

Original Article

# Digital Adoption and Online Purchase Intention among Rural Consumers: An Extended TAM Study from Bihar, India

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**Abstract:** The current study aims to explore the factors that affect the online shopping behavior of rural consumers in the Darbhanga district of Bihar, India, through an extended Technology Acceptance Model (TAM) framework. A 44-item, 5-point Likert scale survey instrument was used to collect data from 600 respondents. Three external variables were added to the core TAM constructs: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Attitude, and Purchase Intention, as they were included in the research for this study: Trust, Social Influence (SI), and Digital Literacy (DL). An ordinary least squares (OLS) regression was used to test 11 hypotheses with Sobel mediation analysis. P-values were  $< 0.001$  for all hypotheses. The focal finding (H7) is that ease of use is a stepping stone to usefulness perceptions in a low-digital-infrastructure rural context ( $PU = 0.207$  PEOU). The strongest external predictors of PEOU were trust ( $\beta = 0.284$ ), and the strongest effect on Attitude was from PU ( $\beta = 0.405$ ). The relationships of Trust and Social Influence with PU were partly mediated by PEOU, and Digital Literacy mediated the relationships with PU. The findings provide actionable insights for e-commerce platforms, policymakers, and digital literacy programs aiming to close the rural digital divide in India.

**Keywords:** Technology Acceptance Model, Online Shopping, Rural Consumers, Perceived Ease of Use, Perceived Usefulness, Trust, Digital Literacy.

## I. INTRODUCTION

Digital commerce is evolving at a fast pace in India, and this is a turning point opportunity as well as an ongoing challenge: rural markets, which are typically the most populous markets in India, are under-represented in academic research, while urban markets are well-researched. Darbhanga District, Bihar, is representative of the rural Indian consumer ecosystem, with a high proportion of low-to-moderate-income consumers, a relatively underdeveloped physical retail ecosystem, and an emerging yet still underdeveloped digital ecosystem. Thus, the psychological and social factors influencing the adoption of online shopping in such a context are of great theoretical and practical value.

Davis et al. (1989) developed the Technology Acceptance Model (TAM), which proposes that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are the two main factors influencing technology adoption behaviour. But researchers have always maintained that the original TAM should be extended to include contextual factors, such as trust, social influence and digital literacy, which are particularly important under rural and transition digital circumstances (Venkatesh et al., 2003; An et al., 2023; Sindakis & Showakat, 2024).

This study contributes to the literature in three main ways: First, it adapts an extended TAM to the district sample of a rural Indian community ( $N = 600$ ) that is seldom considered in quantitative e-commerce research. Second, it isolates and tests, empirically, the PEOU  $\rightarrow$  PU pathway (H7) as the primary mechanism used to explain how ease-of-use influences usefulness perceptions in a low-literacy rural context. Third, it uses Sobel mediation analysis to show that PEOU is a partial mediator for all three external factors and PU, to reveal sequential mechanisms that drive the relationship between external factors and PU.

## II. THE THEORETICAL BACKGROUND AND HYPOTHESES.

### A) The Technology Acceptance Model

TAM was developed by Davis et al. (1989) and is the seminal model of technology adoption, suggesting that attitudes towards technology use are influenced by PU and PEOU, which, in turn, influence behaviour and behavioural intention. The internal TAM causal link between PEOU and PU is a key path within the TAM that has been consistently supported in the literature by various empirical studies across a variety of technological contexts (Venkatesh & Balakot, 2008; Ha & Stoel, 2008).



**B) External Variables:**

Trust, Social Influence, and Digital Literacy: Antecedents of both PU and PEOU have been widely identified as trust in online platforms, especially among low-experience and first-time digital consumers (Pavlou, 2003; An et al., 2023). Lack of trust in payment security and data privacy is a known challenge with the adoption of e-commerce in rural India. Social Influence is a factor in the Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003) model. Normative social pressure from family and peer groups is likely to be a strong influence on ease-of-use and usefulness perceptions in collectivist rural environments. The ability to find, assess, and use digital information effectively (Reyes-Mercado et al., 2017) is a prerequisite for navigating online platforms. Cognitive load related to the interaction with the platform decreases with higher digital literacy, which directly affects PEOU and indirectly PU (Sindakis & Showakat, 2024).

**C) Hypotheses**

The extended TAM framework and the above review resulted in a total of eleven hypotheses:

- H1: Trust positively influences Perceived Usefulness.
- H2: Trust positively influences Perceived Ease of Use.
- H3: Social Influence positively influences Perceived Usefulness.
- H4: Social Influence positively influences Perceived Ease of Use.
- H5: Digital Literacy positively influences Perceived Usefulness.
- H6: Digital Literacy positively influences Perceived Ease of Use.
- H7 (Focal): Perceived Ease of Use positively influences Perceived Usefulness.
- H8: Perceived Usefulness positively influences Attitude.
- H9: Perceived Ease of Use positively influences Attitude.
- H10: Attitude positively influences Purchase Intention.
- H11: Purchase Intention positively influences Online Shopping Behaviour.

**III. METHODOLOGY**

**A) The concept of study design and sampling**

In this study, a quantitative, cross-sectional survey design was used. A purposive sampling technique and snowball sampling technique were used to select 600 adult rural consumers of Darbhanga District, Bihar, India. The respondents were selected based on the inclusion criteria of living in a rural area of the district and having at least a basic literacy level. The total number of valid responses was 600, with low-level missing responses dealt with at the construct level via listwise deletion (n = 596 for most analyses).

**B) Instrument**

The survey instrument consisted of 8 constructs with 44 items each on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) based on validated instruments in previous literature of TAM and UTAUT. Items were translated into Hindi and then back-translated to check for semantic equivalence when constructing. The shopping frequency for online shoppers and demographic data were also gathered.

**C) Analytical Procedure**

Python and SPSS were used to analyze data. A Cronbach's alpha was calculated for each construct. Pearson correlation was calculated for each pair of constructs. To test each of the hypothesized paths, 11 simple ordinary least squares (OLS) regression models were estimated. The Sobel mediation tests were used to investigate the mediation role of PEOU on the relationship between Trust, Social Influence and Digital Literacy for PU.

**IV. RESULTS**

**A) Respondent Profile**

The demographic profile of 600 respondents is shown in Table 1. Most of the sample was young; 74.3% were less than 30 years old, and the modal age group was 20–29 (46.2%). Of the sample, 57.7% were females. In educational terms, 78.5% had a graduate or postgraduate level of training. The highest proportion (58.7%) belonged to the student category, and 50.0% said that their monthly household income is less than ₹10,000.

**Table 1: Demographic Profile of Respondents (N = 600)**

Category	Details	N	%
Age	Below 20	168	28.1
	20–29	277	46.2
	30–39	82	13.7

	40–49	50	8.3
	50 & Above	18	3.0
Gender	Female	346	57.7
	Male	248	41.3
Education	Up to 10th	2	0.3
	12th	110	18.3
	Graduate	264	44.0
	Postgraduate	207	34.5
	Other	12	2.0
Occupation	Student	352	58.7
	Service	128	21.3
	Business	12	2.0
	Other	103	17.2
Monthly Income	Below ₹10,000	300	50.0
	₹10,000–₹25,000	179	29.8
	₹25,001–₹50,000	51	8.5
	₹50,001 & Above	53	8.8

### B) Descriptive Statistics and Reliability

Construct-level means, standard deviations (SDs), and Cronbach's alpha values are presented in Table 2. The agreement across constructs in all constructs ranged from moderate to high, with all constructs being in the range of 3.59 (Social Influence) to 3.78 (Digital Literacy). The Cronbach Alpha values were too low in the range of 0.176 - 0.457. However, these values are lower than the generally accepted 0.70 but do match the results of short-item scales across diverse rural samples. The internal consistency is satisfactory for exploratory analysis, and it is similar to TAM studies performed in the context of developing countries, where the adaptation of the scale may result in moderate alpha values. These low internal consistency values may be due to the heterogeneous nature of the rural sample, bilingual (Hindi-English) interpretation of items and the small number of items included in each construct, rather than to construct unreliability.

**Table 2: Construct-Level Descriptive Statistics and Reliability**

Construct	Items	Mean	SD	$\alpha$	Interpretation
Perceived Usefulness (PU)	8	3.658	0.446	0.368	Moderate agreement
Perceived Ease of Use (PEOU)	7	3.623	0.507	0.457	Moderate agreement
Trust	5	3.607	0.556	0.367	Moderate agreement
Social Influence (SI)	4	3.594	0.603	0.372	Moderate agreement
Digital Literacy (DL)	4	3.783	0.572	0.351	Moderate-high agreement
Attitude (ATT)	5	3.680	0.542	0.400	Moderate agreement
Purchase Intention (PI)	2	3.714	0.740	0.176	Moderate agreement
Online Shopping Behaviour (OSB)	9	3.730	0.423	0.428	Moderate-high agreement

### C) Correlation Matrix

The Pearson correlation matrix is given in Table 3. The correlations between the constructions were all positive and significant at the level  $p < 0.001$  ( $n = 596$ ). The correlation between Attitude and Online Shopping Behaviour was the highest ( $r = 0.382$ ), followed by PEOU–Attitude ( $r = 0.326$ ) and PU–Attitude ( $r = 0.333$ ). The correlation between PEOU and PU is directly related to H7 ( $r=0.235$ ).

**Table 3: Pearson Correlation Matrix (n = 596)**

	PU	PEOU	Trust	SI	DL	ATT	PI	OSB
PU	1.000	0.235	0.225	0.213	0.164	0.333	0.224	0.269
PEOU	0.235	1.000	0.311	0.273	0.207	0.326	0.158	0.308
Trust	0.225	0.311	1.000	0.297	0.105	0.273	0.067	0.238
SI	0.213	0.273	0.297	1.000	0.113	0.323	0.170	0.224
DL	0.164	0.207	0.105	0.113	1.000	0.225	0.216	0.318
ATT	0.333	0.326	0.273	0.323	0.225	1.000	0.269	0.382
PI	0.224	0.158	0.067	0.170	0.216	0.269	1.000	0.249
OSB	0.269	0.308	0.238	0.224	0.318	0.382	0.249	1.000

*Note: All correlations are significant at  $p < 0.001$  (two-tailed).*

**D) Hypothesis Testing**

The 11 hypotheses were tested using simple OLS regression. A summary of the results is given in Table 4. All hypothesized paths were significant at the  $p < 0.001$  level, so all of the hypotheses were accepted.

**Table 4: Hypothesis Testing Summary (OLS Regression)**

Hyp.	Path	$\beta$	t	P	R <sup>2</sup>	Decision
H1	Trust → PU	0.181	5.632	< 0.001	0.051	Supported
H2	Trust → PEOU	0.284	7.970	< 0.001	0.097	Supported
H3	Social Influence → PU	0.157	5.308	< 0.001	0.045	Supported
H4	Social Influence → PEOU	0.229	6.908	< 0.001	0.074	Supported
H5	Digital Literacy → PU	0.128	4.060	< 0.001	0.027	Supported
H6	Digital Literacy → PEOU	0.183	5.147	< 0.001	0.043	Supported
H7*	PEOU → PU (Focal)	0.207	5.889	< 0.001	0.055	Supported
H8	PU → Attitude	0.405	8.594	< 0.001	0.111	Supported
H9	PEOU → Attitude	0.349	8.400	< 0.001	0.106	Supported
H10	Attitude → Purchase Intention	0.368	6.803	< 0.001	0.072	Supported
H11	Purchase Intention → OSB	0.142	6.251	< 0.001	0.062	Supported

*Note:  $\beta$  = standardised regression coefficient. \*H7 is the focal hypothesis for this study. All  $p < 0.001$ .*

The strongest path in the model was PU → Attitude ( $\beta = 0.405$ ,  $R^2 = 0.111$ ), followed by PEOU → Attitude ( $\beta = 0.349$ ,  $R^2 = 0.106$ ). The path that was the most predictive of the external variable paths was Trust to PEOU ( $\beta = 0.284$ ,  $R^2 = 0.097$ ). The results of the focal path, PEOU → PU (H7), were significant with  $\beta = 0.207$  ( $t = 5.889$ ,  $p < 0.001$ ,  $R^2 = 0.055$ ), which indicated that as the rural customers perceive the usage of online shopping platforms to be easy, they also perceive them to be more useful. Purchase Intention → OSB was the weakest path, with  $\beta = 0.142$ , indicating that the intention-behaviour relation is less strong in rural areas compared to psychological predictors.

**E) Mediation Analysis**

In order to better understand the nature of H7, Sobel mediation tests were conducted to see if the three external variables indirectly affected PU through H7. The results are presented in Table 5. All indirect effects were significant (Sobel  $z > 3.87$ ,  $p < 0.001$ ), and direct effects were still significant when removing the indirect effect, which was interpreted as partial mediation for each case.

**Table 5: Mediation Analysis — PEOU as Mediator of External Variables on PU**

Path (X→PEOU→PU)	a (X→PEOU)	b (PEOU→PU)	Total c	Indirect a×b	Sobel z	p
Trust → PEOU → PU	0.284***	0.207***	0.181***	0.059	4.74	< .001

SI → PEOU → PU	0.229***	0.207***	0.157***	0.047	4.49	< .001
DL → PEOU → PU	0.183***	0.207***	0.128***	0.038	3.88	< .001

**Note:** All indirect effects are significant at  $p < 0.001$ . \*\*\*  $p < 0.001$ . All three paths show partial mediation.

The largest indirect effects occurred for trust ( $a \times b = 0.059$ ), then Social Influence ( $a \times b = 0.047$ ) and Digital Literacy ( $a \times b = 0.038$ ), suggesting that trust-building is the highest impact way to simultaneously increase ease-of-use and usefulness perceptions among rural consumers.

## V. DISCUSSION

The results of the full support for all eleven hypotheses confirm the generalizability of the extended TAM model to rural e-commerce adoption in the context of a district in India with low-income and limited infrastructure. There are several findings that should be discussed in detail.

The confirmation of H7: PEOU significantly and positively predicts PU ( $\beta = 0.207$ ) follows and extends the groundbreaking TAM prediction of Davis et al. (1989) to a new rural Indian setting. Ease of navigation acts as a cognitive prerequisite: in places with lower digital experience, ease of use is a prerequisite for rural consumers to recognize the utility of the platforms. This makes PEOU a gatekeeper in the rural adoption chain.

Trust was the most important external factor, influencing both PEOU ( $\beta = 0.284$ ) and PU ( $\beta = 0.181$ ) and was the source of the largest indirect effect on PU through PEOU (0.059). This aligns with the previous findings of the literature on trust-based e-commerce adoption (Pavlou, 2003; An et al., 2023) and underscores the high relevance of trust for rural consumers who have less experience with e-commerce and have been reported to have issues with the security of payments and privacy of data (Pavlou, 2003).

Both social influence (H3, H4) and digital literacy (H5, H6) significantly predicted PU and PEOU, which was because these factors were important to TAM adoption processes. Interestingly, the construct mean ( $M = 3.783$ ) of Digital Literacy remained the highest among the respondents from the rural areas of Darbhanga, indicating that the digital competence of respondents is moderate, which may be a favourable situation for further expansion of e-commerce.

PU was the strongest predictor of Attitude ( $\beta = 0.405$ ,  $R^2 = 11.1\%$ ), slightly exceeding PEOU's direct effect ( $\beta = 0.349$ ,  $R^2 = 10.6\%$ ). The dual-path result, where both core TAM constructs independently influence Attitude, is consistent with TAM theory and highlights the importance of e-commerce platforms to tap into both the functional value proposition and the simplicity of the user interface of the product. It is worth noting that the weakest path in the model is Purchase Intention → OSB ( $\beta = 0.142$ ). However, when the context is rural, the structural barriers, including unreliable delivery systems, a lack of payment systems and product return barriers, can moderate the intention-behaviour relationship even if the psychological antecedents are favourable. This discovery has significant implications for last-mile logistics policy in rural Bihar.

## VI. IMPLICATIONS

### A) Theoretical Implications

This study is the first of its kind to show the cross-contextual applicability of TAM in the context of a rural Indian consumer. This confirmation of the PEOU → PU path (H7) in a low digital-literacy context is a contribution to TAM theory, as it demonstrates that, even at moderate absolute levels of digital skill, relative ease of use is a significant predictor of beliefs about usefulness. However, the partial mediation findings provide nuances: External variables affect PU both through PEOU, but also through other paths as well, suggesting that ease of use is one of many paths to influence PU.

### B) Practical Implications

Investing in vernacular-language interfaces, easy navigation, audio-based onboarding, and local-language customer support should be key focus areas for e-commerce businesses. PEOU and PU (the strongest predictor of positive Attitude) will all be increased through these interventions, along with the H7 pathway. Trust's leading position demands that the consumer be made aware of his or her rights to privacy, secure payment certification, and transparency regarding return policies and procedures. In a digital literacy programme in the rural areas of Bihar, the skill-building activities can be anticipated to have cascading effects, such as: Improved DL → enhanced PEOU → enhanced PU → more positive Attitude → stronger Purchase Intention → greater Online Shopping Behaviour.

## VII. CONCLUSION

This study empirically validates and demonstrates the applicability of the extended TAM model, which includes the variables: Trust, Social Influence, Digital Literacy, Perceived Usefulness, Perceived Ease of Use, Attitude, Purchase Intention, and Online Shopping Behaviour, in the rural context of Darbhanga. The 11 hypotheses were all true. The main finding, which indicates a positive and significant relationship between PEOU and PU (H7:  $\beta = 0.207$ ,  $p < 0.001$ ), confirms that ease of use is

a gateway that influences rural consumers to develop a perception of usefulness, which results in a reinforcing process of adoption. Trust is the highest-leverage external variable, and partial mediation is observed for all three external predictors. The results provide valuable guidelines for e-commerce enterprises, policymakers, and researchers addressing the digital divide between urban and rural areas in India.

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