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TRUST SIGNALS FOR STARTUP E-COMMERCE: EFFECTS OF PERCEIVED SECURITY, TRANSPARENCY, AND CREDIBILITY ON ONLINE SHOPPING FREQUENCY IN PAKISTAN

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Abstract

Although e-commerce has seen a boom in Pakistan, consumers remain hesitant to use it, especially with startup sellers, due to data protection concerns and inadequate post-purchase support. Until now, research has mostly focused on individual trust cues that can enhance consumer confidence, leaving a practical gap: which signals prevail when competing cues are present? Using a signal theory framework, we surveyed 200 Pakistani consumers, investigating whether three trust cues: perceived security, transparency, and credibility, can affect online shopping frequency (ordinal measure). Ordered logit regression models, while controlling for age, gender, and education, suggested that each signal significantly predicted heightened shopping frequency when considered in isolation. However, in a competing cues context, credibility emerged as the sole unique predictor. This indicates that, within the realm of startup e-commerce, credibility is the most potent signal, surpassing basic safeguards and disclosures. Our findings offer actionable guidance to resource-constrained startups and contribute to the broader discourse on enhancing consumer trust in Pakistan's emerging e-commerce marketplace.

Introduction

E-commerce has seen an upward trend in recent years, but users are still reluctant to use it because sellers have not established credibility, do not ensure fairness in post-purchase transactions, and do not guarantee the safety of users' personal data. These issues will be pronounced when the seller is a startup with no reputation to back its strength, making it difficult to earn trust (Stinchcombe, 1965). Though the digital commerce system in Pakistan has strengthened (State Bank of Pakistan, 2024), consumer protection, seller's accountability, and dispute handling for sustainable e-commerce growth are still major concerns (UN Trade and Development [UNCTAD], 2024a, 2024b). The trust remains fragile because of scams and low-recourse transactions, especially when sellers are new and unregulated (Siddiqui, 2023).

Handoyo (2024) states that online purchasing decisions are mostly made when trust, low perceived risk, security, and widespread electronic word of mouth exist. Trust-related beliefs are the predictors of online purchasing outcomes (Wang et al., 2022). Current research from Pakistan also shows the same pattern, despite perceived risk and low reputation, electronic trust is most commonly associated with intention, loyalty, and downstream e-commerce behaviors (Ashiq et al., 2024; Habib et al., 2022; Hussain et al., 2023; Qalati et al., 2021; Zaman et al., 2025). This is why Malik et al. (2025) noted that trust issues are not merely theoretical but essential concerns for consumers, despite security and privacy concerns being the salient inhibitors.

Since trust cues are essential for transforming an intention to buy online into actual buying behavior, it is important to know which cues carry the most weight. Contrary to common sense belief that many cues would work in a single buying decision, most studies examine a single cue in isolation, such as perceived security risk, which masks the relative importance of different signals in a single shopping decision (Handoyo, 2024; Qalati et al., 2021). In this study, we have focused on three cues: perceived security, transparency, and credibility, which are repeatedly cited in contemporary e-commerce and platform research. Perceived security, as rooted in perceived web security (Salisbury et al., 2001) that is further reinforced by Singh et al. (2004) who link security measures to trusting beliefs, is treated here as consumers' belief that e-commerce platforms can transmit and protect sensitive personal/payment information without undue security lapse and unauthorized exposure. On the other hand, perceived transparency reflects consumers' belief that the seller makes key product-related information (descriptions, pricing, return policy, and the identities of the contractual parties) observable, comprehensible, and intentionally disclosed (Montecchi et al., 2024). Veltri et al. (2023) observed that increased transparency on online platforms could increase trust in online activities and change users' choice behaviors. Lastly, perceived credibility is users' judgement about sellers' communication as believable, accurate, and trustworthy. This operational definition of credibility aligns with the main concern in e-commerce where information quality directly shapes consumers buying behavior (Pooja & Upadhyaya, 2024). Azhar et al. (2024) further show that credibility-laden judgments are behaviourally relevant in the Pakistan digital purchase context.

Grounded in the logic of multiple cues transforming a e-buying intention into a e-buying behavior, the present study examines whether perceived security, transparency, and credibility predict online shopping frequency among Pakistani consumers, with a specific focus on startup e-commerce contexts. We aim to (a) test the direct associations between each cue and online shopping frequency and (b) assess their relative predictive value when the cues compete, and key demographics are controlled.

Theoretical Background and Hypotheses

The current study draws on signaling theory, which explains how observable cues reduce asymmetrical information patterns when it is not possible to directly verify the underlying quality at the moment of decision (Spence, 1973). Because consumers cannot physically inspect products, verify sellers' integrity in person, or audit data-handling procedures, asymmetry is structurally high in e-commerce. As a result, consumers often make their judgments based on information embedded in the platform, content, and transaction flows (Handoyo, 2024; Veltri et al., 2023). Since startup sellers have a limited track record, amplifying buyers' skepticism, trust should be built through signals that are difficult to fake and costly to sustain (Stinchcombe, 1965). Importantly, signals are not evaluated one-by-one in real shopping journeys. When multiple cues co-occur, the incremental influence of any one cue depends on whether it adds information beyond the others (Wang et al., 2022). This is why estimating competing cues is not merely a modeling preference; it is a test of which signals remain informative when others are held constant.

Perceived Security and Online Shopping Frequency

Perceived security reflects consumers' confidence regarding the protection of their personal and payment information during or after the e-buying process. Handoyo (2024) highlights a significant correlation between perceived security and trust in e-commerce setups. Because the likelihood of fraud in online transactions is higher, the security measures taken by the seller affect trust dynamics (Singh et al., 2024). Given its significant role in shaping online purchasing decisions, security perception will remain theoretically prominent in shaping shopping frequency in Pakistan (Malik et al., 2025). Thus, our first hypothesis states:

H1: Perceived security is positively associated with online shopping frequency.

Perceived Transparency and Online Shopping Frequency

Perceived transparency refers to the extent to which consumers believe essential information is adequately disclosed and comprehensible, thereby minimizing uncertainty about costs, delivery processes, return policies, and the roles of various marketplace participants (Montecchi et al., 2024). Increased transparency can enhance consumer trust in digital transactions and influence decision-making (Veltri et al., 2023). Transparency about information provided to the buyer enables them to better predict potential problems, particularly when engaging with startups or less familiar sellers. Therefore, we hypothesize:

H2: Perceived transparency is positively associated with online shopping frequency.

Perceived Credibility and Online Shopping Frequency

Perceived credibility, which is influenced by the quality of information and the authenticity of reviews, refers to how consumers assess the reliability of sellers' claims and marketplace information. This remains a crucial construct, especially once fake review environments and manipulation undermine consumer confidence (Pooja & Upadhyaya, 2024). Wang et al. (2022) substantiate the assertion that credible beliefs are significantly correlated with purchasing outcomes in their meta-analysis. Azhar et al. (2024) further demonstrate that source credibility in Pakistan, within an online purchasing context, remains pivotal in shaping purchase-related behaviors. Therefore, we hypothesize:

H3: Perceived credibility is positively associated with online shopping frequency.

Method

Data Collection and Sample

This study was conducted in Pakistan using convenience sampling, recruiting active e-commerce users. This cross-sectional data were collected using a pre-validated questionnaire administered via a paper-based survey, with voluntary and anonymous participation. The survey included a cover note that assured participants that no personally identifiable information (e.g., names, phone numbers) would be collected and that the data would be used for academic purposes only (Podsakoff et al., 2003). To improve response quality, the instrument included non-leading, simple sentences and an attention-trap item (an instructed-response check) embedded within the questionnaire. We removed cases that failed the attention check because that indicated inattentive or careless responding, which can bias reliability and inflate observed associations (Kung et al., 2018). The dataset was further screened for completeness (missing data), response-pattern issues (e.g., straight-lining), and logical consistency before finalizing the analytical sample.

A total of 222 questionnaires were administered. After screening for missingness, attention-check failures, and invalid response patterns, 22 cases were excluded, resulting in a final sample of n = 200. This sample size exceeds common minimum recommendations for multivariate analysis and is consistent with guidance emphasizing adequate respondent-to-item ratios for stable estimation (Hair et al., 2018). Demographic characteristics of the final sample are summarized in the results section.

Measures

The study employed established scales that were adapted to the e-commerce context under investigation. In line with the methodological rigor consistent with the measurement literature (Hinkin, 1998; DeVellis, 2017), two subject matter experts and one psychometrician were consulted to ensure that the theoretical meaning of each construct was preserved while the wordings were updated. Following adaptation, all items were subjected to reliability and validity assessments to confirm their psychometric integrity.

Perceived Security. It was measured using three items adapted from Salisbury et al. (2001). Items reflected respondents' perceptions of e-commerce platform security and the extent to which security features influence purchasing behavior. Responses were recorded on a 5-point Likert Scale (1 = Strongly Agree to 5 = Strongly Disagree), which

were reverse-coded. The current scale demonstrated strong reliability (α = .72). Sample items included: I feel secure providing my personal information on this e-commerce platform.

Perceived Information Transparency. It was assessed using three items adapted from Zhou et al. (2018). The scale captures consumers' perceptions of clarity and openness and their impact on purchasing behavior. Respondents were to indicate their agreement on a Likert scale (1 = Strongly Agree to 5 = Strongly Disagree), which were reverse-coded before analysis. current scale showed strong reliability (α = .73). A sample item included: Clear return and exchange policies make me more likely to make a purchase on this e-commerce platform.

Perceived Credibility. Items were adapted using Singh et al.'s (2024) scale. They captured the role of brand reputation and customer feedback in shaping consumer confidence and purchase decisions in e-commerce. Respondents indicated their agreement using a 5-point Likert scale (1 = Strongly Agree to 5 = Strongly Disagree), which was reverse-coded for better understanding and use. The current scale showed strong reliability (α = .84). Sample item included: E-commerce brand that has a good reputation influences my purchasing decision.

Analysis strategy

Since we captured the online shopping frequency (DV) as an ordinal variable (1 = Never to 5 = Very Frequently), ordinal logistic regression (proportional odds/ordered logit) was employed to preserve the rank-ordering of the response categories and avoid assuming equal intervals across frequency levels. Also, since the three IVs, perceived security, transparency, and credibility, were originally anchored from 1= strongly agree to 5 = strongly disagree, we reverse-scored them so that higher perceived security, transparency, and credibility could be reflected, improving the interpretability of coefficients and correlations.

Descriptive analyses, internal consistency (Cronbach α), and zero-order correlations among study variables were calculated. Since scales were adapted from other validated scales, composite reliability (CR) and average variance extracted (AVE) were calculated (Fornell & Larcker, 1981). CR is a reliability indicator that complements α, whereas AVE supports convergent validity (Hair et al., 2018).

To mitigate threats to cross-sectional data from common method bias, we implemented procedural safeguards, including assurances of confidentiality and screening for response quality using attention traps. In addition, we conducted a post hoc diagnostic using a single-factor test across the nine perceptual-cue items (Kung et al. 2018; Podsakoff et al., 2003). For hypothesis testing, we adopted a two-step approach: first, we estimated three direct-effect ordered logit models, each incorporating one independent variable (IV) along with relevant control variables; second, we analyzed a competing IV model where all three IVs were included simultaneously, while controlling for demographic factors such as age, gender, and education. To assess multicollinearity, we utilized variance inflation factor (VIF) diagnostics, ensuring values remained below 2.2. All statistical procedures were performed using SPSS (v. 21).

Results

Sample Characteristics

The final sample consisted of a balanced gender group [n = 200; Male = 96, Female = 104] and was concentrated in the 19-45 age group (69.5%). 97% of the respondents possessed a Bachelor's or Master's degree. Barring a small portion of respondents (4.5%) who had never had any online shopping experience, most were avid online shoppers. As a diagnostic check, a single-factor solution across the nine cue items accounted for 49.8% of the total variance, which is below the commonly referenced 50% heuristic, suggesting that common method variance was unlikely to fully account for the observed relationships. However, as emphasized in prior work, such tests are only indicative. Therefore, results are interpreted alongside procedural safeguards and the study's limitations, including its cross-sectional design (Podsakoff et al., 2003; Kung et al., 2018).

Variables Descriptives (Reliability, Composite Reliability, Average Variance Extracted, and Zero-Order Correlations)

Table 1 describes the variables. Respondents reported moderate perceived security (M = 3.33, SD = 0.72), relatively high perceived transparency (M = 3.92, SD = 0.74), and high perceived credibility (M = 4.00, SD = 0.74). Internal consistency was acceptable across short three-item scales (α = .72 to .84). Composite reliability further supported construct reliability (CR = .74 to .86), while AVE indicated adequate convergent validity, particularly for credibility (AVE = .68). Zero-order correlations showed that all three IVs were positively associated with shopping frequency (PS: r = .37, PT: r = .36, PC: r = .48; all p < .001), and the cues were also intercorrelated (PS–PT: r = .47; PT–PC: r = .67; PS–PC: r = .56; all p < .001), consistent with the idea that consumers often perceive these trust-related signals as a bundle in startup e-commerce contexts.

Ordinal Regression Tests of Hypothesis

We estimated a series of ordinal logistic regression (ordered logit) models to test H1-H3, predicting online shopping frequency (1–5) while controlling for age, gender, and education in all specifications. Table 2 reports the estimated odds ratios (ORs) for each model.

Table 1

Variable Descriptives (Mean, Reliability, Composite Reliability, Average Variance Extracted, and Zero-Order Correlations

Variable	M	SD	α	CR	AVE	1	2	3
1. Perceived Security (PS)	3.33	.72	.72	.74	.5	-	-	-
2. Perceived Transparency (PT)	3.92	.74	.73	.76	.55	.47***	-	-
3. Perceived Credibility (PC)	4	.74	.84	.86	.68	.56***	.67***	-
4. Online shopping frequency	3.28	.99	-	-	-	.37***	.36***	.48**

Note. α = Cronbach's alpha; CR = Composite Reliability; AVE = Average Variance Extracted; ***p < .001

Perceived security was positively associated with online shopping frequency in the direct-association model (M1: B = 0.92, SE = 0.23, Wald χ^2 = 15.71, p < .001), supporting H1. The corresponding odds ratio indicated that a one-unit increase in perceived security was associated with 2.50 times higher odds of reporting a higher shopping-frequency category (OR = 2.50, 95% CI [1.59, 3.93]), net of controls. Perceived transparency was also positively associated with shopping frequency when entered alone with controls (M2: B = 0.78, SE = 0.20, Wald χ^2 = 14.97, p < .001; OR = 2.18, 95% CI [1.47, 3.23]), supporting H2. Finally, perceived credibility (H3) showed a robust positive association with online shopping frequency (M3: B = 1.35, SE = 0.22, Wald χ^2 = 36.06, p < .001), implying nearly a fourfold increase in the odds of reporting a higher frequency category (OR = 3.86, 95% CI [2.48, 6.00]).

We estimated a competing-cues model including perceived security, transparency, and credibility together with controls (M4). Adding the three cues significantly improved fit relative to the control-only model (LR $\chi^2(3)$ = 39.85, p < .001). In this joint model, credibility remained the only unique predictor of online shopping frequency (B = 1.15, SE = 0.28, Wald χ^2 = 16.65, p < .001; OR = 3.17, 95% CI [1.82, 5.51]). In contrast, perceived security (B = 0.30, p = .244) and transparency (*B* = 0.11, *p* = .654) did not retain statistical significance once credibility was included, suggesting that credibility captures most of the incremental explanatory signal when these trust cues are considered together. Among controls, age showed a marginal negative trend in the full model (*p* =

.069), whereas gender and education were not significant predictors.

Table 2
Ordinal Regression Test

Model	Predictor	B	SE	Wald χ^2	p	OR	95% CI for OR
M1	Perceived Security	.92	.2	15.71	< .001	2.5	[1.59, 3.93]
	Age	-.2	.1	3.91	.048	0.8	[0.68, 1.00]
	Gender	.22	.3	0.65	.419	1.3	[0.73, 2.15]
	Education	.39	.2	3.49	.062	1.5	[0.98, 2.21]
M2	Perceived Transparency	.78	0.2	14.97	< .001	2.2	[1.47, 3.23]
	Age	-.2	0.1	6.25	.012	0.8	[0.65, 0.95]
	Gender	.4	0.3	2.11	.147	1.5	[0.87, 2.54]
	Education	.42	0.2	4.05	.044	1.5	[1.01, 2.27]
M3	Perceived Credibility	1.35	.2	36.06	< .001	3.9	[2.48, 6.00]
	Age	-.2	.1	4.93	.026	0.8	[0.67, 0.97]
	Gender	.21	.3	0.57	.451	1.2	[0.71, 2.13]
	Education	.28	.2	1.8	.18	1.3	[0.88, 1.99]
M4	Perceived Security	0.3	0.3	1.36	0.244	1.4	[0.82, 2.23]
	Perceived Transparency	0.11	0.2	0.2	0.654	1.1	[0.70, 1.78]
	Perceived Credibility	1.15	0.3	16.65	< .001	3.17	[1.82, 5.51]
	Age	-0.2	0.1	3.3	.069	0.8	[0.68, 1.01]
	Gender	0.17	0.3	0.37	.541	1.2	[0.68, 2.07]
	Education	.25	.2	1.46	.226	1.3	[.85, 1.95]

Note. All models are proportional-odds ordinal logistic regressions. Controls: age, gender, and education. Model M1: Percieved Security and Control; Model M2: Perceived Transparency and Controls; Model M3: Perceived Credibility and Controls; Model M4: Perceived Security, Transparency, Credibility and Control; B = log-odds Coefficient; SE = Standard Error; Wald $\chi^2 = (B/SE)^2$; CI = 95% confidence interval for OR. Model improvement vs controls-only (likelihood-ratio tests): M1: LR χ^2 (1) = 15.85, $p < .001$; M2: LR χ^2 (1) = 15.10, $p < .001$; M3: LR χ^2 (1) = 38.02, $p < .001$; M4: LR χ^2 (3) = 39.85, $p < .001$.

Discussion

Despite the rise of e-commerce in Pakistan, consumers remain reluctant to use these platforms for various reasons, including data security concerns and post-purchase behavior. Compared to most research that focuses on a single trust cue, we examined whether three cues: perceived security, transparency, and credibility, predict online shopping frequency among Pakistani consumers. We drew on signal theory and treated these signals as cues that help consumers reduce information asymmetry when they cannot fully verify seller quality, intent, or reliability at the time of purchase. We have observed that the three trust cues help users decide to purchase online in isolation, but credibility is the sole unique predictor when all three cues are jointly observed. Each of the three cues, perceived security, transparency, and credibility, when entered separately in a logistic regression model along with

controls (age, gender, and education), predicted online shopping frequency. More specifically, perceived security (M1: B = .92, p < .001; OR = 2.50), transparency (M2: B = .78, p < .001; OR = 2.20), and credibility (M3: B = 1.35, p < .001; OR = 3.90) each increased the odds of belonging to a higher online shopping frequency category. Our findings align well with recent syntheses (Handoyo, 2024; Wang et al., 2022), showing that trust-related cues are meaningfully linked to e-commerce purchasing outcomes. Our results also align with findings in the Pakistani e-commerce market, where these trust-related signals were influential in online purchasing decisions (Azhar et al., 2024; Habib et al., 2022; Malik et al., 2025). However, once the three trust cues were entered in the model simultaneously, along with controls (age, gender, and education), credibility remained the only statistically significant unique predictor (B = 1.15, p < .001; OR = 3.20, 95% CI [1.82, 5.51]). In other words, credibility has shown an incremental signal when other cues were held constant. It means that the credibility construct is more diagnostic than others when consumers cannot directly observe underlying quality and reliability is questioned (Spence, 1973). In line with our findings, Pooja and Upadhyaya (2024) noted that marketplace information quality and review authenticity, which enhance sellers' credibility, are central to how consumers form trust judgments in a digital marketplace, especially when manipulation risk is high.

A plausible explanation for the current result is that security and transparency meet baseline expectations. Consumers expect them as a minimum level of payment protection before they are willing to make a transaction. However, once these basics are met by the seller, they may no longer differentiate between sellers, especially for startups that aim to meet the minimum requirements of standard policy templates, such as security and transparency. In this context, the other construct that is more likely to determine which sellers feel real and dependable is credibility, because credibility speaks to truthfulness rather than just another cue for safeguards and disclosures. Our explanation is supported by recent work on online trust, where security measures can shape trusting beliefs, but consumers' overall belief in the sellers' reliability and the authenticity of information often drives purchase behavior (Handoyo, 2024; Singh et al., 2024).

Our interpretation of the findings also fits Pakistan's market realities. Discussions on policy and consumer protection repeatedly underscore that sustainable online market growth depends on credible dispute resolution, enforceable rights, and transparent market conditions (Ministry of Commerce, Government of Pakistan, 2025; UNCTAD, 2024a). However, consumers experience the marketplace through concrete cues, sellers' responsiveness, consistent delivery performance, authentic feedback, and believable product claims. These impressions, which are predominantly led by credibility constructs, explain why credibility remained strong even when other cues in the present study are controlled.

Another observation in the current study was that demographic controls did not occupy a dominant position. Gender was non-significant in all models, whereas education produced mixed results. On the other hand, age showed a small negative relationship with online shopping frequency in the direct models, and this relationship remained marginal in the competing-cue model. One plausible reason is that a few people are not comfortable using digital products, their habits are not tuned to online purchasing, and risk appetite while shopping online differs across age groups. Therefore, we surmise that future work can test the relationship directly rather than inferring from controls alone.

Practical Implications for E-Commerce Startups in Pakistan

This study guides newly set-up e-commerce businesses in systematically building credibility across the business. Security and transparency are important and should not be forgotten, but they do not give any advantage once consumers consider multiple trust cues while making an online purchase decision. Therefore, an e-commerce startup should invest in measures to build credibility. These measures may include verifiable product information, consistent store

identity signals, clear return policies, and visible post-purchase service. Our contention aligns with recent evidence that trustworthy information environments and the authenticity of reviews shape trust and purchase outcomes (Pooja & Upadhyaya, 2024). Second, as part of a credibility-building measure, review governance should be instituted. Consumers discount sellers when review ecosystems look manipulated or inconsistent, which directly harms credibility-based judgments (Peña-García et al., 2024). Third, the startups should base their credibility-building measures on instituting security and transparency at a must-have level, as they are repeatedly reinforced in policy guidance and the consumer protection agenda, and failure to meet this standard might lead to rapid trust breakdown (Government of Pakistan, 2025; UNCTAD, 2024a).

Limitations and future research

Our study has contributed meaningfully to understanding that credibility-enhancing measures are superimposed on the minimum requirements of security and transparency. However, this study is not without limitations. First, this is a cross-sectional study, and therefore, temporal ordering cannot be confirmed. Future studies should test whether improvements in credibility signals precede increases in shopping frequency using time-lagged designs or field experiments. Second, self-reports increase the risk of common-method bias. Though we used procedural safeguards, method-related inflation cannot be ruled out (Memon et al., 2023; Podsakoff et al., 2024). Third, credibility likely reflects several sub-elements, such as information accuracy and expectations for complaint handling. Future work should explore these components and test moderators that matter in Pakistan, such as digital literacy and prior fraud exposure.

Conclusion

Since consumers cannot verify a product before purchasing in e-commerce, they look for signals that reduce uncertainty about their decision to buy. In this study, we examined three signals: perceived security, transparency, and credibility. Perceived security and transparency are important; however, credibility emerged as the most robust cue when signals were jointly considered in a single model. It implies that founders must maintain baseline security and clear disclosures while prioritizing credibility-building measures that make the seller feel reliable and truthful throughout the customer journey.

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