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Online-Offline Satisfaction Gaps among University Students: Cochran's Q and McNemar Tests

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ABSTRACT
The rapid expansion of online shopping has reshaped consumer behavior; however, offline shopping remains preferred under certain conditions. This study examines satisfaction dimension gaps between online and offline shopping among university students using a repeated binary measures design. Data were collected through a questionnaire containing eight satisfaction indicators measured on a dichotomous scale (yes/no) from 26 respondents. Cochran's Q test was applied to assess whether satisfaction proportions differ across dimensions, followed by McNemar's test as an exploratory post-hoc procedure to provide diagnostic insights into the largest dimension gaps. The findings reveal meaningful variation across satisfaction dimensions. Online shopping demonstrates stronger satisfaction in convenience and payment security, while offline shopping shows higher satisfaction in product trial experience and perceived product assurance. Nevertheless, offline shopping exhibits comparatively lower satisfaction in service-related dimensions, indicating a potential weakness in interpersonal service delivery. These results confirm that consumer satisfaction is multidimensional and that satisfaction gaps across shopping channels are not uniform. The study offers practical insights for businesses to formulate channel-specific strategies to improve service quality and customer experience in both online and offline retail environments.
Keyword: Cochran's Q test, Consumer satisfaction, McNemar's test, Online and offline shopping, Satisfaction dimension gaps

1. Introduction

The rapid expansion of online-shopping has fundamentally reshaped consumer purchasing behavior by enabling individuals to access products efficiently, compare alternatives quickly, and complete transactions anytime and anywhere. This transformation is increasingly reinforced by omnichannel retail strategies, where customers move seamlessly across digital and physical touchpoints throughout the purchasing journey (Hult et al., 2019; Rahman et al., 2022). Among student consumers, online platforms provide substantial value through convenience, time efficiency, and integrated digital payment systems (Lazaroiu et al., 2020). These reasons are making online shopping particularly attractive for routine purchases even for creating an impulsive buying behavior (Gulfraz et al., 2022). Despite these advantages, offline shopping remains preferred in several situations, particularly when consumers seek direct product evaluation, physical trial, immediate product acquisition, or interpersonal assistance from sales staff. They are reflecting the continuing role of sensory and experiential shopping value (Liu et al., 2017). These patterns suggest that online and offline channels deliver different shopping experiences that may shape consumer satisfaction through distinct mechanisms (Zhang et al., 2025).

Consumer satisfaction is widely recognized as a key outcome influencing repurchase intentions, customer loyalty, and positive word-of-mouth (Rita et al., 2019). However, prior research in Indonesia and other contexts frequently measures satisfaction as an aggregated construct or relies primarily on mean-difference comparisons, which may not adequately capture satisfaction as a multidimensional phenomenon. Satisfaction

is typically formed through multiple dimensions, including consumer trust, return policies, risk perception, convenience, payment security, accuracy of product information, service quality, and experiential factors such as physical product trial (Hipólito et al., 2025). Therefore, a more diagnostic approach is required to identify which dimensions represent the strengths and weaknesses of each shopping channel (Rahman et al., 2022).

Empirical evidence also remains inconsistent. While online shopping may generate higher satisfaction in convenience and transaction-related dimensions, offline shopping may offer stronger satisfaction in experiential and product assurance-related dimensions depending on product category and consumer characteristics (Tueanrat et al., 2021). These variations imply that channel-based satisfaction cannot be generalized without mapping dimension-specific satisfaction gaps more precisely. Consequently, a dimension-level comparison provides a clearer understanding of how consumer satisfaction differs between channels and which dimensions should be prioritized for strategic improvement (Hult et al., 2019).

This study addresses this gap by examining satisfaction dimension gaps between online and offline shopping among university students using a repeated binary measures approach. The study contributes in two main ways. First, it conceptualizes satisfaction as a multidimensional construct and offers dimension-level profiling rather than relying solely on aggregated satisfaction measures (Rahman et al., 2022). Second, it applies Cochran's Q test and McNemar's test to analyze paired dichotomous satisfaction indicators, providing a methodologically consistent approach for repeated binary data (Cleophas & Zwinderman, 2016). The findings are expected to offer practical insights for developing channel-specific service improvement strategies that enhance consumer experiences in both online and offline retail environments (Blom et al., 2021; Biswas et al., 2024).

2. Method

2.1 Research Design

This study employs a quantitative comparative approach using a repeated measures (within-subject) design. Each respondent evaluated multiple satisfaction dimensions across two shopping channels (online and offline) using dichotomous responses (yes/no). This design is appropriate for examining dimension-level satisfaction gaps because it allows the same individuals to provide evaluations across multiple conditions, thereby reducing between-subject variability and enabling more efficient statistical inference (Cleophas & Zwinderman, 2016; Smith & Ruxton, 2020). The analysis focuses on identifying whether satisfaction proportions differ across dimensions and mapping the dimensions that represent relative strengths and weaknesses for each shopping channel.

2.2 Research Object and Target Population

The research object is consumer satisfaction associated with online and offline shopping among university students. The target population consists of students who have experience with both online and offline shopping channels. Students are selected because they represent an active consumer group with high exposure to digital commerce and continued engagement with offline retail, making them suitable for examining satisfaction dimension differences between channels (Muthaffar et al., 2024).

2.3 Sample and Sampling Technique

Data were collected from 26 university students using a convenience sampling approach based on respondent availability and willingness to participate. Although the sample size is relatively modest compared to survey-based studies that employ regression or structural equation modeling, it is methodologically appropriate for this study for several reasons.

First, the study uses a repeated measures design in which each respondent provides responses to eight satisfaction indicators, resulting in a total of 208 paired binary observations (26×8). This within-subject structure offers richer information than a single-indicator cross-sectional survey and improves statistical efficiency because each respondent serves as their own control across dimensions (Cleophas & Zwinderman, 2016). Second, the main inferential technique, Cochran's Q test, and the supporting McNemar test are specifically developed for paired binary data and are commonly applied in research settings where sample sizes are smaller than those required for regression-based models (Smith & Ruxton, 2020). Therefore, the results should be interpreted as exploratory and diagnostic evidence, primarily aimed at profiling satisfaction gaps across dimensions and generating actionable insights rather than producing population-level estimates.

2.4 Data Collection Procedure

Data were collected through a structured questionnaire administered to respondents. The questionnaire consisted of eight satisfaction statements representing key dimensions of satisfaction for online and offline shopping. Respondents were instructed to answer each statement using a dichotomous response format: Yes (1) if they agreed or felt satisfied with the statement, and No (0) otherwise. The dichotomous format was selected to support paired nominal analysis using Cochran's Q and McNemar tests and to ensure the clarity and simplicity of responses.

2.5 Measurement and Operational Definition of Variables

Consumer satisfaction was operationalized as a set of eight binary indicators representing satisfaction dimensions across online and offline shopping channels. Four indicators capture online shopping satisfaction, while four indicators capture offline shopping satisfaction. Each indicator is treated as a repeated measure for each respondent.

Table 1. Satisfaction Dimensions and Operational Definition

Code	Channel	Indicator Statement (Full)	Measurement
D1	Online	I feel satisfied because online shopping is more practical/easier.	Yes = 1 No = 0
D2	Online	I feel satisfied with the delivery time when shopping online.	Yes = 1 No = 0
D3	Online	I feel satisfied because the product I received matches the photo/description shown online.	Yes = 1 No = 0
D4	Online	I feel satisfied because online payment transactions are safe and secure.	Yes = 1 No = 0
D5	Offline	I feel satisfied because product quality is more guaranteed when shopping offline.	Yes = 1 No = 0
D6	Offline	I feel satisfied with the service provided by staff when shopping offline.	Yes = 1 No = 0
D7	Offline	I feel satisfied because I can try products directly when shopping offline.	Yes = 1 No = 0
D8	Offline	I feel satisfied because exchanging/returning products is easier when shopping offline.	Yes = 1 No = 0

Source: Questionnaire instrument developed by the authors (2026)

- Online shopping dimensions:
  (1) Convenience of online shopping
  (2) Satisfaction with delivery time
  (3) Product-information match (product matches photo/description)
  (4) Payment security and safety

- Offline shopping dimensions:
  (1) Product assurance (quality is more guaranteed offline)
  (2) Satisfaction with staff service
  (3) Ability to try products directly
  (4) Ease of exchange/return in offline shopping

These dimensions reflect key elements emphasized in the consumer satisfaction literature, including convenience and security for online channels and assurance, experience, and service interactions for offline channels (Biswas, 2019; Hipólito et al., 2025).

2.6 Data Analysis Technique

Data analysis consisted of three stages: descriptive analysis, global hypothesis testing using Cochran's Q test, and exploratory post-hoc diagnostics using McNemar's test.

2.6.1 Descriptive Analysis

Descriptive statistics were used to summarize the number and percentage of "yes" responses for each satisfaction dimension. A satisfaction gap ranking was then constructed to identify the strongest and weakest satisfaction dimensions across online and offline shopping channels. A bar chart visualization was used to present the gap ranking clearly.

2.6.2 Cochran's Q Test (Global Hypothesis Testing)

Cochran's Q test was applied to test whether the proportion of "yes" responses differs significantly across the eight satisfaction dimensions measured on the same respondents. Cochran's Q is appropriate for repeated measures nominal data with $k \geq 3$ related conditions and is considered a nonparametric extension of McNemar's test (Cleophas & Zwinderman, 2016).

Let x_{ij} denote the binary response (1 = yes; 0 = no) for respondent i on satisfaction dimension j. Let:

- $C_j = \sum_{i=1}^{n} x_{ij}$ denote the total number of "yes" responses for dimension j (column total),
- $R_i = \sum_{j=1}^{k} x_{ij}$ denote the total number of "yes" responses for respondent i across dimensions (row total), and
- $T = \sum_{j=1}^{k} C_j$ denote the total number of "yes" responses across all dimensions.

The Cochran's Q statistic is computed as:

$$Q = \frac{(k-1)\left[k\sum_{j=1}^{k} C_j^2 - T^2\right]}{kT - \sum_{i=1}^{n} R_i^2} \quad \text{.....(1)}$$

Under the null hypothesis that satisfaction proportions are equal across all dimensions, the Q statistic follows a chi-square distribution with $k-1$ degrees of freedom:

$$Q \sim \chi^2_{(k-1)} \quad \text{.....(2)}$$

Statistical significance was evaluated at $\alpha = 0.05$. If the p-value is less than 0.05, the null hypothesis is rejected, indicating that at least one satisfaction dimension differs significantly from the others (Sheskin, 2020).

2.6.3 McNemar's Test (Exploratory Post-hoc Supporting Analysis)

Following the global Cochran's Q test, McNemar's test was conducted as an exploratory post-hoc procedure to provide additional diagnostic insights into selected dimension comparisons. McNemar's test compares paired proportions between two binary conditions and focuses on discordant response pairs (Smith & Ruxton, 2020). For a 2×2 contingency table comparing two dimensions A and B, the discordant frequencies are b and c:

	B = Yes	B = No
A = Yes	a	b
A = No	c	d

The continuity-corrected McNemar test statistic is:

$$\chi^2 = \frac{(|\, b-c\,|-1)^2}{b+c} \quad \ldots\ldots(3)$$

Under the null hypothesis of equal marginal proportions, the statistic approximately follows a chi-square distribution with 1 degree of freedom:

$$\chi^2 \sim \chi^2_{(1)} \quad \ldots\ldots(4)$$

Because multiple comparisons increase the risk of Type I error, Holm's correction was applied to adjust p-values across pairwise tests. Given the modest sample size, post-hoc findings were interpreted cautiously and used primarily to support descriptive gap profiling rather than to draw definitive inferential conclusions (Sheshkin, 2020).

2.7 Ethical Considerations

Participation in the study was voluntary. Respondents were informed about the research purpose and assured that responses would remain confidential and used solely for academic purposes. No personal identifying information was collected.

3. Result and Discussion

3.1 Descriptive Results: Satisfaction Profiles Across Dimensions

This study assessed eight satisfaction dimensions using dichotomous responses (yes/no) from 26 student respondents. Table 2 summarizes the distribution of affirmative responses across online and offline shopping dimensions. Overall, the descriptive results indicate that satisfaction levels vary across dimensions, suggesting that consumer satisfaction is not uniform and should be understood as a multidimensional phenomenon.

For online shopping, the highest satisfaction was observed for payment security (92.3%) and shopping convenience (88.5%). This indicates that students perceive online channels as strong in transaction efficiency and perceived safety, consistent with research emphasizing the role of trust and perceived security in digital commerce. Satisfaction for delivery time was also high (88.5%), suggesting that logistics performance is generally perceived positively in the student context. However, the lowest online satisfaction was found in product-information match (80.8%), indicating that a portion of respondents still experience uncertainty or dissatisfaction related to product mismatch risk—an issue frequently identified in perceived risk literature.

For offline shopping, the highest satisfaction was observed for product trial experience (96.2%). This result highlights the continuing value of sensory evaluation and "need for touch," which increases confidence in purchase decisions and reduces product uncertainty. Satisfaction was also high for return/exchange ease (88.5%) and product assurance (84.6%), indicating that offline shopping is perceived as reliable in terms of product quality certainty and post-purchase support. However, offline shopping showed relatively lower satisfaction in service satisfaction (65.4%), suggesting that interpersonal service delivery may remain a critical weakness in offline retail settings. This finding aligns with service quality theory, which emphasizes that responsiveness and empathy in service encounters strongly influence satisfaction outcomes.

Table 2. Descriptive Profile of Satisfaction Dimensions (n = 26)

Code	Channel	Indicator Statement (Full)	Yes (n)	Yes (%)
D1	Online	Satisfied because online shopping is more practical/easier.	23	88.5
D2	Online	Satisfied with delivery time when shopping online.	23	88.5
D3	Online	Satisfied because product matches the photo/description shown online.	21	80.8
D4	Online	Satisfied because online payment transactions are safe and secure.	24	92.3
D5	Offline	Satisfied because product quality is more guaranteed when shopping offline.	22	84.6

Code	Channel	Indicator Statement (Full)	Yes (n)	Yes (%)
D6	Offline	Satisfied with staff service when shopping offline.	17	65.4
D7	Offline	Satisfied because I can try products directly when shopping offline.	25	96.2
D8	Offline	Satisfied because exchanging/returning products is easier when shopping offline.	23	88.5

Source: Authors' analysis (2026)

3.2 Satisfaction Gap Ranking (Diagnostic Dimension Mapping)
To provide a clearer diagnostic comparison, the study constructed a satisfaction gap ranking based on the percentage of affirmative responses. Figure 1 visualizes the ranking and highlights which dimensions represent the strongest and weakest satisfaction drivers across shopping channels.

The ranking shows that the strongest satisfaction dimension overall is offline product trial experience (96.2%), followed by online payment security (92.3%). Several dimensions cluster at high satisfaction levels, including online convenience (88.5%), online delivery satisfaction (88.5%), and offline return/exchange ease (88.5%). In contrast, the weakest dimension is offline service satisfaction (65.4%), indicating the largest negative gap relative to other dimensions. This pattern demonstrates that while offline shopping offers strong experiential and assurance benefits, service quality issues may undermine overall satisfaction unless retailers improve frontline service delivery. Meanwhile, online shopping performs well on convenience and transaction security but still faces challenges associated with product-information mismatch risk .

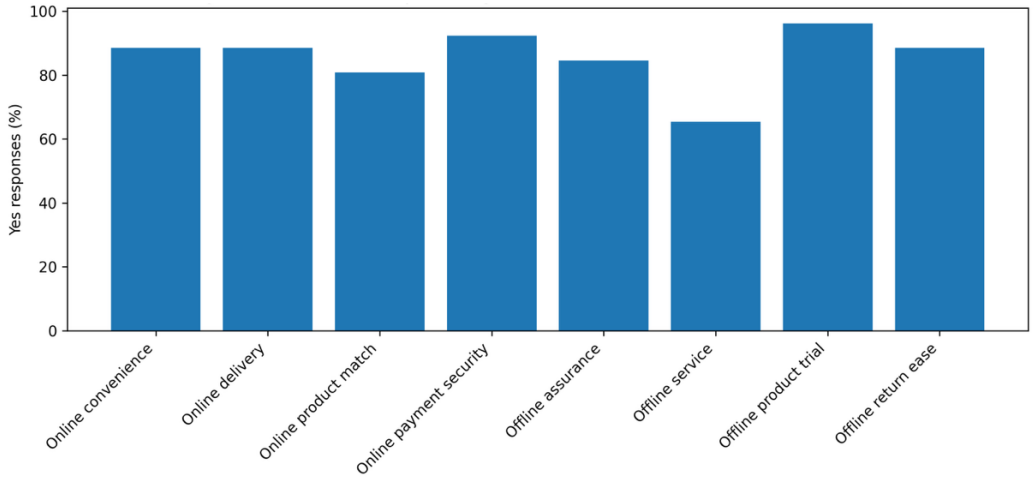

Figure 1. Satisfaction Gap Ranking Across Online and Offline Dimensions
Source: Authors' analysis (2026)

3.3 Hypothesis Testing: Cochran's Q Test (H1)
To test whether satisfaction proportions differ significantly across the eight satisfaction dimensions measured on the same respondents, this study applied Cochran's Q test. The results show that the Q statistic is significant at the 5% level ($Q = 15.09$; $df = 7$; $p = 0.0349$), indicating statistically significant differences across satisfaction dimensions.

Thus, H1 is supported, confirming that satisfaction is not homogeneous across dimensions. This finding strengthens the argument that channel-based satisfaction assessments should not be limited to aggregated measures because different dimensions may capture distinct strengths and weaknesses of each shopping channel (Blom et al., 2021; Reinares-Lara et al., 2021).

Table 3. Cochran's Q Test Result Across Satisfaction Dimensions

Test	Q statistic	df	p-value	Decision (α = 0.05)	Interpretation
Cochran's Q	15.09	7	0.0349	Reject H0	Satisfaction proportions differ across dimensions

Source: Authors' analysis (2026)

3.4 Exploratory Post-hoc Analysis: McNemar Test (Supporting Evidence)

Following the significant Cochran's Q result, McNemar's test was conducted as an exploratory post-hoc procedure to provide diagnostic insights into selected pairwise comparisons. Because multiple comparisons can inflate the risk of Type I error, Holm correction was applied and results were interpreted cautiously as supporting evidence rather than definitive inference.

The post-hoc comparisons suggest that the most notable contrast occurs between offline product trial experience and offline service satisfaction, reflecting a substantial gap in affirmative response proportions. This contrast supports the descriptive gap ranking, emphasizing that offline shopping provides strong experiential value but may fail to deliver consistent satisfaction when interpersonal service quality is perceived as low. While some comparisons may show smaller unadjusted p-values, these effects become less pronounced after adjustment, reinforcing the exploratory nature of this post-hoc analysis.

Table 4. Exploratory McNemar Post-hoc Summary

Comparison pair (indicator statements)	b	c	χ^2 (cc)	p	Holm-adjusted p	Supporting interpretation
Offline service satisfaction vs offline product trial experience	0	8	6.125	.0133	.0532	Notable contrast: product trial advantage
Online product-information match vs online payment security	1	4	0.800	.3711	.7422	Not significant
Online convenience vs online product-information match	3	1	0.250	.6171	.6171	Not significant
Offline product assurance vs offline service satisfaction	5	0	3.200	.0736	.2208	Marginal difference

Source: Authors' analysis (2026)

Note. McNemar tests are reported as exploratory post-hoc comparisons to support descriptive gap profiling. Only selected comparisons with the largest descriptive gaps are reported to maintain interpretability and reduce multiple comparison issues. *b* and *c* represent discordant response pairs. After Holm adjustment, the pairwise comparisons are no longer statistically significant at α = 0.05; therefore, the post-hoc findings should be interpreted as exploratory diagnostic support for the descriptive gap ranking.

3.5 Discussion: Interpretation of Satisfaction Dimension Gaps

The findings confirm that consumer satisfaction differs across online and offline shopping channels depending on the specific dimension evaluated. Online shopping achieves higher satisfaction in convenience and payment security, which is consistent with technology acceptance and trust-based e-commerce research suggesting that ease of use and perceived security strengthen satisfaction and continued usage (Asawawibul et al., 2025). Moreover, the strong satisfaction in delivery time suggests that logistics efficiency contributes positively to student experiences in online purchasing.

In contrast, offline shopping shows superior satisfaction in product trial experience and product assurance, reflecting the advantage of physical evaluation and sensory engagement. This aligns with the Need for Touch theory, which posits that tactile evaluation increases confidence and satisfaction in purchasing, especially when product uncertainty is high (Liu et al., 2017; Hult et al., 2019). High satisfaction in return/exchange ease also suggests that offline channels retain competitive strength through simpler post-purchase support processes.

However, the weakest dimension observed—offline service satisfaction—highlights a key managerial challenge. Service quality research suggests that interpersonal encounters strongly influence satisfaction and loyalty, particularly in offline retail contexts where staff interactions are central to the customer experience

(Faria et al., 2022). If service satisfaction remains low, offline retailers may lose potential advantages even when experiential benefits are strong. Conversely, online retailers should prioritize reducing dissatisfaction in product-information match by enhancing product descriptions, visual content, and return policy transparency to mitigate product mismatch risk (Amsl et al., 2023; Duong et al., 2025).

Overall, the descriptive pattern supports H2 and H3 at the interpretive level. Offline shopping appears stronger in experience and assurance dimensions, while online shopping appears stronger in convenience and transaction-related dimensions. These results reinforce the view that satisfaction gaps across channels are multidimensional and require channel-specific improvement strategies rather than uniform interventions.

4. Conclusion

This study examined online and offline satisfaction dimension gaps among university students using a repeated binary measures approach. The results confirm that consumer satisfaction is multidimensional, and satisfaction gaps across shopping channels are not uniform across dimensions. Descriptive gap profiling indicates that online shopping performs strongly in convenience and payment security, whereas offline shopping performs strongly in experiential and assurance-related dimensions, particularly the ability to try products directly and perceived product assurance. However, offline shopping shows a notable weakness in service-related satisfaction, suggesting that interpersonal service delivery may limit the competitive advantage of offline retail despite its experiential strengths.

The global hypothesis test using Cochran's Q revealed statistically significant differences in satisfaction proportions across the eight dimensions ($Q = 15.09$; $df = 7$; $p = 0.0349$), supporting H1. The descriptive pattern also provides interpretive support for H2 and H3: offline shopping is stronger in experience-and assurance-related dimensions, while online shopping is stronger in convenience- and transaction-related dimensions. An exploratory McNemar post-hoc analysis was used as supporting evidence to highlight the largest dimension gaps, reinforcing the practical relevance of dimension-based satisfaction diagnostics.

4.1 Implications

This study contributes to consumer behavior and retailing literature by reinforcing that consumer satisfaction should not be treated as a single aggregated construct, particularly in online–offline channel comparisons. Instead, satisfaction must be assessed across multiple dimensions, as each channel may perform differently depending on the satisfaction mechanism involved. In addition, the study demonstrates the usefulness of applying paired binary nonparametric methods (Cochran's Q and McNemar tests) to analyze dimension-level satisfaction indicators, offering a methodologically consistent option for repeated measures satisfaction assessment.

Furthermore**,** the findings provide actionable insights for businesses to design channel-specific improvement strategies. Online retailers should improve satisfaction in product-information accuracy by enhancing product visualization, providing verified reviews, and ensuring transparent return policies to reduce product mismatch risk. Offline retailers should prioritize improving interpersonal service quality, including staff responsiveness, communication skills, and service professionalism. Strengthening the weakest satisfaction dimensions may improve consumer experiences more effectively than generalized service improvements. Overall, businesses may benefit from a hybrid approach that integrates the convenience and transaction efficiency of online channels with the experiential strengths of offline channels.

4.2 Limitations

This study has several limitations. First, the sample size is relatively modest ($n = 26$) and was collected using convenience sampling, which limits generalizability beyond the student context. Nevertheless, the repeated measures design provides richer information because each respondent evaluates multiple satisfaction dimensions, and the applied analytical methods are appropriate for paired binary data. Second, satisfaction dimensions were measured using a dichotomous scale (yes/no), which does not capture variation in satisfaction intensity. Third, the study focuses on dimension-level comparisons rather than examining causal determinants of satisfaction, meaning that explanatory relationships between satisfaction and behavioral outcomes (e.g., repurchase intention) were not tested.

4.3 Future Research Directions

Future studies are encouraged to replicate this analysis using larger and more diverse samples, including broader consumer groups beyond students. Researchers may also extend the measurement approach by employing Likert-type scales to capture satisfaction intensity and applying additional analytical techniques such as ordinal regression or structural equation modeling to test causal pathways linking satisfaction dimensions to loyalty, repurchase intention, and word-of-mouth. Further research can also examine satisfaction dimension gaps across different product categories (e.g., fashion, electronics, food) and compare channel-based satisfaction across specific platforms or retail formats, which may reveal more nuanced patterns of consumer satisfaction.

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