

Technology Acceptance and Online Shopping Attitudes among Rural Consumers: Extended TAM (E-TAM) Evidence from Darbhanga District, Bihar, India

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Abstract: *In this paper, the empirical results of this study investigating the adoption of online shopping among the rural people of Darbhanga District in Bihar, India have been provided. The research is based on Extended Technology Acceptance Model (E-TAM) and primary survey data collected from 600 respondents in rural area and investigates the simultaneous effect of Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) on Attitude toward online shopping. Covariance-based Structural Equation Modelling (SEM) with Maximum Likelihood (ML) estimation is used for testing the two hypothesized focal concepts, $PU \rightarrow ATT$ and $PEOU \rightarrow ATT$. The results indicate that PU has a stronger direct effect on Attitude ($\beta = 0.306, p < 0.001$) than PEOU ($\beta = 0.249, p < 0.001$), suggesting that the classical TAM pattern (in which functional usefulness is the more proximal driver of attitude) remains valid even for first-generation rural digital consumers. Together, PU and PEOU account for 23.8 per cent of the variance in Attitude ($R^2 = 0.238$). The mediation analysis also shows that PEOU has a significant indirect effect on Attitude through PU (indirect $\beta = 0.097$) and its total effect on Attitude ($\beta = 0.346$) is only slightly higher than that of PU's direct effect on Attitude. This confirms that the two belief constructs have a complementary rather than competitive relationship. Overall the fit of the structural model to the data is acceptable but not strong in all areas (RMSEA = 0.045; CFI = 0.924; CMIN/DF = 2.29), suggesting that the instrument needs to be refined in future versions. The results have significant implications for the design of e-commerce platforms, rural digital-inclusion policies and TAM theory in the developing-country context.*

Keywords: Technology Acceptance Model (TAM), Perceived Usefulness, Perceived Ease of Use, Attitude, Online Shopping, Rural Consumers, Bihar, India, SEM, E-TAM

Introduction

The tremendous growth of e-commerce in India has led to extensive scholarly research into factors that determine technology adoption by varying groups of consumers. The Technology Acceptance Model (TAM), first proposed by Davis (1989), offers one theoretical basis for examining and explaining the processes that consumers go through when considering and using information systems; however, the majority of empirical studies have been conducted in technologically sophisticated, and urban, consumer environments. The character of TAM constructs might be different in rural India, a context that is larger than 65 per cent of the national population (Census of India, 2011), and which has been largely neglected by research. Within this context, this study places itself in the context of the Darbhanga District, which is an area of the rural population, in which Internet and smart-phone penetration is expanding rapidly but e-commerce is not as widespread as in urban centres (IAMAI, 2024; Sanketh & Srushti, 2024). The doctorate research of which this paper is a component has an Extended TAM (E-TAM) including the endogenous constructs of PU and PEOU along with the exogenous constructs of Trust (TR), Social Influence (SI) and Digital Literacy (DL). External Antecedents lead to PU and PEOU, which in turn lead to Attitude, Purchase Intention, and eventually, Online Shopping Behaviour.

The present paper concentrates solely on the analysis of the effect of Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) on Attitude toward online shopping among rural consumers. This is tested using Structural Equation Modelling (SEM) software from IBM AMOS 26.0, which is based on Hypotheses (PU → ATT) and Hypotheses (PEOU → ATT). It is crucial to understand how the two factors, PU and PEOU, interact in shaping consumers' attitude in the rural Indian context, with first generation digital users using platforms in a second language on low-end devices. The results have important implications for TAM theory, platform design of e-services and rural digital inclusion policy. The theoretical framework and hypotheses development is presented.

Theoretical Framework and Hypotheses Development

2.1 The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) developed by Davis (1989) and later extended by Davis, Bagozzi and Warshaw (1989) suggests that the adoption of technology is dependent on two main belief constructs: Perceived Usefulness (PU) which is the extent to which a user believes that the use of the technology will improve task performance, and Perceived Ease of Use (PEOU) which is the extent to which the user thinks the technology will be effortless to use. The two constructs PU and PEOU are hypothesized to directly impact the Attitude toward Technology use which further influences Behavioural Intention and finally actual Technology use behaviour within the TAM nomological network.

Importantly, the original TAM (Davis, 1989) also includes an internal path from PEOU to PU, a proposition that intuitively follows the idea that more usable a technology is, the more useful it will be perceived. Such hierarchical relationships have been repeatedly validated in various technology adoption research studies (Venkatesh & Bala, 2008; Ha & Stoel, 2008).

2.2 Extended TAM (E-TAM) in the Rural Indian Context

In this study, the traditional TAM has been expanded by adding three exogenous constructs which are relevant to the context: Trust (TR), Social Influence (SI), and Digital Literacy (DL). These three antecedents have been found to significantly influence the PU and PEOU perceptions of the rural consumers (Pavlou, 2003; Reyes-Mercado et al., 2017; Sindakis & Showakat, 2024). This paper is interested in the downstream part of the E-TAM causal chain – (PU and PEOU) on Attitude toward online shopping – after they are formed.

2.3 Perceived Usefulness and Attitude

Perceived Usefulness is the degree of belief that online shopping will make shopping easier and that it will save time, have a greater variety of products, and allow for price comparisons (Davis et al., 1989; Kapoor et al., 2022). PU has been consistently identified as an important factor in consumer attitude in the context of online shopping. Consumer attitudes towards functional benefits of the ecommerce platforms lead to more positive attitudes towards ecommerce (Singh, Preeti et al., 2016; Rahman et al., 2019; Wibasuri et al., 2023).

However, in the rural area, PU may have even more attitudinal significance, as consumers there are more vulnerable to the utility of technology in making access to markets and services easier and more fulfilling. The study of Parvez and Khan (2025) on the adoption of e-commerce in rural areas in India corroborated PU as a significant positive predictor of attitude, while the study of Rathod and Srinu (2022) similarly found attitude to be positively influenced by PU among the rural consumers of Telangana in India.

Hypothesis: There is a significant positive relationship between Perceived Usefulness (PU) and rural consumers' attitude toward online shopping.

2.4 Perceived Ease of Use and Attitude

Perceived Ease of Use relates to the mental effort that the consumer believes he or she must put into using an online shopping site (such as reading product descriptions, making digital payments, contacting customer service, etc.). PEOU has a direct effect on Attitude, as it impacts the perceived user experience aspect of platform evaluation, and an indirect effect, mediated by its effect on PU (Davis, 1989; Ha & Stoel, 2008). Rural consumers are more likely to develop positive attitudes towards a platform, regardless of its functional utility, when it is cognitively manageable.

This direct relationship between PEOU and Attitude has been supported in several other contexts (Ruiz-Herrera, G., et al. 2023; Wibasuri et al., 2023) and is likely to be stronger for first-generation digital consumers in rural India who have lower levels of digital literacy, lower availability of high-end devices, and language barriers to accessing e-commerce platforms (Subhash & Agarwal, 2024; Sindakis & Showakat, 2024).

Hypothesis: There is a significant positive relationship between Perceived Ease of Use (PEOU) and rural consumers' attitude toward online shopping

Research Methodology

3.1 Research Design and Sample

The study is conducted using a quantitative approach with a cross sectional survey design that is based on positivist research philosophy (Rehman et al., 2019). The primary data were gathered from the rural consumers of Darbhanga District, Bihar, India in July 2025–October 2025. Three subdivisions (Darbhanga Sadar, Benipur and Biraul) were purposively and snowball sampled and a structured questionnaire in bilingual (English/ Hindi) format was administered. 600 complete and valid responses were collected.

The majority of people in the sample were under 40 years old (82.5%, 55.0% were below 30 years) and well-educated (71.7% had graduate or post-graduate qualifications). Most people (34.0%) are service and employed; students (30.3%) and business (28.8%) are the next largest occupational groups. The modal income band is ₹25,001–₹50,000 per month (30.7%). This sample is engaged with digital commerce, at 44.0 per cent often and 41.7 per cent sometimes, or 85.7 per cent overall.

3.2 Measurement Instrument

Multiple-item scales were adapted from previous TAM research literature (Davis, 1989; Ha & Stoel, 2008; Pavlou, 2003) and quantified for all constructs in this research using the rural Bihar context. The questionnaire items were rated using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Perceived Usefulness (PU) was measured with 8 items ($\alpha = 0.905$), Perceived Ease of Use (PEOU) with 7 items ($\alpha = 0.900$), and Attitude (ATT) with 5 items ($\alpha = 0.812$). All the instruments were translated into Hindi language and then back translated in English to ensure semantic equivalence.

3.3 Analytical Approach

The research objectives were tested using a two-step approach suggested by Anderson and Gerbing (1988) which employed covariance-based Structural Equation Modelling (SEM) and Maximum Likelihood (ML) estimation. All of the E-TAM measurement and structural model (Trust, Social Influence and Digital Literacy as antecedents to PU and PEOU as focal variables, and downstream Attitude → Purchase Intention → Online Shopping Behaviour as antecedents to Online Shopping Behaviour) was estimated using the present 600 respondents. To validate the measurement model, the confirmatory analysis of item loadings, composite reliability (CR) and average variance extracted (AVE) was conducted, after which the structural model was estimated for testing the hypothesized paths. The goodness-of-fit indices recommended by Hu and Bentler (1999) were studied: CMIN/DF, CFI, TLI, RMSEA, GFI, AGFI and NFI. Standardized direct, indirect and total effects were used to conduct the mediation analysis. Harman's single-factor test (Podsakoff et al., 2003) was used to assess common method bias.

Results

4.1 Descriptive Statistics and Reliability

The descriptive statistics and reliability coefficients for the three constructs of focus (PU, PEOU and Attitude) are shown in Table 1. The mean scores are between 3.795 to 3.911, which

is the consistently moderate to positive perceptions in the sample. Each item measure is reliable in terms of internal consistency, with reliabilities for all three measures (PU = 0.905; PEOU = 0.900; ATT = 0.812) well above the 0.70 level generally recommended for acceptable internal-consistency reliability – an improvement over the modest reliabilities reported with the previous, smaller item pool.

Table 1: Descriptive Statistics and Reliability – Focal Constructs (N = 600)

Construct	Items	Mean	Std. Dev.	Skewness	Kurtosis	Cronbach's α
Perceived Usefulness (PU)	8	3.823	0.617	-0.291	0.007	0.905
Perceived Ease of Use (PEOU)	7	3.795	0.631	-0.202	-0.310	0.900
Attitude (ATT)	5	3.911	0.605	-0.236	-0.461	0.812

Source: Primary Survey Data (N = 600). Note: All constructs measured on a 5-point Likert scale. Skewness and Kurtosis within ± 2 and ± 7 indicate acceptable normality (Hair et al., 2019).

4.2 Convergent Validity: CFA and Composite Reliability

Convergent validity was examined by Composite Reliability (CR) and Average Variance Extracted (AVE) as suggested by Anderson and Gerbing (1988). Table 2 shows the results.

Table 2: Convergent Validity Statistics – Focal Constructs (CFA, ML Estimation)

Construct	Items	Alpha (α)	CR	AVE	Assessment
Perceived Usefulness (PU)	8	0.905	0.905	0.545	Good
Perceived Ease of Use (PEOU)	7	0.900	0.900	0.563	Good
Attitude (ATT)	5	0.812	0.830	0.506	Acceptable

Source: Estimated CFA output (ML). Thresholds: Alpha ≥ 0.70 ; CR ≥ 0.70 ; AVE ≥ 0.50 (Hair et al., 2019). Note: all three constructs now clear the strict 0.50 AVE threshold.

The composite reliabilities for all three constructs are above 0.70 and are very high (0.830). The loadings for the PU items range from 0.705 to 0.786, which is well above 0.50–0.60 (Hair et al., 2019); the PEOU items range from 0.715 to 0.798, and the ATT items range from 0.374 to 0.799, with the exception of one ATT item, which is “I have a positive attitude toward online shopping”, with $\lambda = 0.374$, which is comfortably below 0.60, but which is flagged for review when refining the instrument in future. The relationship of PU to ATT is $r = 0.393$ ($p < 0.001$ at the composite score level); the relationship of PEOU to ATT is $r = 0.370$ ($p < 0.001$ at the composite score level), suggesting that the hypothesized relationships are supported by the data.

4.3 Structural Model Fit Assessment

The goodness-of-fit indices for the full Extended TAM model (which contains the Objective pathways) are reported in Table 3.

Table 3: Structural Model Goodness-of-Fit Indices (N = 600, AMOS 26.0)

Fit Index	Obtained Value	Threshold / Criterion	Interpretation
CMIN/DF	2.29	≤ 3.0	Acceptable
CFI (Comparative Fit Index)	0.924	≥ 0.90	Acceptable
TLI (Tucker-Lewis Index)	0.915	≥ 0.90	Acceptable
RMSEA	0.045	≤ 0.06	Good Fit
SRMR (Standardised RMR)	0.063	≤ 0.08	Acceptable
GFI (Goodness of Fit Index)	0.911	≥ 0.90	Acceptable
NFI (Normed Fit Index)	0.871	≥ 0.80	Acceptable
AGFI (Adjusted GFI)	0.886	≥ 0.80	Acceptable

Source: AMOS 26.0 output. Primary decision criteria: CFI, TLI, RMSEA, and SRMR (Hu & Bentler, 1999).

All fit indices indicate good model fit. RMSEA = 0.045 falls within the good-fit range (< 0.06), SRMR = 0.063 is below the 0.08 threshold, and both CFI (0.924) and TLI (0.915) exceed 0.90. The ratio of CMIN/DF is 2.29 which is within the acceptable range. Overall, the results support the validity of the Extended TAM model for the observed rural Darbhanga data, and suggest that the structural path interpretation be presented.

4.4 SEM Path Coefficients: Hypothesis Testing for Objectives

The entire SEM path coefficients for the Extended TAM model are shown in Table 4, where the hypotheses of particular focus are indicated.

Table 4: SEM Path Coefficients – Full E-TAM Model Focal Paths (N = 600, ML Estimation)

Hyp.	Structural Path	Beta (β)	z-value (C.R.)	p-value	R ²	Decision
H1	Trust $\rightarrow$ PU	0.206	3.859	$< 0.001^{***}$	–	Supported
H2	Trust $\rightarrow$ PEOU	0.247	4.352	$< 0.001^{***}$	–	Supported
H3	Social Influence $\rightarrow$ PU	0.148	2.782	0.005^{**}	–	Supported
H4	Social Influence $\rightarrow$ PEOU	0.187	3.212	0.001^{**}	–	Supported
H5	Digital Literacy $\rightarrow$ PU	0.149	2.654	0.008^{**}	–	Supported
H6	Digital Literacy $\rightarrow$ PEOU	0.284	4.314	$< 0.001^{***}$	–	Supported
H7	PEOU $\rightarrow$ PU	0.317	6.405	$< 0.001^{***}$	0.400	Supported

Hyp.	Structural Path	Beta (β)	z-value (C.R.)	p-value	R ²	Decision
H8*	PU $\rightarrow$ Attitude (Focal)	0.306	4.962	< 0.001***	0.238	Supported
H9*	PEOU $\rightarrow$ Attitude (Focal)	0.249	4.247	< 0.001***	–	Supported
H10	Attitude $\rightarrow$ Purchase Intention	0.488	5.958	< 0.001***	0.238	Supported
H11	Purchase Intention $\rightarrow$ OSB	0.475	7.388	< 0.001***	0.226	Supported

Source: Estimated SEM output (ML). * = Focal hypotheses. ** $p < 0.01$; *** $p < 0.001$. PU = Perceived Usefulness; PEOU = Perceived Ease of Use; ATT = Attitude; OSB = Online Shopping Behaviour. R² for Attitude reflects joint explanation by PU and PEOU (0.238).

Both focal hypotheses are supported. H8 is confirmed: PU exerts a significant positive direct effect on Attitude ($\beta = 0.306$, $z = 4.962$, $p < 0.001$). H9 is confirmed: PEOU exerts a significant positive direct effect on Attitude ($\beta = 0.249$, $z = 4.247$, $p < 0.001$). The two together (PU and PEOU) explain 23.8 per cent of the variance in Attitude ($R^2 = 0.238$). In contrast to the near parity found in previous analysis, the estimated model demonstrates a moderate but consistent difference between PU and PEOU, with the former being the more proximal of the two attitudinal determinants and PEOU still being a significant and important determinant in its own right (0.306 vs. 0.249).

4.5 Mediation: The Indirect Effect of PEOU on Attitude through PU

PEOU also has an indirect influence on Attitude via the established H7 pathway (PEOU $\rightarrow$ PU: $\beta = 0.317$). Table 5 shows the direct, indirect and total effects of PEOU on Attitude.

Table 5: Direct, Indirect, and Total Effects of PEOU on Attitude

Effect Type	Path(s)	Beta (β)	Interpretation
Direct Effect	PEOU $\rightarrow$ ATT (H9)	0.249	Significant; PEOU directly shapes Attitude
Indirect Effect	PEOU $\rightarrow$ PU $\rightarrow$ ATT	0.097 (0.317 $\times$ 0.306)	Partial mediation via PU
Total Effect of PEOU on ATT	Direct + Indirect	0.346	Modestly exceeds PU's direct effect (0.306)

Source: Estimated SEM mediation output. Indirect effect = $\beta(\text{PEOU} \rightarrow \text{PU}) \times \beta(\text{PU} \rightarrow \text{ATT}) = 0.317 \times 0.306 = 0.097$.

The indirect effect of PEOU on Attitude via PU is 0.097 which is not large in absolute value, but has statistical significance, with both pathways significant at $p < 0.001$. The indirect effect added to PEOU's direct effect (0.249) gives an aggregate effect of 0.346, which is now only slightly higher than the direct effect of PU (0.306) as contrasted with the large difference pointed out in the previous analysis. This shows that PEOU is still operating in two ways

(directly on Attitude and indirectly through PU) but the general trend of this dataset is that PEOU and PU complement each other, and both are broadly similar contributors to Attitude, rather than being the dominant contributors to Attitude.

4.6 Common Method Bias Assessment

The single-factor test conducted by Harman (1976) was conducted on all substantive items, to check the potential common method bias (Podsakoff et al., 2003). The common method bias does not seem to be a major concern in the validity of the results, because the largest single unrotated factor accounted for only 28.9 per cent of the total variance (less than 50 per cent).

Discussion of Findings

5.1 Perceived Usefulness as the Primary Driver of Attitude, with PEOU as a Significant Complement

The direct effect of PU on Attitude is statistically larger than the direct effect of PEOU ($\beta = 0.306$ vs. 0.249 , respectively), a pattern that is in line with the literature that shows that PU tends to have a larger direct effect than PEOU in the formation of attitude in the conventional TAM literature (e.g., Davis, 1989; Venkatesh & Bala, 2008; Schepers & Wetzels, 2007) albeit moderate.

The practical benefits of online shopping (time saving, comparing prices, and variety of products) are the more immediate determinants of positive attitudes for first-generation rural digital customers (who are constrained by interfaces in English or imperfect Hindi, by small smartphones, by poor connectivity, and by not having used e-commerce platforms before), and platform manageability (PEOU) is an important but secondary and partly mediated determinant of positive attitudes.

The result is in contrast to previous studies that argue attitudinal similarity between PU and PEOU in low experience or non-metropolitan setting (cf. Ha & Stoel, 2008; Wibasuri et al., 2023), and therefore this finding might be expected. It is, however, in line with the rest of the TAM literature – such as the work of Rathod and Srinu (2022) and Parvez and Khan (2025) in rural India – that continues to highlight the importance of PEOU, albeit less prominent than the PU.

5.2 PEOU as a Dual-Pathway Driver of Attitude

In addition to the direct effect, PEOU also has a significant indirect effect on Attitude through PU (indirect $\beta = 0.097$; total effect = 0.346). This effect is cascading: ease-of-use perceptions feed into the usefulness perceptions, which act as a partial multiplier on attitude, but has a smaller magnitude than originally thought because the ease-of-use perceptions are not directly inducing attitudes.

In practice, decisions around usability (using vernacular language interface, voice search, simplified checkout, easy to navigate catalogues) continue to pay off in terms of attitudinal returns directly (PEOU $\rightarrow$ ATT) as well as indirectly (PEOU $\rightarrow$ PU $\rightarrow$ ATT) for e-commerce businesses targeting rural Bihar. These two levers – usefulness and usability – work together,

if not in isolation, with a little bit more independence of usage these days, as it were. The continued centrality of functional value.

5.3 Sufficiency of PU: Functional Value, Still Matters

The direct effect of PU on Attitude is still important and is the strongest direct path to Attitude in this estimated model ($z = 4.962$, $p < 0.001$, $\beta = 0.306$). This validates that consumers from Darbhanga have strong functional evaluations of online shopping (time savings, more products available, comparing prices, and shopping from home), which in turn are reflected in their attitude.

This is consistent with the study results of Parvez and Khan (2025), which indicated that the PU–attitude relationship was significant even after controlling for government support and information quality in a rural context, and the study results of Ruiz-Herrera et al. (2023) that showed a significant PU–attitude relationship among e-commerce adopters in developing countries. The joint Attitude R^2 of 23.8 per cent suggests that PU and PEOU are a valuable, but incomplete, dual-belief explanation of rural users' attitude formation, leaving open valuable room for other antecedents (such as Trust, Social Influence and Digital Literacy, captured upstream in the E-TAM) to indirectly affect attitude.

5.4 Theoretical Contributions

The present study adds to the TAM theory on multiple bases:

- In the context of a near-parity hypothesis, the broad persistence of the traditional TAM ordering (PU exerts somewhat more direct attitudinal influence than PEOU) even among first generation rural digital consumers, but with a smaller margin than in fully digitally mature, urban samples.
- It confirms a dual-pathway model where there is a direct effect of PEOU on Attitude and an indirect effect of PEOU on Attitude through PU, its total effect (0.346) is modestly stronger than the direct effect of PU on Attitude (0.306), suggesting that usability remains relevant even in situations where usefulness drives it.
- It extends the E-TAM framework with the constructs of Trust, Social influence and Digital Literacy, and extends the framework to a previously under-researched rural context in India (Darbhanga District, Bihar).
- It provides clear SEM evidence, with a large sample size from the rural population of India ($N = 600$), with a model-fit caveat ($RMSEA = 0.045$; $CFI = 0.924$; $R^2_{ATT} = 0.238$) indicating opportunities for instrument improvements in future E-TAM research.

Practical Implications

6.1 For E-Commerce Companies

Functional value communication is the major lever with direct effect on the rural attitude, which is also expected to have indirect effect through the amplification of PU, and hence, e-commerce businesses targeting rural India should focus on functional value communication rather than continue investing in usability.

Specifically, companies should:

- Deliver clear messages that demonstrate practical improvements such as time savings, price comparison, product variety and convenience, at a local level, with the right testimonials and community messages.
- Develop and provide fully localized, vernacular language interfaces (Hindi, Maithili, Bhojpuri), which include voice search and navigation facilities for people with low literacy in rural communities.
- Minimise the cognitive load involved in checkout, payment processes (UPI/COD), and order tracking for first time customers, thus strengthening the indirect PEOU → PU → Attitude pathway.
- Invest in onboarding tools, which will help to show both usefulness and ease of use to low-experience rural users.

6.2 For Policymakers and Development Organizations

There is a significant but partial relationship between PU and PEOU ($R^2 = 0.238$); hence, digital-inclusion initiatives in rural areas of Bihar should focus on making online shopping more functional (through community demonstrations, testimonials and savings calculations) and remain cognitive in terms of training hands-on. E-commerce specific skills like navigating through ecommerce platforms, making payments online and transacting safely should be introduced along with ecommerce digital literacy in programmes like PMGDISHA.

Since the three beliefs (PU, PEOU, and Social Influence and Digital Literacy) each significantly predict the other belief upstream in the E-TAM (Table 4), interventions that build the three beliefs are expected to have cascading effects over the other beliefs and ultimately over Attitude, Purchase Intention, and Online Shopping Behaviour.

Limitations and Future Research

There are a number of restrictions to be made.

First, it is geographically restricted to the District of Darbhanga, Bihar, India and should not be extended to other rural Districts of India or to other developing countries.

Second, the data are cross-sectional, and thus longitudinal inferences cannot be drawn; future research should examine the PU–PEOU–Attitude relationships longitudinally over time as digital experiences build up. Qualitative research would also enable us to understand which features of the platforms are useful for rural consumers and which are easy to use.

Last but not least, a comparison between the rural regions of Bihar and other rural areas of the country (including Uttar Pradesh, Jharkhand, Odisha) would provide an indication of the generality of the current pattern of PU-led development in rural India.

Conclusion

The paper has reported fresh empirical findings as regards online shopping uptake by 600 respondents in rural areas of Darbhanga district, Bihar, India. Covariance-based SEM (CSEM) with Maximum Likelihood estimation was used to test two focal hypotheses: $PU \rightarrow ATT$ and $PEOU \rightarrow ATT$.

The two direct predictors are PU ($\beta = 0.306$, $p < 0.001$) and PEOU ($\beta = 0.249$, $p < 0.001$) which together explain 23.8 per cent of the variance in Attitude toward online shopping. Although somewhat larger, PU's effect is more consistent with the classical TAM model than previous analysis indicated, and PEOU continues to be a strong and statistically significant predictor.

The results of mediation analysis revealed that the indirect path of PEOU through PU (indirect $\beta = 0.097$) was statistically significant, although small, suggesting that the overall effect of PEOU on Attitude (0.346) was still significant, albeit small, when they compared the direct effect of PU on Attitude (0.306), which constituted a complementary dual-pathway mechanism instead of a single dominant belief. There is also acceptable absolute fit to the data, more marginal incremental fit and no major common method bias is found (Harman's single factor = 28.9%).

This means that for e-commerce companies entering the rural market, communication of functional value should be clear and concrete and be the first step, followed by continuing to invest in usability as an attitude-formation lever, rather than an afterthought. A similar challenge for digital-inclusion policymakers is to match functional benefits with practical training in navigating and using the platform, such that consumers' attitudes towards online shopping are reinforced from both sides at once in rural areas.

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