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Personalization or diversity? a comparative study of AI ad recommendations on user acceptance

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Abstract. With the wide application of artificial intelligence and big data technologies, personalized advertising has become a mainstream strategy for digital marketing. However, whether highly relevant ad recommendations always lead to better user acceptance is increasingly being questioned. This study investigates the impact of ad recommendation relevance (strong vs. weak) on user acceptance and examines the moderating role of users' exploratory tendency. Using a simulated ad experiment combined with an online survey, it finds that while strongly relevant ads generally receive higher acceptance, weakly relevant ads are more attractive to users with higher exploratory tendencies. Privacy concerns and interest domain heterogeneity also influence ad effectiveness. This research contributes to optimizing ad resource allocation and enhancing the return on investment in advertising.

Keywords: personalized advertising, algorithm fatigue, precision ad recommendation, relevant ads, exploratory tendency

1. Introduction

Digital marketing has become a crucial component of modern business strategies, and within this landscape, personalized advertising has emerged as a dominant approach. The widespread application of artificial intelligence and big data has made personalized advertising a dominant strategy in digital marketing. Companies now leverage large-scale personal data to train algorithms that can infer users' preferences, purchasing behaviors, and even political tendencies [1]. These systems can deliver highly targeted advertisements tailored to users' interests and needs, thereby increasing click-through and exposure rates [2]. However, a critical question remains: does higher relevance lead to better effectiveness of advertising? Users may feel repetitive exposure, reduced curiosity and even resistance in the highly precise recommendations, resulting in "algorithm fatigue". Algorithm fatigue may reduce ad click-through and conversion rates, ultimately diminishing the return on ad spend [3]. This challenges the assumption that more personalization is always better. While previous research has shown personalized advertising can better fit the needs of users and achieve marketing purposes, relatively little attention has been paid to individual differences in user response [4]. In particular, users with high exploratory tendencies may prefer fresh, unfamiliar content; therefore weakly relevant content may be more attractive for them. This study investigates how ad recommendation relevance strength affects user acceptance based on individual psychological traits, and further explores whether this relationship is moderated by users' exploratory tendencies. This study used a combination of a mock advertisement experiment and an online questionnaire, and focused on three interest tags, namely, "digital technology", "skincare and beauty", and "entertainment content". Participants evaluate one strongly relevant (personalized) and one weakly relevant (diversified) advertisement, rating them on interest level, click willingness, and privacy concerns, as well as measuring the level of their exploratory tendency. This research contributes to optimizing ad resource allocation and enhancing the return on investment in advertising from the investment perspective.

2. Literature review

Driven by advances in artificial intelligence (AI), big data, and hardware technologies (e.g., sensors), personalized advertising has emerged as a dominant force in digital marketing [5]. Artificial intelligence typically builds user models based on users' browsing history, purchasing behavior, social media interactions, and geographic characteristics to predict their response to specific advertising content. This enables recommendation systems to deliver ads that better align with users' potential interests [6].

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Existing literature on personalized advertising can be broadly categorized into two streams. The first focuses on computational models and algorithmic advances, including real-time bidding (RTB), relevance ranking, and recommendation algorithms [4,7,8]. These studies emphasize the critical role of contextual data and machine learning in improving advertising efficiency. The second category focuses on user psychology and acceptance, including privacy concerns, perceived intrusiveness, and cognitive fatigue. Scholars define algorithmic fatigue as the mental and emotional strain users experience when overwhelmed or disappointed by algorithmic outputs [3]. This phenomenon reflects that users gradually become tired or even turned off by overly precise content, which reduces the effectiveness of the ads.

However, the existing studies are still insufficient in exploring the individual differences of users, especially the role of "exploratory tendency" in the acceptance of advertisements, which needs to be further verified. However, the neglect of individual differences in user responses, especially the role of exploratory tendency, has limited the optimization of personalized advertising strategies. This study combined simulated advertisement experiments and questionnaire surveys to focus on the effect of "recommendation relevance" on "user acceptance", and further examine whether "exploratory tendency" plays a moderating role in the effect of "recommendation relevance", aiming to fill the gap in the current literature on the psychological and behavioral mechanisms of user acceptance.

3. Theoretical framework & hypotheses

This study is grounded in the theory that ad acceptance is influenced not only by content relevance but also by individual psychological traits—particularly exploratory tendency. While personalized ads are expected to perform better in general, users with a higher tendency to seek novelty and unfamiliar content may show more favorable responses to weakly relevant ads. This can be explained by Optimal Stimulation Level (OSL), which is a key factor influencing consumer behavior with pronounced exploratory features. Individuals with a high Optimal Stimulation Level are drawn to unique and innovative advertisements, as they look for different forms of stimulation [9]. They will search for more information driven by curiosity. Therefore, this research proposes that recommendation relevance influences user acceptance, and this effect is moderated by the user's exploratory tendency. Personalized ads featured strongly relevant content, while diversified ads included less relevant content.

Based on the theoretical model, the following hypotheses are proposed:

H1: Ads with strong relevance will result in higher user acceptance (interest and click intention) than weakly relevant ads.

H2: Users' exploratory tendency will positively moderate the effect of ad relevance on user acceptance, such that the effect of ad relevance on acceptance is weaker for users with high exploratory tendency compared to those with low exploratory tendency.

Users with lower exploratory tendencies are expected to be more inclined to choose highly relevant advertisements.

H3: Users' sense of privacy concern is negatively related to acceptance of personalized ads.

4. Methodology

4.1. Research design

This study adopts the quantitative research method of simulated advertisement experiment and questionnaire survey, aiming to explore the influence of the relevance of advertisement recommendation (strong/weak) on user acceptance, and further examine the moderating effect of the user's exploratory tendency. Participants first check their interest tags, such as digital technology, skin care and beauty, entertainment, and the system will display two advertisements according to their interests: one strongly relevant advertisement for a personalized recommendation, and one weakly relevant advertisement for a diversified recommendation. After providing basic information, the system delivers two ads based on interest grouping, with display order randomized to prevent bias. In addition, the user's exploratory personality traits are measured through five questions, including one reverse question.

4.2. Participants and procedure

The questionnaire was distributed through an online platform and participants answered voluntarily and anonymously. After filling in the basic information, the system pushed two advertisements based on interest grouping and randomly ordered the display to avoid order bias. Respondents who did not select an explicit interest were randomly assigned to a set of advertisement scenarios as a control group.

4.3. Measures

Table 1. Definition and measurement of variables

Variable type	Variable name	Description
Independent	Recommendation relevance	Strong vs Weak relevance
Moderator	Exploratory tendency	Tendency to seek novelty (1–7 Likert, 4 items)
Dependent	Advertisement interest	Perceived ad attractiveness
Dependent	Click intention	Willingness to learn more (1–7 scale)
Control	Privacy concern	Perceived privacy violation (1–7 scale)

The independent variable, Recommendation Relevance, was operationalized by showing participants one strongly relevant ad and one weakly relevant ad. The Exploratory Tendency was measured using a modified scale based on Baumgartner & Steenkamp (1996), with five items including one reverse-coded item. The two dependent variables—Ad Interest and Click Intention—were rated on a 7-point Likert scale for both ad types. Additionally, Privacy Concern was added as a control variable to account for the potential negative reaction to personalized content(Table 1).

4.4. Data analysis strategy

First, descriptive statistical analysis was performed on the demographic information of the sample. Subsequently, based on the scores from the 7-point Likert scale, weighted averages were calculated to measure the participants' level of ad acceptance, and differences in acceptance between personalized ads and diverse ads were compared. A group comparison of weighted averages was conducted for the exploratory tendency scale. Finally, open-ended responses on privacy and ad preferences were qualitatively analyzed to gain deeper insights into user reactions.

5. Results

Table 2. Descriptive statistics of respondents (N = 130)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Female	106	81.50%
	Male	24	18.50%
Age Group	Below 18	24	18.50%
	19-25	48	36.90%
	26-35	26	20.00%
	36+	32	24.60%
Education	High school or below	26	20.00%
	Junior college	16	12.30%
	Bachelor’s degree	48	36.90%
	Master’s degree or above	40	30.80%
Occupation	Student	62	47.70%
	Employed	44	33.80%
	Self-employed	12	9.20%
	Other	12	9.20%
Monthly Online Shopping	1-3 times	46	35.40%
	4-6 times	34	26.20%
	7+ times	50	38.50%
Interest Tags (multiple choice)	Digital technology	52	40.00%
	Skincare & Beauty	78	60.00%
	Entertainment	78	60.00%
	Other	12	9.20%

Note: Interest tags are multiple-response items; percentages may exceed 100%.

Table 3. Descriptive statistics of ad acceptance

Measure	Personalized	Diversified
Ad Attractiveness (1–7)	4.29	3.45
Click Intention (1–7)	4.21	3.23
Ad Acceptance (mean of above two)	4.25	3.34
Privacy Concern (1–7)	3.00	2.54

Note. "Ad Acceptance" = mean(Ad Attractiveness, Click Intention).

This section presents research findings based on simulated advertising experiments and structured questionnaire surveys, focusing on examining the relationship between advertising relevance intensity, user acceptance, and exploratory tendencies, as well as their moderating effects. As shown in Table 2, the sample was predominantly female (81.5%) and primarily young adults, with the largest age group being 19–25 years old (36.9%). Most participants had attained a university degree or higher (67.7%), and nearly half were students (47.7%), followed by employed respondents (33.8%). The overall exploratory tendency score was 3.41, indicating a moderate inclination among respondents toward exploring novel products.

5.1. Main effect test

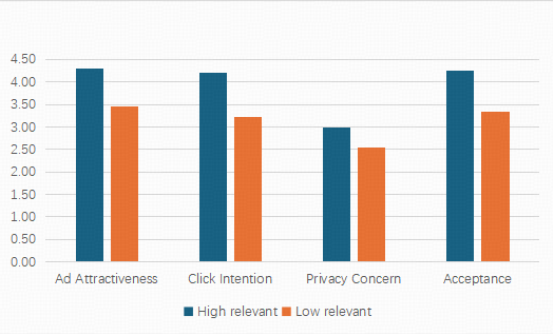

Figure 1. Difference in ad acceptance

-Strongly relevant ads have a significant advantage in terms of click intent

The analysis results indicate that the relevance of ad recommendations has a significant impact on users' willingness to click. The average click intention score of the strongly relevant ad group was significantly higher than that of the weakly relevant ad group ($M_1 = 4.29$ vs. $M_2 = 3.45$, $p < 0.01$)(Table 3), validating Hypothesis 1: the stronger the ad relevance, the higher the user acceptance.

-The compensatory effect of weakly related advertisements on long-term memory retention

However, in memory tests, weakly related advertisements showed better memory retention effects in some groups of respondents, especially when the content was contextually novel, making it easier for users to recall the brand information of weakly related advertisements. This result suggests that weakly related advertisements may have a certain compensatory effect on long-term memory, providing theoretical support for diversified recommendations(Figure 1).

5.2. Analysis of the moderating effect of exploratory tendencies

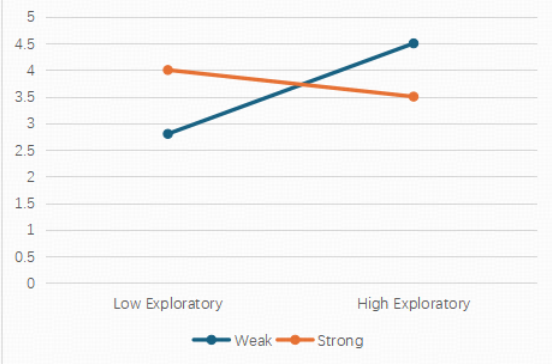

Figure 2. Difference in Ad acceptance relevance in different exploratory tendency

Further interaction term regression analysis revealed that users' exploratory tendencies exerted a significant moderating effect between ad relevance and acceptance. Specifically(Figure 2):

Users with high exploratory tendencies exhibit higher click intent toward weakly relevant ads (M = 4.5), as they are more inclined to try novel and unexpected content, indicating that such users hold a positive attitude toward diverse recommendations. Conversely, users with low exploratory tendencies exhibit significantly lower acceptance of weakly relevant ads (M = 2.8) and are more inclined toward personalized recommendations within their existing areas of interest. This partially validates Hypothesis 2: exploratory tendencies moderate the relationship between relevance and acceptance.

5.3. The moderating effect of privacy concerns

Although the core focus of this study is not on privacy variables, an exploratory analysis of the "privacy concern" dimension reveals that highly privacy-sensitive users are more likely to feel "monitored" when exposed to highly relevant ads, leading to a tendency to develop aversion or even resistance to clicking on such ads. This finding suggests that if users' privacy perceptions are not taken into account during the implementation of high-relevance advertising strategies, the intended effects may be counterproductive. It is recommended that future research systematically incorporate privacy concerns into regulatory mechanisms.

5.4. Analysis of heterogeneity in areas of interest

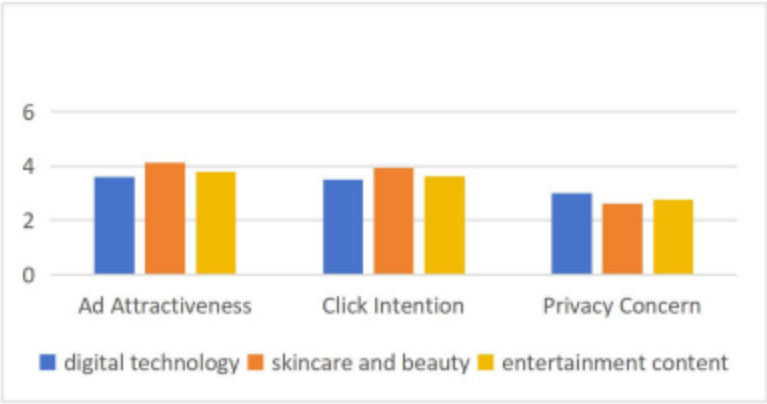

Figure 3. Differences in effects across interest fields

To further test the robustness of the research results, this paper divides respondents into three subgroups based on their primary areas of interest: "digital technology," "skincare and cosmetics," and "entertainment content," and conducts intergroup analysis. The results show(Figure 3):

For the "skincare and cosmetics" group, the click-through rate for strongly related ads increased the most significantly; "Digital Technology" users showed little difference in acceptance of strong vs. weak-related ads, but placed greater emphasis on

the practicality of ad content; highly exploratory users in the "Entertainment Content" group exhibited a stronger preference for weak-related ads, consistent with their entertainment-oriented usage motives. These findings support Hypothesis 3: Interest areas exhibit heterogeneity in ad acceptance. It is recommended that ad platforms incorporate user interest classification tags into content recommendations to enhance the multidimensional precision of personalized recommendations.

6. Conclusion

This study explored how the relevance of ad recommendations and users' exploratory tendency influence ad acceptance, with a focus on the moderating role of exploratory traits and the influence of privacy concerns. The findings reveal that diverse ads can boost engagement among highly exploratory users by catering to their desire for novel content. In contrast, less exploratory users favor highly relevant ads, and prioritizing privacy protection is crucial to prevent adverse reactions. Advertisers can leverage this information to segment users by their exploratory traits, customize ad content accordingly, and safeguard privacy via transparency and consent mechanisms. In practice, companies can employ data-driven algorithms to dynamically tailor ad recommendations according to user traits and interests, thereby balancing personalization with user comfort. Appropriate privacy protection and attention to exploratory preferences can help improve user engagement and long-term trust. Future research could further elucidate the role of individual differences in ad acceptance by incorporating additional behavioral metrics (e.g., dwell time), expanding sample sizes, and encompassing a more diverse range of populations and cultural backgrounds. Additionally, incorporating cognitive needs and cross-cultural differences into analysis could further optimize personalized and diverse ad strategies.

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