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Understanding Online Review Persuasion: A Structural Equation Modeling Approach Based On The Elaboration Likelihood Model

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Abstract:

In the era of digital commerce, online reviews play a pivotal role in shaping consumer attitudes and purchase decisions. The Elaboration Likelihood Model (ELM) provides a theoretical framework to understand how individuals process persuasive messages. This study employs Structural Equation Modeling (SEM) to empirically test the central and peripheral routes of persuasion as posited by ELM in the context of online reviews.

Using data from a sample of 485 participants, the study examined the influence of central processing (e.g., content evaluation, argument quality) and peripheral cues (e.g., source credibility, review attractiveness) on key outcomes such as attitude formation, perceived accuracy, usefulness, and purchase intention related to online reviews.

The study reveal strong support for the central route, indicating that deep processing of information leads to more positive attitudes, perceived accuracy, and intentions to purchase. Additionally, peripheral cues such as source expertise and social connectedness significantly influence attitudes and credibility perceptions. The findings offer valuable insights for marketers and platform designers to enhance the effectiveness of online review strategies in influencing consumer behavior.

This study contributes to the understanding of online review persuasion by integrating theoretical insights from ELM with empirical analysis using SEM.

Key words: Consumer behavior, Elaboration Likelihood Model (ELM), Online reviews, Purchase Intention, Structural Equation Modeling (SEM).

Introduction

The widespread use of Social Media and the Internet has drastically changed how consumers obtain and assess information about goods and services. Consumer-generated reviews are becoming one of the most important factors when making judgments about what to buy, among the many information sources available online. These reviews, which are frequently found on Social media, Forums, and e-Commerce websites, are a wealth of knowledge that can affect the attitudes and actions of prospective customers. Online reviews have a persuasive effect that is complex and involves a number of factors, including the review's substance, the credibility of the reviewer, and the media in which it is presented. Researchers and Marketers alike must

comprehend the mechanisms by which online reviews affect customer behavior. Petty and Cacioppo (1986) created a model called the Elaboration Likelihood Model (ELM), which offers a solid theoretical framework for investigating how people interpret persuasive information. According to the ELM, The Central and Peripheral routes are the two main paths to persuasion. The Central route requires much elaboration, with people closely examining the points made in the message. On the other hand, the peripheral route requires less explanation and relies on indications like the message's beauty or the authority of the source.

This research aims to delve deeper into the persuasive mechanisms of online reviews by employing Structural Equation Modeling (SEM) based on the Elaboration Likelihood Model. SEM is a powerful statistical technique that allows for the examination of complex relationships among observed and latent variables. By integrating the ELM with SEM, this study seeks to elucidate the pathways through which online reviews influence consumer attitudes and intentions.

Literature Review

Structural Equation Modeling (SEM) has been widely employed to examine the structural relationships between various elements of online reviews and consumer behavior. According to Anderson and Gerbing (1988), SEM provides a robust methodological framework for testing causal relationships among constructs, allowing researchers to analyze how factors such as review content quality, reviewer credibility, and review helpfulness influence consumer attitudes and purchase intentions. Several studies have utilized SEM to understand the effects of review components on consumer behavior. For instance, Cheung, Lee, and Rabjohn (2008) found that review credibility significantly affects consumer trust, which in turn influences purchase intentions, while Filieri (2015) identified review quality, source credibility, and review consistency as critical determinants of perceived trustworthiness. SEM's flexibility also enables the exploration of mediating and moderating effects; Park and Kim (2008) demonstrated that perceived usefulness and enjoyment mediate the relationship between review quality and purchase intentions, whereas Lin, Wu, and Chen (2013) showed that consumer involvement moderates the influence of online reviews on purchasing behavior. Additionally, Lee and Youn (2009) revealed cross-cultural differences in how consumers evaluate review attributes, and Chen and Xie (2008) highlighted that online reviews have a stronger impact on experience goods than on search goods. Zhu, Yin, and He (2014) further illustrated that review quality and reviewer expertise directly affect purchase intentions, while review quantity influences them indirectly through perceived credibility. While SEM provides methodological rigor for modeling such complex relationships, the Elaboration Likelihood Model (ELM) proposed by Petty and Cacioppo (1986) offers a theoretical explanation of how online reviews persuade consumers through two cognitive routes: the central route, which involves thoughtful consideration of message content, and the peripheral route, which relies on superficial cues.

In the context of online reviews, the central route's effectiveness depends on the quality and relevance of the information, as detailed and well-argued reviews engage consumers in deeper cognitive processing (Park & Lee, 2009), whereas peripheral cues such as reviewer credibility, review format, and review volume (Cheung et al., 2012) are more influential when consumers have low motivation or ability to process information. Integrating ELM with SEM provides a nuanced understanding of these mechanisms, enabling simultaneous examination of multiple variables and their interactions. Studies using this integrated approach have shown that the relative effectiveness of central and peripheral cues varies depending on contextual and consumer characteristics (Filieri, 2015; Lee et al., 2008). Moreover, specific elements such as review tone, length, and reviewer expertise significantly shape perceptions of review credibility and usefulness, ultimately influencing purchase intentions (Zhang et al., 2014). Therefore, understanding the interplay between these factors is essential for developing effective online review strategies. By leveraging both high-quality review content and strategic peripheral cues, marketers can enhance the persuasive power of reviews and positively influence consumer decision-making. Building on these insights, the present research seeks to develop and validate a comprehensive SEM framework grounded in the ELM, offering both theoretical and practical contributions to understanding how online reviews shape consumer behavior in the digital marketplace.

Research Gap

Despite substantial research on the influence of online reviews on consumer behavior, several critical gaps persisted. The Elaboration Likelihood Model (ELM) had been extensively utilized, yet there was a notable lack of studies integrating ELM with Structural Equation Modeling (SEM) to provide a comprehensive analysis of how central and peripheral routes interacted. Most research focused on these routes in isolation, overlooking their potential synergistic effects. Additionally, while factors like review, helpfulness had been identified; their relative importance and combined impact on consumer perception and behaviors remained underexplored.

Methodology

Research Objectives

- To delve deeper into the persuasive mechanisms of online reviews by employing Structural Equation Modeling (SEM) based on the Elaboration Likelihood Model.
- To understand the impact of both central and peripheral routes on consumer attitudes and purchase intentions (identifying
- key elements such as review content quality and heuristic cues like reviewer credibility).
- To provide practical insights for marketers on optimizing online review strategies to enhance their persuasive effectiveness.

Research Design

This study employed a Quantitative-Descriptive research design using Structural Equation Modeling (SEM) to analyze the relationships between variables related to Online review persuasion.

Sampling Method

Non-Probability – Purposive (Judgmental) Sampling Method.

Sample Size

The study was conducted in Ahmedabad city, and data were collected from a sample of 485 participants. Specifically collected from those respondents who read online reviews before making purchase decision.

Data Collection Tool

A well-structured, closed-ended questionnaire has been used to collect the responses by using the survey tool.

Reliability and Validity of the measurement model

The results of Cronbach's alpha and Average Variance Extracted (AVE) for different constructs are shown in the table below. Cronbach's alpha is a measure of internal consistency, indicating how well items within a scale or construct correlate with each other. A higher alpha value generally suggests greater reliability, with values above 0.7 or 0.8 considered acceptable in most cases. In the table, we see Cronbach's alpha values ranging from 0.693 to 0.9, indicating moderate to high levels of internal consistency across the constructs.

Average Variance Extracted (AVE) assesses the convergent validity of a construct, which refers to the extent to which items within a construct are related and measure the same underlying concept. AVE values range from 0 to 1, with higher values indicating better convergent validity. AVE values above 0.5 are typically considered acceptable, indicating that more than half of the variance in the items is explained by the construct they are supposed to measure. In the table, AVE values range from 0.491 to 0.592, indicating moderate to good convergent validity across the constructs.

Overall, the results suggest that the measurement scales used to assess the constructs in the study demonstrate satisfactory levels of reliability and convergent validity.

Table 1 : Reliability and Validity testing of the model

	cronbach's alpha	average variance extracted (ave)
accuracy	0.755	0.491
attitude towards contents of online reviews	0.900	0.498
credibility	0.833	0.503
purchase intention	0.812	0.578
quality of argument	0.852	0.511
review attractiveness	0.710	0.592
source expertise	0.698	0.496
source social	0.790	0.506
usefulness	0.725	0.501
vividness	0.693	0.532

Discriminant Validity

The table below displays the results of discriminant validity analysis using the Fornell-Larcker Criterion (FLC) for a set of constructs in a research study. Discriminant validity is an important aspect of construct validity in Structural Equation Modeling (SEM) and confirms that different constructs are distinct and not measuring the same underlying concept.The Fornell-Larcker Criterion evaluates discriminant validity by comparing the square root of each construct's Average Variance Extracted (AVE) value (diagonal elements) with the correlations between that construct and other constructs (off-diagonal elements). If the square root of the AVE for a construct is greater than the correlations with other constructs, then discriminant validity is supported.In the table, the diagonal elements represent the square root of the AVE for each construct, and the off-diagonal elements represent the correlations between pairs of constructs. The values in the table are correlation coefficients. Based on the Fornell-Larcker criterion, discriminant validity is supported if the diagonal elements (square root of AVE) are higher than the correlations between constructs. Looking at the table:For each construct, the diagonal element (square root of AVE) is higher than the correlations with other constructs, indicating good discriminant validity.

For example, the square root of AVE for Accuracy (ACC) is 0.837, which is higher than its correlations with other constructs (ranging from 0.321 to 0.701), supporting discriminant validity. Similarly, the square root of AVE for Attitude is 0.817, which is higher than its correlations with other constructs (ranging from 0.036 to 0.669), also supporting discriminant validity.Overall, the table demonstrates that the constructs have good discriminant validity according to the Fornell-Larcker criterion, as the diagonal elements (square root of AVE) are consistently higher than the correlations with other constructs, confirming that these constructs are distinct and measure different underlying concepts.

Discriminant Validity

(Diagonal Values represent square root of AVE)

	ACC	Attitud	CR	PI	QA	RA	SE	SSC	US	VIV
ACC	**0.701**									
Attitude	0.579	**0.669**								
CR	0.326	0.129	**0.749**							
PI	0.575	0.587	0.075	**0.761**						
QA	0.551	0.569	0.368	0.393	**0.679**					
RA	0.321	0.036	0.167	0.021	0.269	**0.769**				
SE	0.235	0.128	0.594	0.075	0.332	0.167	**0.676**			
SSC	0.287	0.16	0.442	0.094	0.426	0.208	0.441	**0.697**		
US	0.529	0.471	0.354	0.276	0.361	0.211	0.364	0.332	**0.685**	
VIV	0.572	0.476	0.248	0.456	0.595	0.14	0.298	0.226	0.419	**0.72**

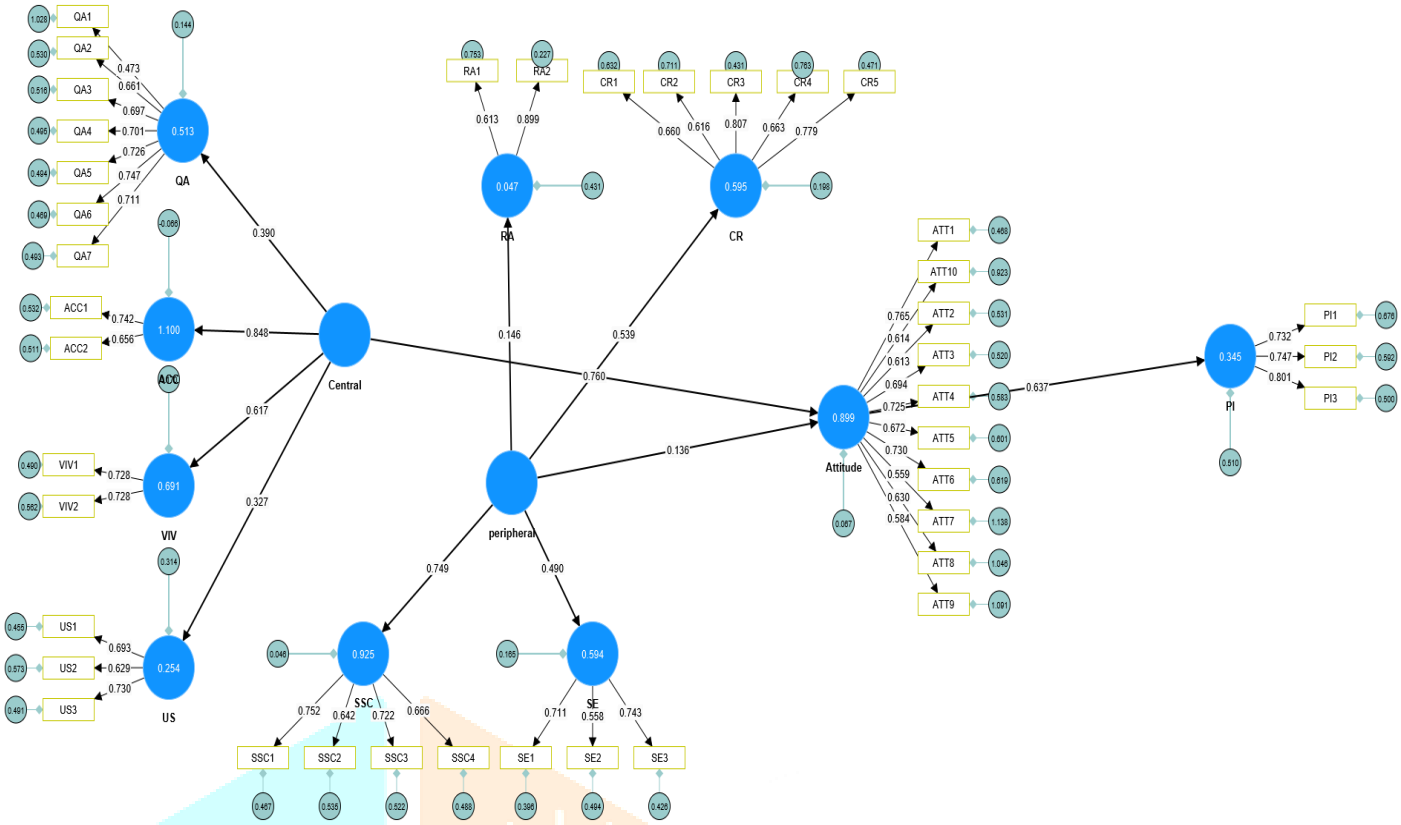
Model Fit

The model fit statistics provided offer insights into how well the estimated model aligns with the data it is meant to represent. Beginning with the chi-square statistic, which measures the discrepancy between the observed covariance matrix and the model-implied covariance matrix, its value of 1893.421 is sizable but must be considered in light of the large sample size of 485 observations and the number of model parameters, which stands at 93. The resulting degrees of freedom, calculated as the difference between observations and parameters, amount to 768, indicating a complex model structure.Despite the relatively high chi-square value, the associated p-value of 0 suggests that the model fits the data well, adhering to the null hypothesis that the model adequately represents the observed covariance structure. However, it's essential to recognize that with larger sample sizes, even minor misfit can yield significant chi-square values and low p-values, necessitating a comprehensive evaluation of additional fit indices.

The ChiSqr/df ratio, which is 2.4693 in this case, falls slightly below the desired threshold of 3 or lower, hence remains within an acceptable range given the complexities of the model and the sample size. Moving to the Root Mean Square Error of Approximation (RMSEA), a widely-used index that considers model fit relative to the number of estimated parameters, its value of 0.075 indicates reasonable fit, as values below 0.08 are typically considered indicative of good fit.Furthermore, the RMSEA's 90% confidence interval, with lower and upper bounds of 0.097 and 0.103 respectively, provides additional context by suggesting a relatively narrow range of potential values for the RMSEA, enhancing confidence in its accuracy as an index of model fit. Complementary fit indices such as the Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Normed Fit Index (NFI), Tucker-Lewis Index (TLI), and Comparative Fit Index (CFI) all report values ranging from 0.891 to 0.935, indicating a high proportion of variance and covariance explained by the model.

Table 2: Estimated Model fit

	estimated model		**estimated model**
chi-square	1893.421	**rmsea low 90% ci**	0.097
number of model parameters	93	**rmsea high 90% ci**	0.103
number of observations	485	**gfi**	0.915
degrees of freedom	768	**agfi**	0.891
p value	0.00	**nfi**	0.935
chisqr/df	2.4693	**tli**	0.914
rmsea	0.075	**cfi**	0.9016



Estimated Model

Hypothesis Statements

Hypothesis 1: Attitude -> Purchase Intention/ H0: Attitude has a significant positive influence on Purchase Intention.

The parameter estimate of 0.637 indicates a strong positive relationship between Attitude and Purchase Intention. This means that as individuals' attitudes towards something (e.g., online reviews) become more positive, their intention to purchase also increases significantly. The low p-value of 0.000 confirms that this relationship is statistically significant, providing robust support for Hypothesis 1.

Hypothesis 2: Central processing -> Accuracy/ H0: Central processing has a significant positive influence on Accuracy.

The parameter estimate of 0.848 indicates a very strong positive relationship between Central processing (i.e., deep, thoughtful processing of information) and Accuracy. This suggests that when individuals engage in central processing, their perception of accuracy regarding the information (e.g., online reviews) significantly increases. The low p-value of 0.000 confirms the statistical significance of this relationship, supporting Hypothesis 2.

Hypothesis 3: Central processing -> Attitude/H0: Central processing has a significant positive influence on Attitude.

The parameter estimate of 0.76 indicates a strong positive influence of Central processing on Attitude. This means that when individuals engage in deep processing of information (central route), their attitudes towards the information (e.g., online reviews) become more positive. The low p-value of 0.000 confirms the statistical significance of this relationship, supporting Hypothesis 3.

Hypothesis 4: Central processing -> Quality of Argument/H0: Central processing has a significant positive influence on Quality of Arguments.

The parameter estimate of 0.39 indicates a moderate positive relationship between Central processing and the Quality of Argument. This suggests that when individuals process information deeply, they perceive the arguments presented (e.g., in online reviews) to be of higher quality. The low p-value of 0.000 confirms the statistical significance of this relationship, supporting Hypothesis 4.

Hypothesis 5: Central processing -> Usefulness/H0: Central processing has a significant positive influence on Usefulness.

The parameter estimate of 0.327 indicates a positive relationship between Central processing and Usefulness. This implies that deep processing of information (central route) is associated with perceiving the information (e.g., online reviews) as more useful. The low p-value of 0.000 confirms the statistical significance of this relationship, supporting Hypothesis 5.

Hypothesis 6: Central processing -> Vividness/H0: Central processing has a significant positive influence on Vividness. The parameter estimate of 0.617 indicates a strong positive relationship between Central processing and Vividness. This suggests that deep processing of information is associated with perceiving the information (e.g., online reviews) as more vivid or impactful. The low p-value of 0.000 confirms the statistical significance of this relationship, supporting Hypothesis 6

Hypothesis 7: Peripheral processing -> Attitude/H0: Peripheral processing has a significant positive influence on Attitude.

The parameter estimate of 0.136 indicates a positive influence of Peripheral processing on Attitude. This means that when individuals rely on peripheral cues or surface-level processing, it still contributes positively to their attitudes towards the information (e.g., online reviews). The low p-value of 0.000 confirms the statistical significance of this relationship, supporting Hypothesis 7.

Hypothesis 8: Peripheral processing -> Credibility/H0: Peripheral processing has a significant positive influence on Credibility.

The parameter estimate of 0.539 indicates a strong positive relationship between Peripheral processing and Credibility. This suggests that relying on peripheral cues or superficial aspects (e.g., source credibility) positively influences perceptions of credibility regarding the information (e.g., online reviews). The low p-value of 0.000 confirms the statistical significance of this relationship, supporting Hypothesis 8.

Hypothesis 9: Peripheral processing -> Review Attractiveness/H0: Peripheral processing has a significant positive influence on Review Attractiveness.

The parameter estimate of 0.146 indicates a positive but relatively weaker influence of Peripheral processing on Review Attractiveness. This suggests that relying on peripheral cues or surface-level processing has a modest impact on perceptions of review attractiveness. The p-value of 0.008 confirms the statistical significance of this relationship but at a slightly higher threshold, supporting Hypothesis 9.

Hypothesis 10: Peripheral processing -> Source Expertise/H0: Peripheral processing has a significant positive influence on Source Expertise.

The parameter estimate of 0.49 indicates a strong positive relationship between Peripheral processing and Source Expertise. This suggests that relying on peripheral cues or superficial aspects positively influences perceptions of the source's expertise regarding the information (e.g., online reviews). The low p-value of 0.000 confirms the statistical significance of this relationship, supporting Hypothesis 10.

Hypothesis 11: Peripheral processing -> Source Social Connectedness/H0: Peripheral processing has a significant positive influence on Source Social Connectedness.

The parameter estimate of 0.749 indicates a strong positive influence of Peripheral processing on Source Social Connectedness. This means that relying on peripheral cues or surface-level processing significantly contributes to perceptions of social connectedness with the information source (e.g., online reviews). The low p-value of 0.000 confirms the statistical significance of this relationship, supporting Hypothesis 11.

Table 3: Results of Hypothesis Testing

	parameter estimates	standard errors	t values	p values		parameter estimates	standard errors	t values	p values
Attitude -> Pi	0.637	0.058	10.937	0.000	Central -> Viv	0.617	0.044	13.948	0.000
Central -> Acc	0.848	0.044	19.122	0.000	Peripheral-> Attitude	0.136	0.033	4.054	0.000
Central -> Attitude	0.76	0.048	15.709	0.000	Peripheral -> Cr	0.539	0.045	12.031	0.000
Central -> Qa	0.39	0.044	8.955	0.000	Peripheral -> Ra	0.146	0.055	2.655	0.008
Central -> Us	0.327	0.038	8.577	0.000	Peripheral -> Se	0.49	0.041	11.984	0.000

Findings and Discussions

The results from the Structural Equation Modeling (SEM) analysis align closely with the predictions derived from the Elaboration

Likelihood Model (ELM), a theoretical framework that explains how individuals process persuasive messages. ELM proposes two main

routes through which persuasion can occur: the central route and the peripheral route.

Central Route

The central route involves deep, thoughtful processing of information, where individuals carefully evaluate the content, arguments, and evidence presented. In the SEM results, we see strong support for the central route components:Central processing has a significant positive effect on Accuracy ($\beta = 0.848$, $p < 0.05$), indicating that when individuals engage in central processing, they perceive the information (e.g., online reviews) as more accurate. Central processing also positively influences Attitude ($\beta = 0.76$, $p < 0.05$), Quality of Argument ($\beta = 0.39$, $p < 0.05$), Usefulness ($\beta = 0.327$, $p < 0.05$), and Vividness ($\beta = 0.617$, $p < 0.05$). This suggests that deep processing leads to more positive attitudes, perceived quality of arguments, usefulness, and vividness of the information.

These results are consistent with the central route of ELM, where individuals carefully evaluate information, leading to more enduring attitude changes and behavior.

➢ **Peripheral Route**

The Peripheral route relies on cues and heuristics that are peripheral to the message itself, such as source credibility, emotional appeals, or superficial aspects of the message.

The SEM results also support the components of the peripheral route:Peripheral processing has a significant positive effect on Attitude ($\beta = 0.136$, $p < 0.05$), Credibility ($\beta = 0.539$, $p < 0.05$), Source Expertise ($\beta = 0.49$, $p < 0.05$), and Source Social Connectedness ($\beta = 0.749$, $p < 0.05$).

However, the effect of Peripheral processing on Review Attractiveness was relatively weaker ($\beta = 0.146$, $p < 0.05$ but at a slightly higher threshold). This indicates that peripheral cues have a modest impact on perceptions of review attractiveness.These results align with the peripheral route of ELM, where individuals may rely on cues like source credibility or social connectedness to form attitudes or make decisions without engaging deeply with the message content.

Implications of the Study

The implications of the study's findings based on the methodology and data analysis provide valuable insights into several areas related to online review persuasion, consumer behavior, and marketing strategies.

➢ Marketers and businesses can use insights into factors driving central route processing (e.g., content quality, argument strength, vividness) and peripheral cues (e.g., source credibility, social connectedness) to develop more effective online review strategies that enhance trustworthiness and appeal.

- Emphasizing both source credibility and review attractiveness, along with transparency, authenticity, and reliability in reviews, enhances consumer trust and fosters positive brand perceptions in online environments.
- Findings on purchase intentions and usefulness provide insights into consumers' decision-making processes, guiding businesses to align online reviews with consumer needs and preferences, thereby optimizing marketing efforts and driving conversion rates.
- The exploration of online review influence informs discussions on consumer protection and transparency in online advertising, guiding policymakers to develop guidelines for fair and trustworthy online review practices that benefit consumers and businesses alike.

Future Research Directions

Finally, the study opens avenues for future research in the field of online review persuasion and consumer psychology. Further investigations could delve deeper into specific variables, such as the role of emotions in online review processing, the impact of review volume and diversity on consumer decision-making, or cross-cultural variations in online review perceptions.

Additionally, longitudinal studies or experimental designs could provide insights into the causal relationships between variables and the dynamics of online review influence over time.

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