830 years	98	25.30%
	3145 years	187	48.30%
	4660 years	89	23.00%
	Above 60	13	3.40%
Education	Below primary	67	17.30%
	Primary (5th8th)	142	36.70%
	Secondary (9th10th)	118	30.50%
	Above secondary	60	15.50%
Business Type	Retail	198	51.20%
	Food Services	97	25.10%
	Handicrafts	58	15.00%
	Agriculture	34	8.80%
Daily Revenue	₹200₹500	124	32.00%
	₹501₹1,000	167	43.20%
	₹1,001₹1,500	71	18.40%
	₹1,501₹2,000	25	6.40%
Employees	1 (self- only)	203	52.50%
	23	134	34.60%
	45	50	12.90%
Cashless Adoption	Not adopted	89	23.00%
	Adopted (low use)	142	36.70%
	Adopted (high use)	156	40.30%

Location Distribution:
- Urban: 155 (40.0%)
- Semiurban: 140 (36.2%)
- Rural: 92 (23.8%)

Cashless Payment Methods Used:
- UPI (WhatsApp Pay, Google Pay, PhonePe): 312 respondents (80.6%)
- QR Code: 267 respondents (69.0%)
- Digital Wallets: 198 respondents (51.2%)
- Card Payments: 67 respondents (17.3%)

4.2 Reliability and Validity Testing

Reliability Results:

Variable	Cronbach's Alpha	Composite Reliability
Relative Advantage	0.872	0.912
Perceived Barriers	0.845	0.891
Competition	0.823	0.876
Business Sustainability	0.901	0.934
Financial Inclusion	0.856	0.897

All variables exceed minimum thresholds (Cronbach's alpha > 0.70, Composite Reliability > 0.70), indicating adequate reliability.

Convergent Validity:

Variable	Average Variance Extracted (AVE)
Relative Advantage	0.638
Perceived Barriers	0.612
Competition	0.594
Business Sustainability	0.671
Financial Inclusion	0.623

All AVE values exceed 0.50 threshold, confirming convergent validity.

Discriminant Validity (Fornell Larcker Criterion):
Each variable's AVE exceeds its highest squared correlation with other variables, confirming discriminant validity.

4.3 Hypothesis Testing Results

Path Coefficients and Significance:

Hypothesis	Path	Path Coefficient (β)	tvalue	pvalue	Result
H1	Relative Advantage → Adoption	0.234	4.123	0	Supported
H2	Perceived Barriers → Adoption	0.312	5.876	0	Supported
H3	Firm Size → Adoption	0.156	2.891	0.004	Supported
H4	Firm Scope → Adoption	0.287	5.234	0	Supported
H5	Competition → Adoption	0.198	3.567	0	Supported
H6	Adoption → Business Sustainability	0.341	6.123	0	Supported
H7	Adoption → Financial Inclusion → Sustainability	0.187	4.234	0	Supported

Model Summary:
- R^2 (Adoption): 0.523 (52.3% variance explained)
- R^2 (Business Sustainability): 0.467 (46.7% variance explained)
- Q^2 (Adoption): 0.489 (predictive relevance)
- Q^2 (Business Sustainability): 0.421 (predictive relevance)

Model exhibits good explanatory power and predictive relevance.

4.4 Key Findings Summary

- Perceived barriers show the strongest negative influence (β = 0.312) on adoption, indicating that technical complexity, security concerns, and transaction costs significantly hinder BoP micro entrepreneur adoption
- Relative advantage shows positive influence (β = 0.234), confirming that perceived benefits drive adoption
- Firm scope shows strongest positive influence among organization factors (β = 0.287), indicating businesses with diverse product ranges and customer bases adopt more readily
- Firm size shows moderate positive influence (β = 0.156), suggesting larger micro enterprises adopt more frequently

- Competition shows positive influence (β = 0.198), confirming competitive pressure drives adoption
- Cashless payment adoption strongly influences business sustainability (β = 0.341), supporting the central research proposition
- Financial inclusion significantly mediates the adoption sustainability relationship (β = 0.187), confirming the mediation pathway

4.5 Comparative Analysis by Location

Urban vs. Semiurban vs. Rural Differences:

Factor	Urban (β)	Semiurban (β)	Rural (β)
Perceived Barriers	0.267	0.312	0.389
Relative Advantage	0.289	0.234	0.178
Firm Scope	0.334	0.287	0.221
Adoption → Sustainability	0.378	0.341	0.298

Rural entrepreneurs face higher barriers (β = 0.389) and show lower relative advantage perception (β = 0.178), indicating infrastructure and awareness challenges.

4.6 Comparative Analysis by Business Type

Retail vs. Food Services vs. Handicrafts:

Factor	Retail (β)	Food Services (β)	Handicrafts (β)
Perceived Barriers	0.298	0.334	0.287
Competition	0.223	0.189	0.156
Adoption → Sustainability	0.356	0.334	0.298

Food services show highest barrier perception (β = 0.334), possibly due to transaction speed requirements.

5. Discussion and Implications

5.1 Interpretation of Findings

Perceived Barriers as Primary Constraint:
The strongest finding is perceived barriers' negative influence on adoption (β = 0.312). For BoP micro entrepreneurs, barriers include:

- **Technical complexity:** Limited digital literacy and smartphone familiarity
- **Security concerns:** Fear of fraud, transaction errors, and account hijacking
- **Transaction costs:** Transaction fees, SMS charges, and data costs
- **Infrastructure:** Unreliable internet connectivity and power supply

This finding aligns with previous research identifying barriers as critical adoption constraints. For rural entrepreneurs, barriers are even stronger (β = 0.389), reflecting infrastructure challenges. Positive relative advantage influence (β = 0.234) confirms that perceived benefits drive adoption. Benefits include: Firm scope (β = 0.287) and firm size (β = 0.156) significantly influence adoption, supporting TOE framework applicability to BoP contexts. Businesses with diverse offerings and larger scales have greater resources and need for digital payments. Positive competition influence (β = 0.198) confirms competitive pressure drives adoption, consistent with previous MSME research. When competitors adopt cashless payments, businesses follow to maintain competitiveness. Strong adoption sustainability relationship (β = 0.341) confirms the study's central proposition. Cashless payments enhance sustainability through: Significant mediation (β = 0.187) confirms financial inclusion pathways between adoption and sustainability. Digital payments create transaction histories enabling credit access, connecting to savings instruments, and facilitating insurance access.

5.2 Theoretical Implications

TOE Framework Extension:
This study extends TOE framework to BoP micro entrepreneur contexts, demonstrating framework applicability in resource constrained settings. The findings confirm that technology, organization, and environment factors collectively explain adoption variance (R^2 = 0.523). While the original BoP supply chain study found adoption factors depend on supply chain position, this micro entrepreneur study reveals location- based differences. Rural entrepreneurs face higher barriers and perceive lower advantages, indicating geographic context matters. This study distinguishes business sustainability from financial performance, contributing conceptual clarity. Financial inclusion mediation contributes to understanding how cashless payments affect sustainability, addressing the "how" question beyond the "whether" question.

5.3 Practical Implications

FinTech companies marketing to BoP merchants should: Address barriers directly: Develop simplified interfaces, offer security guarantees, and minimize transaction costs. Highlight relative advantages: Emphasize benefits like speed, security, and credit access in marketing messages. Target diverse businesses: Focus on firms with broader scope showing higher adoption likelihood. Leverage competitive pressure: Use competitor adoption as marketing leverage. Financial institutions should: Integrate payment credit linkage: Use transaction data for credit scoring and digital credit provision. Offer financial literacy: Provide training on digital payment usage and security. Develop microproducts: Create savings and insurance products accessible through payment platforms. Support rural infrastructure: Invest in connectivity and power solutions enabling rural adoption Policymakers should: Address infrastructure gaps: Invest in rural internet connectivity and power supply. Reduce transaction costs: Implement policies minimizing transaction fees for small transactions Enhance digital literacy: Launch training programs for BoP entrepreneurs Provide security frameworks: Establish fraud protection and dispute resolution mechanisms Support financial inclusion: Link payment adoption to broader financial inclusion initiatives

Findings align with MSME research showing TOE factors (relative advantage, compatibility, innovativeness, competitive pressure) positively influence adoption and adoption positively affects firm performance. This study extends to BoP micro entrepreneurs and sustainability outcomes. Consistent with Egypt MSME study showing digital payment adoption positively affects financial performance through cost reduction. This study confirms similar relationships in Indian BoP context with sustainability

focus. Financial Inclusion Mediation: Supports research establishing positive cashless payments sustainability correlation through financial inclusion mediation. This study provides empirical confirmation with BoP micro entrepreneurs.

5.5 Limitations

Study conducted only in Tamil Nadu, limiting generalizability to other Indian regions with different cultural, economic, and infrastructure contexts. Data collected January-March 2025; findings may not reflect subsequent changes in payment technology, policy, or market conditions. Business sustainability and financial measures self- reported, potentially introducing reporting bias despite verification procedures. Crosssectional design limits causal inference; longitudinal research would strengthen causal claims. Purposive sampling may introduce selection bias; random sampling would improve representativeness.

6. Conclusion

This study investigated cashless payment adoption's impact on business sustainability among BoP micro entrepreneurs in Tamil Nadu, India, using the TOE framework. Key findings include:Perceived barriers show strongest negative influence on adoption (β = 0.312), indicating technical complexity, security concerns, and costs significantly hinder adoption Relative advantage positively influences adoption (β = 0.234), confirming perceived benefits drive adoption Firm scope (β = 0.287) and firm size (β = 0.156) positively influence adoption, supporting TOE organization factor applicability Competition positively influences adoption (β = 0.198), confirming competitive pressure drives adoption Cashless payment adoption strongly influences business sustainability (β = 0.341), supporting the study's central proposition Financial inclusion significantly mediates the adoption sustainability relationship (β = 0.187), confirming the mediation pathway Location differences exist: rural entrepreneurs face higher barriers and perceive lower advantages than urban entrepreneurs. Cashless payment adoption represents a critical pathway for BoP micro entrepreneurs toward business sustainability. While barriers remain significant, the positive sustainability impact through financial inclusion provides compelling justification for continued adoption promotion. FinTech companies, financial institutions, and policymakers should collaborate to address barriers, enhance advantages, and support financial inclusion, enabling BoP entrepreneurs to benefit from digital payment transformation. The digital payment revolution in India, exemplified by UPI's growth, offers unprecedented opportunities for BoP micro entrepreneurs. By understanding adoption factors and sustainability impacts, stakeholders can develop targeted strategies enabling vulnerable entrepreneurs to participate in and benefit from the cashless economy. This study's primary contribution is demonstrating that cashless payment adoption significantly enhances business sustainability among BoP micro entrepreneurs through financial inclusion mediation. This finding provides empirical evidence for digital payment policy initiatives targeting vulnerable entrepreneurial populations and extends technology adoption literature to BoP micro entrepreneur contexts.

6.3 Future Research Directions

Future research should address: Longitudinal studies: Track adoption and sustainability changes over time to strengthen causal inference Multi region comparison: Compare Tamil Nadu with other Indian states for generalizability. Qualitative research: Conduct interviews exploring barrier mechanisms and adoption experiences Technology evolution: Examine emerging technologies (cryptocurrency, blockchain) impact on BoP entrepreneurs Policy intervention studies: Evaluate specific policy interventions' effects on adoption and sustainability Consumer entrepreneur linkage: Examine how BoP consumer adoption affects entrepreneur adoption

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