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The Logistics Service Quality - Customer Satisfaction Paradox in Rural Indian E-Commerce

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ABSTRACT

E-commerce in India is rapidly extending beyond metropolitan areas, with rural markets emerging as critical growth frontiers. However, the success of rural e-commerce hinges on logistics service quality (LSQ), an area underexplored in geographically constrained contexts. This study investigates the relationship between LSQ and customer satisfaction in the rural Kumaon Division of Uttarakhand, marked by mountainous terrain, dispersed settlements, and infrastructural limitations. Survey data from 385 rural customers across 24 villages in six districts were analyzed using descriptive statistics and regression analysis. Findings further revealed a statistically significant yet counterintuitive negative relationship between LSQ and satisfaction, indicating that improved service quality may elevate customer expectations, which, if unmet, translate into dissatisfaction. This paradox highlights the unique dynamics of rural logistics, where conventional urban-centric service models fail to capture local realities. The study contributes to LSQ theory by offering rare empirical evidence from a remote rural setting and advances practice by underscoring the need for context-specific, expectation-sensitive strategies to enhance rural customer satisfaction in emerging e-commerce markets

Keywords: E-commerce, Logistics Service Quality, Customer Satisfaction, Rural Consumers, Kumaon Division, Rural E-Commerce, Expectation–Performance Gap, Service Quality Management

INTRODUCTION

E-commerce has transformed consumer markets globally, extending convenience and accessibility well beyond metropolitan areas. In India, while urban markets have driven the first wave of digital retail, rural regions are increasingly emerging as the next growth frontier. With rising smartphone penetration, digital literacy, and improved payment systems, rural households are gradually adopting online shopping. Yet, this expansion is constrained by one of the most decisive factors in rural commerce i.e. logistics. Unlike urban supply chains that benefit from dense infrastructure and standardized service models, rural logistics often faces terrain-related challenges, inadequate connectivity, and fragmented demand patterns.

Logistics service quality (LSQ) has been identified as a critical determinant of customer satisfaction in e-commerce. Classic models such as the SERVQUAL framework **(Parasuraman *et al.*, 1988)** and dimensions of LSQ **(Mentzer *et al.*, 2001)** emphasized empathy, reliability, responsiveness, assurance, and timeliness as key performance drivers. However, most of these frameworks have been tested in urban or developed market contexts, where infrastructure and customer expectations differ significantly from those in rural India. A one-size-fits-all logistics strategy may therefore overlook the distinct needs of geographically dispersed customers in rural settings.

Existing research largely confirms that improvements in service quality enhance customer satisfaction. Yet, in emerging markets, studies also highlight paradoxical outcomes i.e. customers may remain dissatisfied even when

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service providers attempt to improve reliability or timeliness, particularly when infrastructural gaps persist. This suggests that the LSQ–customer satisfaction link may behave differently in rural contexts, warranting a closer examination. The Kumaon Division of Uttarakhand represents a particularly relevant case. Characterized by mountainous terrain, scattered rural settlements, and infrastructural bottlenecks, it poses distinct logistical challenges for e-commerce firms. While the region has witnessed growing adoption of online shopping, customer satisfaction remains inconsistent, raising questions about whether conventional LSQ models adequately explain outcomes in such contexts.

Against this backdrop, the present study explores the relationship between logistics service quality and customer satisfaction in rural e-commerce logistics. Specifically, it investigates whether improvements in LSQ dimensions generate proportional increases in customer satisfaction, or whether structural constraints lead to paradoxical outcomes. By focusing on the underexplored rural context of Kumaon, this study aims to extend the theoretical understanding of LSQ, address a significant empirical gap, and generate managerial insights for sustainable rural e-commerce growth. The research objectives of the study are mentioned below.

RESEARCH OBJECTIVES

- To examine the relationship between logistics service quality (LSQ) and customer satisfaction (CS) in rural e-commerce markets of Kumaon Division.
- To test whether higher LSQ consistently leads to higher satisfaction or produces paradoxical effects due to elevated expectations.

LITERATURE REVIEW

The relationship between logistics service quality and customer satisfaction has been central to service management and logistics research. Foundational theories provide a basis for understanding how customers evaluate services, while logistics-specific models extend these insights to supply chain and delivery contexts.

Theoretical Foundations

Disconfirmation Theory **(Oliver, 1980)** remains the dominant lens, positing that customer satisfaction depends on the gap between expectations and perceived performance. In logistics, this implies that high expectations such as for timely or accurate deliveries may amplify dissatisfaction when unmet. The SERVQUAL model **(Parasuraman *et al.*, 1988)** operationalized service quality through five dimensions (reliability, responsiveness, tangibles, assurance, empathy), which continue to inform logistics evaluations, particularly regarding reliability and responsiveness. Complementing this, Customer Value Theory **(Zeithaml, 1988)** emphasized the perceived trade-off between benefits and sacrifices, a trade-off that is especially salient in rural settings where costs, delays, and infrastructural constraints are greater. **Mentzer *et al.* (2001)** advanced the concept further with a multidimensional LSQ model i.e. timeliness, order condition, information, and contact quality, directly capturing logistics-specific realities. Finally, Contingency Theory **(Burns and Stalker, 1961)** underlined that service effectiveness depends on environmental fit, a perspective critical for rural markets like Kumaon where terrain and infrastructure heavily constrain logistics performance.

Empirical Evidence on LSQ and Customer Satisfaction

Empirical studies generally affirm that higher LSQ improves customer satisfaction. Early works **(Daugherty *et al.*, 1998; Collier and Bienstock, 2006)** identified timeliness, responsiveness, and communication as key drivers, while **Bienstock *et al.* (2008)** and **Gawankar *et al.* (2020)** confirmed the importance of reliability and information quality through structural models. In the Indian context, studies highlighted delivery reliability, responsiveness, and reverse logistics **(Seth *et al.*, 2005; Saxena and Srivastava, 2012; Meena and Sarmah, 2012; Yadav and Singh, 2017)** as central to customer satisfaction. More recent contributions **(Chaurasia *et al.*, 2022; Kumar *et al.*, 2022)** suggested that rural and post-pandemic customers now expect faster, technology-enabled, and context-sensitive services. However, these studies predominantly reflected urban or semi-urban realities, where service infrastructure is relatively robust.

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Gaps and Research Contribution

Despite broad consensus on the positive LSQ– customer satisfaction relationship, rural and geographically constrained markets remain underexplored. Studies that do touch on such contexts **(Yang *et al.*, 2011; Roy and Tripathy, 2021)** emphasized last-mile challenges and communication breakdowns, but systematic evidence on how rural customers evaluate LSQ dimensions is limited. More importantly, the assumption of a linear positive LSQ–customer satisfaction link has gone largely unchallenged. This study addresses both gaps by examining LSQ and customer satisfaction in the rural Kumaon Division of Uttarakhand, a region marked by logistical complexity and by testing whether higher LSQ necessarily translates into higher customer satisfaction. In doing so, it not only extends service quality theory to a new geographical context but also uncovers a paradoxical relationship that challenges conventional wisdom and informs context-specific e-commerce strategies.

Drawing on Disconfirmation Theory and prior LSQ research, this study proposes the following hypotheses:

- **H_0:** There is no significant relationship between logistics service quality and customer satisfaction in rural areas of the Kumaon Division of Uttarakhand.
- **H_1:** There is a significant relationship between logistics service quality and customer satisfaction in rural areas of the Kumaon Division of Uttarakhand.

RESEARCH METHODOLOGY

Research Design

This study employed a descriptive research design to examine the relationship between Logistics Service Quality (LSQ) and Customer Satisfaction (CS) in rural e-commerce settings. A structured questionnaire was developed using established scales and administered through in-person interviews, telephonic surveys, and online forms (Google Forms), depending on where the respondent lived and what technology they had access to. Responses were recorded on a five-point Likert scale, capturing perceptions of LSQ dimensions and overall customer satisfaction with logistics services.

Area of Study and Population

The study was conducted in the Kumaon Division of Uttarakhand, India, a rural region characterized by mountainous terrain, dispersed settlements, and underdeveloped logistics infrastructure. These contextual challenges make it an appropriate setting to evaluate logistics service quality in rural e-commerce. The target population comprised rural customers who had received e-commerce deliveries within the past six months from 10 major logistics providers such as Ekart, Delhivery, DTDC, India Post, Blue Dart, Shadowfax, Ecom Express, XpressBees, Safexpress and Gati.

Sampling Design and Sample Size

A multistage stratified mixed sampling technique has been used to examine the relationship between customer satisfaction and logistics service quality in Kumaon Division's rural areas Data were collected from 24 villages spanning six districts of Kumaon. In this study, sampling was done in four steps i.e. first districts, then tehsils, then villages, and finally respondents. To ascertain that the sample was representative, proportionate stratified sampling based on projected rural populations for 2024 was used at the district and tehsil levels for allocation of respondents. However, the selection of tehsils was done through purposive sampling based on high and low-accessibility tehsil. Further, at the village level, disproportionate stratified sampling was used to make sure that both high and low accessibility villages were well represented. The mixed method ensured that the data is statistically valid and that all types of accessibility conditions in the Kumaon Division of Uttarakhand are represented.

The final sample size of 385 rural e-commerce consumers was determined using the Cochran's formula for an infinite population, assuming a 95% confidence level and a 5% margin of error.

In social sciences, this statistical approach is widely used to make sure that the sample size is sufficiently large to get valid and generalizable results. The formula used is expressed as:

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$$n_0 = \frac{Z^2 \cdot p \cdot (1-p)}{e^2}$$

Where:

- Z = Z-value for 95% confidence level = 1.96
- p = assumed proportion of the population =0.5 (maximum variability)
- e = desired margin of error = 0.05 (margin of error)

Thus, the minimum sample size needed was about 384 respondents. The final sample was rounded up to 385 respondents to keep the distribution even and to deal with possible errors or non-responses. After data cleaning and exclusion of incomplete responses, a final sample of 385 rural customers was retained for analysis. This sample size was considered robust for regression-based analysis.

Measurement of Variables

Two variables were measured using validated, adapted scales which are further mentioned below.

- **Logistics Service Quality (LSQ):** Items adapted from Mentzer *et al.* (2001), covering timeliness, reliability, responsiveness, communication, and product condition.
- **Customer Satisfaction (CS):** A three-item measure reflecting overall customer satisfaction with e-commerce logistics services, adapted from prior consumer behaviour research.

The questionnaire was pre-tested with 20 rural respondents to ensure clarity, contextual fit, and face validity.

Reliability and Validity of Variables

Internal consistency was tested using Cronbach's alpha. Both constructs exceeded the 0.70 threshold recommended by Nunnally (1978). Table 1 demonstrates the reliability analysis of variables and is described below.

Table 1: Reliability Analysis of Variables

Variables	No. of items	Cronbach's Alpha (α)	Interpretation
Logistics Service Quality (LSQ)	7	0.840	Good internal Consistency
Customer Satisfaction (CS)	3	0.719	Acceptable internal Consistency

Further, validity was checked by construct validity, convergent validity and discriminant validity and detailed below.

- **Construct Validity:** Construct validity was assessed through Confirmatory Factor Analysis (CFA). Standardized factor loadings were above 0.50, and model fit indices demonstrated strong adequacy ($\chi^2/df < 3.0$, RMSEA < 0.08, CFI/TLI > 0.95, GFI/AGFI > 0.90).
- **Convergent Validity:** Convergent validity was established via Average Variance Extracted (AVE) and Composite Reliability (CR). It was supported by Average Variance Extracted (AVE) > 0.50 and Composite Reliability (CR) > 0.70.
- **Discriminant Validity:** Discriminant validity was confirmed using the Fornell–Larcker criterion, as the square root of AVE for each construct exceeded inter-construct correlations.

Table 2 and Table 3 below illustrates the convergent validity analysis and Fornell–Larcker matrix (√AVE in diagonal).

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Table 2: Convergent Validity Analysis

Variable	Items	AVE	CR	Interpretation
Logistics Service Quality (LSQ)	7	0.648	0.872	Valid
Customer Satisfaction (CS)	3	0.588	0.772	Acceptable

Note: Both constructs exceeded recommended thresholds (AVE > 0.50; CR > 0.70), indicating strong convergence of items within constructs.

Table 3: Fornell–Larcker Matrix (√AVE in Diagonal)

Variable	√AVE	LSQ	CS
Logistics Service Quality (LSQ)	0.805	0.805	0.67
Customer Satisfaction (CS)	0.767	0.67	0.767

Note: The diagonal values (√AVE) exceeded inter-construct correlations, confirming that LSQ and CS were empirically distinct.

Thus, the reliability, construct, convergent, and discriminant validity analysis confirmed that the LSQ and CS measures were psychometrically sound. This provided a robust foundation for testing the hypothesized relationship between logistics service quality improvements and customer satisfaction in rural Kumaon.

RESULTS AND DATA ANALYSIS

Data were analyzed using SPSS. The hypothesized relationship between LSQ (independent variable) and CS (dependent variable) was tested using descriptive statistics and simple linear regression. This method was chosen because the dependent variable (CS) was continuous, and the study sought to assess the strength and direction of the linear relationship.

Descriptive Statistics of Service Quality and Customer Satisfaction

Descriptive statistics for LSQ and CS was performed to examine the relationship between them. Key observations are listed below.

- The mean value for CS (12.15) indicated moderate overall satisfaction, suggesting that customers perceive services as adequate but with room for improvement.
- The mean value for LSQ (13.13) was higher than CS, highlighting a perceptual gap: operationally, service quality is strong, yet it does not fully translate into customer satisfaction.
- Standard deviations (CS: 2.06; LSQ: 2.00) indicated moderate dispersion, with service quality showing slightly more consistency than satisfaction, likely due to standardized operational practices.

Further, comparative insights demonstrated:

- The higher mean for LSQ relative to CS which suggested that satisfaction is multi-dimensional, influenced not only by technical service quality but also by emotional, relational, and expectation-based factors.
- Variance patterns showed that while LSQ is delivered consistently, customer satisfaction fluctuates due to varying expectations, experiences, and external factors such as delivery challenges in rural Kumaon.

Table 5 further presents the descriptive statistics for LSQ and CS based on responses from 385 rural e-commerce customers.

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Table 5: Descriptive Statistics of LSQ and CS

Variable	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Customer Satisfaction (CS)	385	6.00	18.00	12.15	2.06	4.23
Logistics Service Quality (LSQ)	385	7.00	19.00	13.13	2.00	4.01

Regression Analysis of Logistics Service Quality on Customer Satisfaction

A simple linear regression analysis was conducted to examine the effect of LSQ on CS. The model summary, ANOVA, and regression coefficients are summarized below.

Table 6: Model summary: Impact of LSQ on CS

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.104[a]	.011	.008	2.04807
a. Predictors: (Constant), Service quality				

- The correlation coefficient (R = 0.104) indicated a weak positive linear relationship between LSQ and CS.
- R^2 = 0.011 suggested that LSQ alone explains only 1.1% of the variance in CS, indicating that other factors such as product quality, pricing, and customer expectations, contribute more significantly to customer satisfaction.

Table 7: ANOVA results for the Impact of LSQ on CS

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	17.423	1	17.423	4.154	.042[b]
	Residual	1606.536	383	4.195		
	Total	1623.958	384			
a. Dependent Variable: Customer Satisfaction						
b. Predictors: (Constant), Service quality						

- The F-value (4.154, p = 0.042) indicated that the regression model is statistically significant at the 5% level.
- This result allowed rejection of H_0, confirming that LSQ significantly affects CS, albeit modestly, in rural Kumaon.
- The relatively low SSR relative to SSE highlighted that logistics service quality, though important, is only one of several drivers of customer satisfaction.

Table 8: Coefficients of Regression Estimates for the Impact of LSQ on CS

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.550	.693		19.546	.000
	Service quality	-.106	.052	-.104	-2.038	.042

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a. Dependent Variable: Customer Satisfaction

- The unstandardized coefficient for LSQ (B = −0.106) indicated that a one-unit increase in perceived service quality is associated with a 0.106 unit decrease in CS, holding other factors constant.
- The negative Beta (−0.104) confirmed a weak but statistically significant inverse relationship.
- This counterintuitive effect can be explained by the expectation–performance gap: as service quality improves, rural customers may raise expectations, which, if unmet, result in relative dissatisfaction.

DISCUSSION

The results highlight a paradox: while service quality is significant, its impact is negative. This outcome can be explained through several theoretical lenses:

- **Disconfirmation Theory (Oliver, 1980):** Customer Satisfaction depends on the gap between expectations and actual performance. Enhanced service quality may raise expectations, leading to sharper disappointment when lapses occur.
- **SERVQUAL Framework (Parasuraman *et al.*, 1988):** Improvements may be concentrated in less impactful dimensions (e.g., tangibles) while neglecting empathy or reliability, which are more influential for rural customers.
- **Contingency Theory (Burns and Stalker, 1961):** Service improvements not aligned with local infrastructure constraints (e.g., poor connectivity, terrain-driven delays) may fail to translate into customer satisfaction.
- **Customer Value Theory (Zeithaml, 1988):** If higher service quality raises cost or reduces perceived value, customers may view the trade-off negatively.

Overall, the findings confirmed that logistics service quality is a significant determinant of customer satisfaction **(Mentzer *et al.*, 2001; Zeithaml *et al.*, 1996)**, but in rural Kumaon, the relationship is complex and context-sensitive. For managers, this underscores the need to complement operational improvements with customer-centric strategies, including flexible return policies, localized engagement, and personalized communication.

CONCLUSION

This study examined the relationship between logistics service quality (LSQ) and customer satisfaction (CS) among rural e-commerce customers in the Kumaon Division of Uttarakhand. Drawing on responses from 385 participants across 24 villages, the results highlight that LSQ significantly influences satisfaction, though in a counterintuitive manner. While dimensions such as timely delivery, order accuracy, and product condition strongly shaped customer perceptions, the analysis revealed a statistically significant negative relationship between LSQ and CS. This paradox suggests that improvements in service quality elevate customer expectations, which, when not consistently met, translate into dissatisfaction.

The study also identified persistent barriers like last-mile connectivity issues, limited digital awareness, and challenges in return logistics that constrain the effectiveness of service quality improvements. These insights confirm that LSQ is not only a critical determinant of satisfaction but also a structural challenge for the sustainable growth of rural e-commerce in India. Addressing these gaps requires tailored strategies that balance service quality enhancements with realistic expectation management, thereby ensuring that e-commerce growth in rural regions translates into long-term customer trust and satisfaction.

RECOMMENDATIONS

To strengthen e-commerce logistics and improve rural customer satisfaction in the Kumaon Division, companies should prioritize improving last-mile delivery through the establishment of rural micro-hubs, leveraging local transport modes, and engaging community-level entrepreneurs for reliable connectivity. At the same time, enhancing digital literacy by promoting simple, user-friendly interfaces in regional languages and providing basic digital training through community centers and self-help groups will empower customers and make online platforms more

accessible. Localized logistics strategies such as flexible delivery schedules aligned with agricultural and cultural calendars, rural-sensitive return policies, and continued cash-on-delivery options can help build trust and inclusivity among rural consumers. Finally, institutional collaborations with Panchayati Raj institutions, cooperatives, SHGs, and government-supported infrastructure schemes like Digital India and BharatNet can create a supportive ecosystem, reduce inefficiencies, and ensure sustainable rural logistics operations.

MANAGERIAL IMPLICATIONS

The findings underscore that logistics in rural e-commerce should be managed as a strategic function rather than a peripheral cost center. A uniform approach designed for urban markets is inadequate, as rural consumers face unique infrastructural constraints and service expectations. Managers should therefore prioritize reliability, responsiveness, and trust-building, which influence customer satisfaction more strongly than price-based competition. Practical measures include capacity building of delivery staff, use of vernacular communication tools, and deployment of low-cost technologies such as GPS-enabled tracking to enhance transparency and consistency. Furthermore, localized delivery models leveraging rural hubs, community-level entrepreneurs, and partnerships with self-help groups can significantly improve last-mile connectivity. By reframing logistics service quality as a strategic differentiator, firms can foster customer loyalty, strengthen brand reputation, and unlock long-term growth opportunities in rural India's expanding e-commerce landscape.

FUTURE RESEARCH DIRECTIONS

The study has certain limitations that open avenues for further exploration. First, the geographic scope was limited to Kumaon; comparative studies across multiple states would help capture regional variations in logistics challenges and satisfaction outcomes. Second, while the present work focused on logistics service quality, other factors such as product authenticity, seller reputation, and payment systems also influence satisfaction and warrant inclusion in future models. Third, a longitudinal research design would help track how customer perceptions evolve over time with improvements in digital infrastructure and logistics innovations. Fourth, the integration of qualitative methods, such as interviews or focus groups, could provide deeper insights into the lived experiences of rural e-commerce customers. Fifth, technology-driven logistics solutions such as AI-enabled routing, drone delivery, and automated warehouses deserve attention to evaluate their feasibility and acceptance in rural contexts. Finally, research on the role of government policies, such as Digital India and rural connectivity programs, will enrich the understanding of institutional enablers for logistics development.

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