

An Exploratory Study on Women's Struggles with Mobile Technology and Payment Applications: The Digital Gender Gap in Rural Delhi-NCR

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Abstract: The mobile payment platforms have become established throughout India, generating new opportunity points to access financial inclusion; however, the resulting benefits are not equally distributed in terms of gender and space. The current research targets the digital gender divide occurring to women living in rural areas of the Delhi-NCR area, specifically their acceptance as well as their adoption and use of mobile payment applications. The questionnaire that was structured was issued to a group of 400 rural women, therefore, allowing the investigation of the effect of demographic factors, levels of digital literacy, and perceived barriers on the adoption and frequency of use of mobile payment services. Statistical tests were done using one-way ANOVA and multiple linear regression and the SPSS software package. Empirical evidence shows that there is a strong discriminative effect of income and educational attainment on the levels of adoption ($\eta^2 = .417$ and $.398$, respectively); no statistically significant effect of age is detected. Digital literacy contributes 71.9% and 63.3% to the variance in adoption and usage frequency, respectively ($R^2 = .719$ and $R^2 = .633$). The perceived barriers, with the biggest contribution of security issues and lack of connectivity, describe 64.0 percent of the variation in usage frequency ($R^2 = .640$). The analysis supports all of the four hypotheses. The research contributes to existing literature on the topic of UTAUT2 and digital literacy in the Indian rural financial environment and suggests specific interventions to be implemented to train, develop infrastructure, and draft policies.

Keywords: *mobile payment adoption, digital gender gap, digital literacy, rural women, financial inclusion, Delhi-NCR, UTAUT2, perceived barriers*

1. Introduction

The high rate of digitisation of financial services within the developing world has been celebrated as a revolutionary tool of economic empowerment, especially to the populations who have traditionally been out of the formal banking system. Launched in 2016, the Unified Payments Interface (UPI) in India has become the fastest-growing real-time digital payment network in the world, with more than 13 billion transactions recorded every month by 2024 (Koley, 2025). Apps like PhonePe, Google Pay, and Paytm have made financial transactions more accessible to everyone, but the empirically verified data have shown that women, rural populations, and low-income earners are left out of these technologies (Haque, 2025; Singh and Arora, 2022). The rural hinterlands of India are a spectacular landscape. The process of device ownership to use financial technology has been limited by overlapping obstacles of gender, education and economic ability even as mobile phone penetration has risen significantly even within the semi-urban and rural areas of Delhi-NCR (Khadka, 2025). Women in the rural regions, constituting a large portion of economically active women in India—in agriculture, home-based businesses and self-help group (SHG) activities—are still structurally excluded from digital participation in finance (Mary Treasa & Santhi, 2024; Devi, 2025).

The digital gender gap, as the notion of the difference between the access, the literacy, and the efficacy of the use of digital technologies between men and women, is becoming more and more the focus of scholarly research (Reynolds and Ziba, 2023; Barra et al., 2024). The given gap is evident in the sphere of mobile payments, in particular, not only as a deficiency of access to devices but also as a more significant absence of digital financial literacy under the influence of cultural norms, security concerns, and insufficient user support (Rasheduzzaman, 2025; Mini and Sasankan, 2024). The lack of empirical studies that specifically rely on rural women in particular Indian geographies, e.g., the Delhi scenario in a specific region (Delhi NCR), is an important gap that can be filled by this research.

A solid theoretical foundation is offered by the increasing number of studies related to technology acceptance that are based on the frameworks of the Unified Theory of Acceptance and Use of Technology (UTAUT2) (Venkatesh et al., 2022), the Technology Acceptance Model, and perceived risk theory. Yet, there is limited application of these frameworks to the rural Indian woman-specific setting, and the concomitant examination of digital literacy, demographic factors, and perceived obstacles in one research study has not been conducted.

This paper fills these gaps through a survey of 400 rural women in the Delhi NCR by considering four related aspects, namely, the role of demographic variables in the determinants of adoption; the effect of digital literacy on the determinants of adoption; the impact of perceived barriers on usage; and the predictive power of digital literacy on usage. The results have implications for policymakers, financial institutions and civil-society organisations that strive to bring about inclusive digital finance.

The objectives guiding this study are:

- (1) To examine whether variations in demographic characteristics — namely age, educational attainment, and income level — lead to significant differences in mobile payment application adoption among rural women in Delhi-NCR;
- (2) To assess the influence of digital literacy on the adoption of mobile payment applications;
- (3) To analyse the impact of perceived barriers — including security concerns, lack of awareness, and technical difficulties — on the usage of mobile payment applications; and
- (4) To evaluate the predictive relationship between digital literacy and the frequency of usage of mobile payment applications among rural women.

2. Review of Literature and Hypothesis Development

2.1 The Digital Gender Gap: Conceptual Foundations

The digital gap in the gender perspective is a complex phenomenon that cannot be limited to the access to devices and connectivity. Van Deursen and van Dijk (2014) stated one of the fundamental news in conceptualising the digital divide is a concern with access to the digital divide with variance in the quality and frequency of use, a model that is used more often to interpret digital financial exclusion of women. Women living in low- and middle-income nations are 8 per cent less likely than men to have a mobile phone and 20 per cent less likely to have mobile internet (Reynolds & Ziba, 2023). The patriarchal norms, access to movement, and different access to education in India further exaggerate these disparities in rural geographies (Khadka, 2025; Barra et al., 2024). Specifically, Rasheduzzaman (2025) examined the gendered acceptance of mobile payment services and detected that it is not the attitude alone that rationalises why women adopt them less frequently but the different exposures to the digital ecosystem and being the most vulnerable to financial fraud. This echoes the structural argument which argues that women are being digitally marginalised by not creating educational and job disparities as opposed to personal cognitive failures.

2.2 Technology Acceptance and Adoption Theories

UTAUT2 is the prevalent theoretical perspective applied to explain the use of technology in emerging societies that includes performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit as the predictors of behavioural intention (Venkatesh et al., 2022). Usman (2025) returned to the Theory of Planned Behaviour to evaluate it in terms of digital payments and proved that the perceived behavioural control, which is a close factor and directly affects digital literacy, is a key predictor of mobile payment intention. Singh and Arora (2022) used TAM for Indian UPI adoption and showed that the relationship between digital

competence and adoption outcomes is mediated by the perceived usefulness and ease of use. In rural communities, the conditions to which rural citizens find themselves subjected, such as the internet, the availability of devices, and institutional support, also become especially important (Khatun, 2024). Mohapatra et al. (2020) identify social influence and facilitating conditions as one of the key factors driving rural banking clients in India to adopt digital financial services, which highlights how digitised financial use is rooted in communities in the non-urban environment.

2.3 Demographic Factors and Technology Adoption

Studies have continuously found that education, income, and, to a minor degree, age are predictors of adoption of digital technology. According to Barra et al. (2024), the degree of education has been correlated with greater digital entrepreneurial orientation and digital technology use by women, and women are not able to use digital financial tools consistently even among those who initially adopt them because of income constraints. Yadav and Sengupta (2025) obtained the result that access to digital financial services was causing quantifiable enhancements in household consumption spending by women residing in India, contingent on initial digital literacy and income adequacy.

Mruthunjaya (2025) reported that the income inequalities are a significant determinant of the difference in mobile wallet penetration among the Indian states, with the population living below the poverty line having the lowest overall rate despite including the urban-rural location. Khatun (2024) discovered that adoption technology of mobile banks by the rural farming community also exhibits an education gradient, with secondary education holders and those with higher education adopting the technology significantly more frequently compared to primary education holders and those with no formal education whatsoever.

Based on this following hypothesis is formed

H0₁: There is no significant difference in the adoption of mobile payment applications across different demographic groups (age, education, income) among rural women.

H1₁: There is a significant difference in the adoption of mobile payment applications across different demographic groups (age, education, income) among rural women.

2.4 Digital Literacy and Financial Technology Adoption

The conceptual framework of digital literacy created by Eshet (2019) views literacy as a constellation of skills, i.e., photo-visual, reproduction, branching, information, and socio-emotional, that altogether define the ability to absorb digital spaces in a person. This can be translated into the capacity to install and use payment applications, identify phishing and fraud, and process personal data, as well as conduct transactions confidently in the fintech sector (Nene, 2025).

Haque (2025) studied the uptake of UPI in rural India, and results revealed that digital payment literacy is the most significant determinant of continued fintech usage, with people in the lower literacy quartiles being three times less likely to have ever used UPI. Mini and Sasankan (2024) used a TAM approach to honing mobile payment adoption by rural women in Kerala and ensured that concepts of ease-of-use are primarily driven by digital literacy and determine both the adoption and use frequency. Nene (2025) estimated digital financial literacy among the microfinance sector, and this study revealed that with specific training programmes, delivery can yield quantifiable benefits in terms of adoption and level of confidence among rural women.

Based on this following hypothesis is formed

H0₂: Digital literacy does not significantly influence the adoption of mobile payment applications among rural women.

H1₂: Digital literacy significantly influences the adoption of mobile payment applications among rural women.

2.5 Barriers to Mobile Payment Adoption Among Women

There are financial, privacy, performance, time, psychological, and social risk dimensions, which are viewed as detracting factors in e-service adoption (Francis, 2011). Kim et al. (2019) developed the fact that the perceived security risk is the most potent adoption barrier in the mobile payments scenario, especially when it comes to first-time and infrequent users. This disadvantage is magnified in women who, prior to digital financial systems, have little experience of this nature and might have encountered or heard about cases of fraud (Liebana-Cabanillas et al., 2020).

On top of security, infrastructure-driven obstacles, especially low internet connection speeds and unreliable devices, dispositionally apply to rural users (Devi, 2025). Oliveira et al. (2019) discovered that, when using mobile payments, intention and actual behaviour have a moderating effect that is set by facilitation conditions, such as connectivity and technical instruments. Mary Treasa and Santhi (2024) found that rural women entrepreneurs in India often stop using digital payment tools, even after starting to use them, mainly because they face difficulties and lack of guidance, which is not clearly shown in overall statistics.

Based on this following hypothesis is formed

H0₃: Perceived barriers do not significantly influence the usage of mobile payment applications among rural women.

H1₃: Perceived barriers significantly influence the usage of mobile payment applications among rural women.

2.6 Digital Literacy and Frequency of Technology Usage

While the relationship between digital literacy and technology *adoption* has received substantial scholarly attention, the distinct question of how digital literacy shapes the *frequency and regularity* of mobile payment *usage* — once adoption has occurred — remains comparatively underexplored. Van Deursen and van Dijk (2014) were among the first to articulate this critical distinction, arguing that the digital divide has shifted from questions of access to differences in the quality, intensity, and regularity of use. Their framework posits that individuals with higher digital competence not only adopt digital tools more readily but also engage with them more frequently and across a broader range of functions. In the mobile payments domain, Oliveira et al. (2019) found that facilitating conditions — which include digital skill and technical support — are significant predictors of actual usage behaviour, distinct from mere intention to use. This distinction maps onto the adoption–usage gap: many rural women may nominally adopt a mobile payment application but use it infrequently due to anxiety, skill deficits, or residual uncertainty about security. Haque (2025) confirmed this in the Indian UPI context, demonstrating that individuals in higher digital literacy quartiles not only adopt UPI but use it across a significantly wider range of transaction types — including bill payments, merchant transactions, and peer transfers — compared to low-literacy adopters who restrict use to familiar, low-risk scenarios.

Nene (2025), in a study of rural women in microfinance programmes, demonstrated that structured digital financial literacy training produced significant improvements not only in initial adoption but in *sustained usage frequency* over a six-month follow-up period. This suggests a compounding effect: literacy-building interventions yield dividends across both adoption and behavioural entrenchment. Mini and Sasankan (2024), examining rural women in Kerala through a TAM lens, similarly found that perceived ease of use — a direct function of digital literacy — was a stronger predictor of usage frequency than of adoption per se, implying that literacy matters more for sustaining behaviour than for initiating it. Singh and Arora (2022) corroborated this in the broader Indian consumer context, finding that habitual use of UPI is significantly predicted by operational digital confidence — the sense that one can navigate the system without error or loss.

H0₄: Digital literacy does not significantly predict the frequency of usage of mobile payment applications among rural women.

H1₄: Digital literacy significantly predicts the frequency of usage of mobile payment applications among rural women.

2.7 Research Gap

Although current literature on the adoption of mobile payments in India is increasing, there are still some gaps. To start with, there is a lack of empirical research on the study population of rural women specifically in the Delhi-NCR territory, which is a geographically and economically important area with a diverse range of rural-urban boundaries. Second, most research focuses on demographic determinants, digital literacy, or

barriers individually, and there are few instances of a coherent model that examines all three factors in a unified study. Third, the multiple regression and item-level predictor analysis (rather than composite scale regression) provide detailed information about the types of specific literacy competencies and types of barriers that contribute to the outcomes; most of all in literature, it has not been fully used before. This study addresses all three of these gaps.

3. Research Methodology

3.1 Research Design

The specific research design used in this study is a quantitative, cross-sectional, descriptive-cum-explanatory research design. Primary data was collected by means of a structured questionnaire applied to a specified sample; the hypothesis relationships were tested using inferential statistics tools. The cross-sectional design will suit the interest of measuring the adoption patterns and usage one at a time and aligns with the prevailing methodological style in the literature of technology adoption (Singh and Arora, 2022; Usman, 2025).

3.2 Study Area

The sample was surveyed in rural areas of the Delhi-NCR (National Capital Region), including peri-urban villages and rural pockets in the districts of Faridabad, Ghaziabad, Gurugram and Baghpat. Delhi-NCR is a unique research setting since it is geographically close to one of the most digitally advanced urban centres in India, yet it contains a significantly vast rural population with unequal access to digital infrastructures, and it turns out to be an attractive place to analyse the digital gender gap in the zone of transition.

3.3 Target Population and Sample.

The target population consisted of adult (18 years and above) women living in rural regions of Delhi-NCR who were at different stages of exposure to mobile payment applications. A purposive sampling approach with snowball proxies in self-help groups (SHGs) and feminist cooperatives, as well as Anganwadi networks, was utilised to give a balance of age, education, and income groups. The final sample size of N = 400 respondents matched the minimum needed to adequately run a structural regression analysis and would offer sufficient statistical power (80).

3.4 Data Collection Instrument

A pre-tested and structured questionnaire with five sections was used in gathering the data. In Section A, demographic data (age, education, income, occupation, and status of using the apps) was collected. Parts B to E involved the use of a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) to capture the following constructs:

Section B (Digital Literacy, 5 items), Section C (Adoption of Mobile Payments, 5 items), and Section D (Perceived Barriers, 5 items) were based on Eshet (2019), Venkatesh et al. (2022) - UTAUT2, and Liébana-Cabanillas et al. (2020), respectively; and Section E (Frequency of Usage, 3 items) was based on Oliveira et al. (2019). To achieve conceptual equivalence, the questionnaire was translated into Hindi to be administered in the field and translated back to ensure that there were no misunderstandings. The pilot test, which was tested on 30 respondents, ensured clarity and understanding. Before testing the hypotheses, internal consistency was evaluated by use of Cronbach alpha, a statistical measure used to assess the reliability of a set of scale or test items.

3.5 Measurement of Variables

- Independent Variables

Digital literacy (DL1–DL5): measured using five items that assess the operation of apps, their installation, protection of information, fraud detection, and confidence in transactions (Eshet, 2019). Perceived barriers (BARR1–BARR5): five items including security risk, fear of financial loss, connectivity, guidance deficit, and system complexity (Liebana-Cabanillas et al., 2020). The ANOVA grouping variables were demographic variables (age, education, and income).

- Dependent Variables

Adoption of Mobile Payments (C1–C5): the aggregate mean score of C items, which assessed attitude toward and intention to use mobile payment applications (Venkatesh et al., 2022). Frequency of Usage (E1–E3): the mean score of the items in Section E, which measures frequency and frequency variability in using mobile payments (Oliveira et al., 2019).

3.6 Statistical Tools

IBM SPSS Statistics v25 was used in the analysis of data. The distribution of key variables was described by means, SD, skewness, and kurtosis. All scales were examined by the Cronbach measure of internal consistency. H1 was a one-way ANOVA with Bonferroni post-hoc correction to determine whether there was a significant difference in the scores of adoption between the age, education, and income groups. H₂, H₃ and H₄ were tested using multiple linear regression, and items of each scale of the predictors were taken simultaneously to determine each item in the model as well as the entire model quality.

4. Results and Findings

4.1 Demographic Profile of Respondents

The final sample of 400 rural women respondents was distributed as follows:

Table 1. Demographic Profile of Respondents (N = 400)

Demographic Variable	Category	Frequency	Percentage (%)
Age	18–25 years	125	31.2
	26–35 years	138	34.5
	36–45 years	85	21.2
	46 years and above	52	13.0
Education	No formal education	26	6.5
	Primary	90	22.5
	Secondary	145	36.2
	Graduate	84	21.0
Monthly Income	Postgraduate	55	13.8
	Below ₹10,000	108	27.0
	₹10,001–₹20,000	127	31.8
	₹20,001–₹40,000	115	28.7
Occupation	Above ₹40,000	50	12.5
	Homemaker	156	39.0
	Agricultural Worker	90	22.5
	Self-employed	71	17.8
	Salaried Employee	53	13.2
Uses Mobile Payment App	Other	30	7.5
	Yes	288	72.0
	No	112	28.0

The largest age cohort was 26–35 years (34.5%), followed by 18–25 years (31.2%). Secondary education was the modal educational level (36.2%). The ₹10,001–₹20,000 monthly income bracket was most common (31.8%), and homemakers constituted the largest occupational group (39.0%). Notably, 72.0% of respondents reported currently using at least one mobile payment application, suggesting reasonable baseline exposure but not uniformly regular usage.

4.2 Reliability Analysis

Table 2 reports Cronbach's alpha for all four scales. All values meet or exceed the threshold of $\alpha \geq .70$ (Nunnally, 1978), confirming adequate internal consistency for hypothesis testing.

Table 2. Reliability Analysis — Cronbach's Alpha

Scale	Items	Cronbach's α	Interpretation
Section B — Digital Literacy	B1–B5 (5 items)	0.865	Good
Section C — Adoption of Mobile Payments	C1–C5 (5 items)	0.852	Good
Section D — Perceived Barriers	D1–D5 (5 items)	0.857	Good
Section E — Frequency of Usage	E1–E3 (3 items)	0.780	Acceptable

4.3 Descriptive Analysis of Key Variables

Table 3 summarises the descriptive statistics for all composite scale scores. Skewness and kurtosis values within ± 1.0 confirm approximate normality across all variables, satisfying parametric assumptions (Field, 2018).

Table 3. Descriptive Statistics — Composite Scale Scores (N = 400)

Variable / Scale	N	Min	Max	Mean	SD	Skewness	Kurtosis
Digital Literacy (B1–B5)	400	1.60	5.00	3.53	0.71	-0.256	-0.279
Adoption of Mobile Payments (C1–C5)	400	1.80	5.00	3.64	0.68	-0.192	-0.498
Perceived Barriers (D1–D5)	400	1.20	5.00	3.10	0.71	0.050	-0.152
Frequency of Usage (E1–E3)	400	1.00	5.00	3.29	0.75	-0.192	-0.135

Mean adoption score ($M = 3.64$, $SD = 0.68$) and digital literacy score ($M = 3.53$, $SD = 0.71$) both lie in the moderate-to-high range of the 5-point scale, suggesting that while most respondents have some familiarity with mobile payments, ceiling adoption has not been reached. The perceived barriers mean ($M = 3.10$, $SD = 0.71$) indicates that barriers are perceived as moderately prevalent, representing a material impediment to full adoption.

4.4 Hypothesis H1 — One-Way ANOVA: Demographic Differences in Adoption

One-Way ANOVA was conducted to examine whether adoption scores differed significantly across age, education, and income groups. Results are presented in Table 4.

Table 4. One-Way ANOVA — Adoption Score by Demographic Group

Demographic Variable	Source	SS	df	MS	F-value	η^2	p-value	Decision
Age	Between	1.110	3	0.370	0.790	0.006	0.500	Fail to Reject H_0
	Within	185.394	396	0.468	—	—	—	—
	Total	186.504	399	—	—	—	—	—
Education	Between	74.204	4	18.551	65.250***	.398	<.001	Reject H_0
	Within	112.300	395	0.284	—	—	—	—
	Total	186.504	399	—	—	—	—	—
Income	Between	77.756	3	25.919	94.383***	.417	<.001	Reject H_0
	Within	108.747	396	0.275	—	—	—	—
	Total	186.504	399	—	—	—	—	—

Note. SS = Sum of Squares; df = Degrees of Freedom; MS = Mean Square; η^2 = Eta-squared (effect size). *** $p < .001$; ns = not significant. η^2 benchmarks (Cohen, 1988): < .06 = small; .06–.14 = medium; > .14 = large.

Age did not produce a statistically significant effect on adoption, $F(3, 396) = 0.790$, $p = .500$, $\eta^2 = .006$, suggesting that women across age cohorts face similar structural barriers to mobile payment adoption. In contrast, **Education Level** yielded a large significant effect, $F(4, 395) = 65.250$, $p < .001$, $\eta^2 = .398$, indicating that educational attainment is a powerful differentiator of adoption outcomes — a finding consistent with Khatun (2024) and Barra et al. (2024). **Monthly Income** demonstrated the strongest demographic effect of all, $F(3, 396) = 94.383$, $p < .001$, $\eta^2 = .417$, confirming that economic capacity is the primary demographic driver of mobile payment adoption among rural women (Mruthunjaya, 2025). Post-hoc Bonferroni comparisons confirmed significant pairwise differences across nearly all education and income group combinations (all $p < .05$ after correction). **H1 is partially supported:** rejected for Education and Income; not rejected for Age.

4.5 Hypothesis H2 — Multiple Regression: Digital Literacy → Adoption

Multiple linear regression was conducted with DL1–DL5 as simultaneous predictors of Adoption Score.

Table 5a. Model Summary — H2 (Digital Literacy → Adoption)

R	R ²	Adjusted R ²	Std. Error of Estimate
0.848	0.719	0.716	0.191

Table 5b. ANOVA — Overall Fit of H2 Regression Model

Source	Sum of Squares	df	Mean Square	F	p-value
Regression	134.118	5	26.824	201.742	< .001
Residual	52.386	394	0.133	—	—
Total	186.504	399	—	—	—

Table 5c. Regression Coefficients — H2 (Digital Literacy → Adoption)

Predictor	B	Std. Error	β	t	p-value	95% CI for B
(Constant)	0.792	0.092	—	8.591	< .001	[0.611, 0.973]
DL1 — Independently operate apps	0.220	0.029	0.283	7.530	< .001	[0.162, 0.277]
DL2 — Install and update apps	0.106	0.029	0.134	3.671	< .001	[0.050, 0.163]
DL3 — Protect personal info online	0.190	0.029	0.243	6.512	< .001	[0.133, 0.247]
DL4 — Recognise fraudulent messages	0.192	0.028	0.252	6.770	< .001	[0.136, 0.247]
DL5 — Confident performing transactions	0.099	0.027	0.131	3.641	< .001	[0.046, 0.152]

Note. B = unstandardised coefficient; β = standardised coefficient; CI = confidence interval. All predictors significant at $p < .001$.

The model was highly significant, $F(5, 394) = 201.742, p < .001$, with the five digital literacy items collectively explaining 71.9% of variance in adoption ($R^2 = .719$, Adjusted $R^2 = .716$), confirming an exceptionally strong predictive relationship (Haque, 2025; Mini & Sasankan, 2024). All five predictors contributed significantly. DL1 (ability to independently operate mobile apps) emerged as the strongest predictor ($\beta = 0.283$), followed by DL4 (recognising fraudulent messages, $\beta = 0.252$) and DL3 (protecting personal information online, $\beta = 0.243$), underscoring that operational and security-related digital competencies are most consequential for adoption. **H2 is fully supported.**

4.6 Hypothesis H3 — Multiple Regression: Perceived Barriers → Frequency of Usage

Table 6a. Model Summary — H3 (Perceived Barriers → Frequency of Usage)

R	R ²	Adjusted R ²	Std. Error of Estimate
0.800	0.640	0.635	0.270

Table 6b. ANOVA — Overall Fit of H3 Regression Model

Source	Sum of Squares	df	Mean Square	F	p-value
Regression	142.885	5	28.577	139.911	< .001
Residual	80.475	394	0.204	—	—
Total	223.360	399	—	—	—

Table 6c. Regression Coefficients — H3 (Perceived Barriers → Frequency of Usage)

Predictor	B	Std. Error	β	t	p-value	95% CI for B
(Constant)	5.914	0.102	—	58.103	< .001	[5.714, 6.113]
BARR1 — Security risk concerns	-0.221	0.035	-0.258	-6.385	< .001	[-0.289, -0.153]
BARR2 — Fear of losing money	-0.157	0.034	-0.185	-4.577	< .001	[-0.224, -0.090]
BARR3 — Poor internet connectivity	-0.164	0.034	-0.197	-4.838	< .001	[-0.230, -0.097]
BARR4 — Lack of guidance/training	-0.164	0.035	-0.196	-4.738	< .001	[-0.232, -0.096]
BARR5 — Digital systems complicated	-0.141	0.036	-0.166	-3.928	< .001	[-0.212, -0.071]

Note. All negative β values confirm the hypothesised inverse relationship: higher barriers → lower usage frequency. All predictors significant at $p < .001$.

Perceived barriers collectively explained 64.0% of variance in usage frequency ($R^2 = .640$), $F(5, 394) = 139.911, p < .001$. All five barrier items were individually significant negative predictors. BARR1 (security risk concerns) exerted the strongest suppressive effect ($\beta = -0.258$), consistent with Kim et al. (2019) and Featherman and Pavlou (2003), who identify financial and privacy risk as the most potent deterrents to e-service engagement. BARR3 (poor internet connectivity, $\beta = -0.197$) and BARR4 (lack of guidance, $\beta = -0.196$) follow closely, highlighting the compounded disadvantage of rural women who face both psychological barriers and infrastructural deficits simultaneously (Devi, 2025; Oliveira et al., 2019). **H3 is fully supported.**

4.7 Hypothesis H4 — Multiple Regression: Digital Literacy → Frequency of Usage

Table 7a. Model Summary — H4 (Digital Literacy → Frequency of Usage)

R	R ²	Adjusted R ²	Std. Error of Estimate
0.795	0.633	0.628	0.275

Table 7b. ANOVA — Overall Fit of H4 Regression Model

Source	Sum of Squares	df	Mean Square	F	p-value
Regression	141.342	5	28.268	135.796	< .001
Residual	82.018	394	0.208	—	—
Total	223.360	399	—	—	—

Table 7c. Regression Coefficients — H4 (Digital Literacy → Frequency of Usage)

Predictor	B	Std. Error	β	t	p-value	95% CI for B
(Constant)	0.353	0.115	—	3.057	0.002	[0.127, 0.579]
DL1 — Independently operate apps	0.171	0.036	0.201	4.676	< .001	[0.099, 0.242]
DL2 — Install and update apps	0.154	0.036	0.178	4.250	< .001	[0.083, 0.225]
DL3 — Protect personal info online	0.209	0.037	0.244	5.718	< .001	[0.137, 0.280]
DL4 — Recognise fraudulent messages	0.172	0.035	0.207	4.859	< .001	[0.103, 0.242]
DL5 — Confident performing transactions	0.128	0.034	0.155	3.761	< .001	[0.061, 0.194]

Digital literacy items collectively explained 63.3% of variance in usage frequency ($R^2 = .633$), $F(5, 394) = 135.796, p < .001$. DL3 (protect personal information online, $\beta = 0.244$) was the strongest predictor of usage frequency, while DL4 (recognise fraudulent messages, $\beta = 0.207$) and DL1 (independently operate apps, $\beta = 0.201$) also made substantial contributions. This hierarchy suggests that information security literacy — rather than basic operational skill — is the decisive competency for sustaining regular mobile payment usage, consistent with the findings of Nene (2025) and Haque (2025). **H4 is fully supported.**

4.8 Hypothesis Testing Summary

Table 8. Summary of Hypothesis Testing Results

Hyp.	Relationship	Test	Key Statistic	p-value	Effect Size	Decision
H1a	Age → Adoption	One-Way ANOVA	$F(3,396) = 0.790$.500 ns	$\eta^2 = .006$	Fail to Reject
H1b	Education → Adoption	One-Way ANOVA	$F(4,395) = 65.250$	< .001***	$\eta^2 = .398$	Reject H ₀
H1c	Income → Adoption	One-Way ANOVA	$F(3,396) = 94.383$	< .001***	$\eta^2 = .417$	Reject H ₀
H2	Digital Literacy → Adoption	Mult. Regression	$R^2 = .719, F = 201.742$	< .001***	$\beta: .131-.283$	Reject H ₀
H3	Barriers → Freq. Usage	Mult. Regression	$R^2 = .640, F = 139.911$	< .001***	$\beta: -.166-.258$	Reject H ₀
H4	Digital Literacy → Freq. Usage	Mult. Regression	$R^2 = .633, F = 135.796$	< .001***	$\beta: .155-.244$	Reject H ₀

Note. *** $p < .001$; ns = not significant. η^2 (Cohen, 1988): < .06 = small; .06-.14 = medium; > .14 = large. R^2 (Cohen, 1988): .01 = small; .09 = medium; .25 = large.

5. Discussion, Conclusion, and Implications

5.1 Discussion

This study, through its results, provides a consistent policy-relevant image of the mobile payment situation of rural women in Delhi-NCR. The age effect (H1a) is interesting, as it is a null effect indicating that age is not the main obstacle to the adoption of digital payment but is instead the structural barrier, based on economic factors and education levels in place of technological anxiety that should be considered with age. This

conclusion is the opposite of some previous literature which has focused on older adults' technophobia (van Deursen and van Dijk, 2014) but is also in line with newer reports that the age effects can be reduced in case structural factors are lessened (Rasheduzzaman, 2025).

The high earnings impact correlates with the observation that low household incomes reflect economically contingent behaviour; women with higher incomes have greater access to their smartphones, engage in digital transactions more frequently (such as e-commerce, utility bills, and remittances), and are better connected, making it easier for them to adopt mobile payments and develop habits (Yadav and Sengupta, 2025; Mruthunjaya, 2025). The equally big education impact gets the assumption that education can be considered a proxy of digital readiness, as it not only gives someone the cognitive resources on how to engage in technologies but also exposes a person to the power of social networks on digital finances via the peer effect (Barra et al., 2024). The most notable fact about the study is the extraordinarily high level of explanatory power that digital literacy has on adoption ($R^2 = .719$). This is an indicator to show that digital literacy is not only an enabling state but rather the dominant operational process by which rural women can be seen as using mobile payment systems. The item-level results showing that DL1 (operational ability) is most likely a predictor of an adoption and DL3 (information security literacy) is most likely a predictor of usage frequency suggest a temporal development, i.e., initial adoption is supported by basic operational competence, and frequent and constant usage requires further security literacy, allowing one to be confident about their transactions without anxiety (Nene, 2025; Kim et al., 2019).

It is proved by the barriers analysis that perceived security risk is the most important one to inhibit frequent use of the given device, which is of particular concern to rural women who might not have recourse mechanisms against financial fraud cases (Featherman and Pavlou, 2003). The high impact of poor internet connectivity and lack of guidance emphasises the idea that the disengagement of rural women with mobile payments is more psychological (fear-based) and structural (infrastructure-based) and, therefore, requires intervention of both types (Devi, 2025; Oliveira et al., 2019).

5.2 Comparison with the Prior Literature.

These effects of income and education are consistent with those in larger studies of the country as a whole, but the effects are much greater. According to Khatun (2024), the effects of education on mobile banking adoption by the farming communities were moderate, whereas the present research demonstrates that the effects are substantial (.40), which can be attributed to the sample of rural women being represented more uniformly and the greater dispersion within and without the education categories. The security barrier result is identical to that of Kim et al. (2019) or Liébana-Cabanillas et al. (2020) in the Indian rural area. The reported values of digital literacy R^2 are significantly above other single-item or scale-level analyses reported before (Haque, 2025; Mini & Sasankan, 2024), which supports the usefulness of item-level regression to address the finer predictor effects.

5.3 Theoretical Implications

This research contributes to the theory in three main ways. First, it builds on UTAUT2 (Venkatesh et al., 2022) by providing support to its digital literacy components to be seen as interrelated measures of effort expectancy content, which shows that various literacy sub-skills show differences in terms of predicting different parts of the journey of using a device. Second, it combines the theory of digital literacy in Eshet (2019) and the theory of mobile payment adoption, enriching the operationalisation of digital competence compared to items. Third, placing the perceived risk (Featherman and Pavlou, 2003) in a multiple regression model with item-level predictors distinguishes the perceived risk of security risk and infrastructure barriers, which extends the literature on perceived barriers beyond the aggregate scale scores.

5.4 Practical Implications on Policymakers and Financial Institutions.

A number of action points come out of this analysis. First, educational initiatives on digital literacy with particular emphasis on app usage and information security (the two most prognostic dimensions of digital literacy) must be given priority in the SHG's curriculum for rural women and NABARD affiliate programmes. Second, incentive schemes can be used to address the income-adoption gap, that is, income-linked incentives like subsidised data packs, zero-cost basic smartphones provided to BPL households, cashback mechanisms to first-time users of UPI, etc. Third, payment service providers and financial institutions need to invest in regional-language security awareness programmes that de-mystify fraud cases and describe recourse options, which are directly targeting security risk deterrents. Fourth, the persistent connectivity barrier is an initiative that demands a speedy rural broadband development under BharatNet and similar initiatives. Fifth, post-adoption dropout recorded in the literature (Mary Treasa & Santhi, 2024) could be mitigated by implementing peer-mentor programmes in SHGs where digitally literate women encourage novice users using the systems in question, which are based on the social influence mechanisms of UTAUT2 (Venkatesh et al., 2022).

5.5 Limitations of the Study

This research is limited in a number of ways. The cross-sectional nature of the study does not indicate causal relationships; longitudinal data would be better to update the direction of relationships and their sustainability between digital literacy and adoption. Although the purposive sampling strategy is suitable in the case of a marginalised population, the constraint extends the ability to generalise to outside of the Delhi-NCR rural setting. The self-reported Likert scale data are also affected by the social desirability bias, especially on questions concerning the digital skills confidence. Household-level factors are also uncontrolled in the study, e.g., smartphone ownership or the cost of a data plan or the influence of male household members on the women using technology, etc., which could definitely moderate the literacy-adoption relationship.

5.6 Scope for Future Research

The next round of research ought to adopt longitudinal panel designs in order to follow up on the efficacy of the interventions on literacy-building procedures through adoption and continued use in the long run. Multi-state comparative research across varying geographies, e.g., Delhi-NCR with Rajasthan, Bihar or Odisha, would help clarify the extent to which the regional infrastructure and cultural conditions moderate the digital literacy-adoption relationship. In-depth interviews and ethnographic observation on the SHG meetings would be qualitative approaches that would add value to the social and relational aspects of mobile payment adoption among rural women. Lastly, assessing the financial independence of women and home welfare due to the implementation is also revenue-generating topic deserving research that will have a direct policy implication and should be done by Yadav and Sengupta (2025).

5.7 Conclusion

The current research gives very solid empirical support to the fact that the digital gender gap in mobile payment uptake by rural women in Delhi-NCR is not uniform and necessary. Although not influential, age, education, and income have a significant differentiating influence on the results of adoption and indicate the obvious structure of intervention points. Digital literacy (especially the ability to operate and the ability to secure information) is found to be the most significant contributor to both adoption ($R^2 = .719$) and regular use ($R^2 = .633$), but the perceived risks of security and the lack of connectivity all negatively affect usage by significant entails ($R^2 = .640$). These results emphasise that efforts to thoroughly include rural Indian women in meaningful ways by means of mobile payments would need a comprehensive effort that includes the interventions of digital literacy, income transfer, infrastructure development, and institutions building trust. The research adds a confirmed empirical concept that trifurcates the demographic study; variations in literacy and apparatus profiling have the potential to shape further investigation and evidence-based policy in the swiftly expanding field of rural fintech use.

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