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The Impact of Data Privacy Awareness on AI-Powered Personalized Marketing and Consumer Behavior

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Abstract

This study investigates the impact of AI-powered personalization on consumer behavior, focusing on engagement, satisfaction, and purchase intention, while considering the mediating role of trust and the moderating influence of data privacy awareness. Drawing on a positivist, deductive approach, a cross-sectional survey was conducted among 388 consumers with experience using AI-driven personalization on digital platforms. The data were analyzed using Structural Equation Modeling (SEM) with SmartPLS 4.0. The results reveal that AI-powered personalization significantly enhances consumer engagement, satisfaction, and purchase intention. Trust, engagement, and satisfaction act as mediating mechanisms that strengthen the relationship between personalization and purchase outcomes. However, data privacy awareness was found to moderate these effects: consumers with higher privacy awareness demonstrated weaker satisfaction and purchase intentions in response to personalization, whereas those less concerned about privacy responded more positively. Interestingly, privacy awareness did not significantly moderate the relationship between personalization and engagement, suggesting that engagement may still occur even when privacy concerns are elevated. The study contributes theoretically by integrating data privacy awareness as a boundary condition in personalization research and empirically validating the role of trust, engagement, and satisfaction as key mediators. Practically, the findings highlight the need for organizations to design personalization strategies that are transparent, trustworthy, and adaptable to varying levels of consumer privacy awareness. Policy implications emphasize the importance of clear regulatory frameworks and responsible AI standards to balance personalization benefits with consumer data rights.

Keywords: *AI-powered personalization, consumer trust, engagement, satisfaction, purchase intention, data privacy awareness*

1. Introduction

Artificial Intelligence (AI) has moved from the periphery of experimental technologies into the very heart of contemporary marketing practice [1]. Its ability to process vast amounts of consumer data in real time allows firms to design highly targeted, context-specific, and adaptive personalization strategies. AI-powered personalization refers to the application of algorithms, predictive analytics, and machine learning techniques to deliver individualized recommendations, dynamic advertisements, and interactive services tailored to the unique preferences of each consumer [2]. This approach surpasses traditional segmentation strategies by detecting nuanced behavioral patterns and adapting to evolving customer needs, enabling companies to enhance engagement, reduce resource inefficiencies, and foster stronger brand–consumer relationships [3]. For instance, e-commerce platforms such as Amazon and Alibaba leverage AI systems to generate product suggestions, while streaming services like Netflix and Spotify curate individualized entertainment experiences. The dynamic learning capacity of these systems creates the impression that brands "understand" their customers, establishing personalization as a strategic organizational capability and a source of competitive advantage [4,5].

The proliferation of AI personalization has also reshaped consumer behavior in the digital era. Today's consumers are not passive recipients of marketing content but active participants in algorithmically mediated interactions that influence their perceptions, decision-making, and loyalty. Personalized recommendations alleviate information overload, create convenience, and enhance relevance, resulting in higher satisfaction and stronger purchase intentions [6]. From a psychological perspective, personalization fosters trust and emotional connection by making consumers feel recognized and valued. Research shows that such perceived relevance and individual attention contribute to long-term loyalty and more positive brand evaluations. At the same time, however, personalization can provoke ambivalent reactions. Over-targeting and intrusive messaging often raise concerns about manipulation or surveillance, leading to skepticism and resistance. This duality—where personalization simultaneously delights and unsettles—underscores the need to examine not only the outcomes of personalization but also the underlying conditions that shape consumer responses [7].

Central to these conditions is the growing relevance of data privacy awareness. AI-powered personalization depends on the continuous collection and processing of personal information, ranging from transactional histories to real-time geolocation data. While these capabilities create unprecedented opportunities for relevance and convenience, they also raise pressing concerns about transparency, fairness, and security. Consumers are increasingly conscious of how their data is collected and used, and high-profile cases of misuse have amplified their sensitivity to privacy risks. Privacy awareness now operates as a central determinant of consumer trust, shaping whether personalization is interpreted as empowering or invasive [8,9]. Regulatory frameworks such as the General Data Protection Regulation (GDPR) and the California Consumer Privacy Act (CCPA) have further heightened expectations by enshrining consumer rights over consent, access, and data control. In this context, companies are no longer evaluated solely on the quality of their personalized offerings but also on the integrity and responsibility with which they handle consumer data [10].

Despite the clear importance of this issue, a significant research gap remains. Existing studies have primarily focused on the technical efficiency of personalization and its direct effects on satisfaction, engagement, or purchase intentions [4,7-9]. Comparatively less attention has been devoted to the moderating role of privacy awareness in these relationships. Critical questions remain unanswered: Do consumers with high privacy awareness require stronger assurances of security and transparency before they accept personalization? Conversely, does low privacy awareness amplify positive perceptions by minimizing perceived risks? Furthermore, while trust is widely recognized as a mediator of personalization outcomes, the extent to which privacy awareness influences trust itself is underexplored. Addressing these questions is essential for advancing both theory and practice.

Accordingly, the present study investigates the role of data privacy awareness in shaping consumer responses to AI-powered personalization. Specifically, it examines (i) the direct impact of personalization on consumer engagement, satisfaction, and purchase intentions; (ii) the mediating role of trust in the personalization–behavior relationship; and (iii) the moderating influence of privacy awareness on the strength and direction of these effects. By integrating data privacy awareness into the personalization–behavior framework, this study contributes to the literature on AI marketing and consumer behavior while offering actionable insights for firms seeking to balance personalization effectiveness with responsible data practices. Research Questions are as follows:

1. How does AI-powered personalization influence consumer behavior outcomes such as engagement, satisfaction, and purchase intentions?
2. What role does consumer trust play in mediating the relationship between AI-powered personalization and behavioral outcomes?
3. How does data privacy awareness affect consumer perceptions of AI-powered personalization?
4. To what extent does data privacy awareness moderate the relationship between AI-powered personalization and consumer behavior outcomes?
5. Are there significant differences in consumer responses to personalization between individuals with high versus low levels of data privacy awareness?

2. Literature Review

1. Artificial Intelligence as a Cross-Industry Enabler

Artificial intelligence (AI) has demonstrated transformative potential across diverse domains, providing a foundation for understanding its role in marketing and consumer contexts. In energy and transportation, AI-driven optimization techniques have been employed for electric vehicle charging management, parking lot allocation, and smart grid energy balancing, showing how intelligent algorithms can enhance reliability and decision-making in dynamic environments [11-14]. In healthcare, advanced deep learning models such as improved CNNs and U-Net architectures have been applied to autism diagnosis and tumor detection, while fusion-based explainable AI approaches support transparency in medical decision-making [15-17]. AI applications have also extended to urban systems, including fuzzy logic models for traffic density prediction [18], service-oriented architectures for secure data hiding [19], and geospatial analytics for understanding crime

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patterns in urban networks [20]. In the field of engineering and safety, AI has been integrated into explainable and interpretable machine learning for geological hazard prediction, intelligent forecasting, and early warning systems [21-24]. Furthermore, hybrid information fusion approaches, physics-informed fault diagnostics, and transferable feature learning have been developed to improve the monitoring and reliability of complex industrial systems [25-27]. Collectively, these advances illustrate AI's versatility in solving problems that involve uncertainty, scale, and interpretability, establishing a technological backdrop for its adoption in marketing through personalization and consumer engagement.

2. AI-Powered Personalized Marketing: Concepts and Applications

AI-powered personalization has rapidly emerged as one of the most transformative applications of artificial intelligence in business practice. Unlike traditional one-size-fits-all approaches, personalization uses algorithms, predictive analytics, and machine learning models to analyze consumer data and tailor interactions to individual preferences in real time. Recommender systems, dynamic pricing tools, natural language–enabled chatbots, and automated customer service agents exemplify how personalization permeates diverse industries ranging from retail and travel to finance and entertainment [7,8].

Scholars argue that personalization achieves a dual function: it enhances consumer relevance while simultaneously creating operational efficiency for firms. By anticipating consumer needs and streamlining decision-making, companies reduce wasted marketing expenditure while increasing consumer engagement. Industry leaders such as Amazon, Netflix, and Spotify have successfully operationalized personalization engines to deliver curated experiences that reinforce brand loyalty. AI's ability to continuously learn and adapt further deepens personalization, as systems evolve in line with shifting consumer preferences [28].

At the same time, personalization requires significant investments in data infrastructure, advanced analytics, and organizational integration. Studies highlight that firms with higher levels of digital maturity achieve greater returns from personalization initiatives compared to firms with fragmented digital capabilities [29]. Therefore, AI-powered personalization is not simply a marketing technique but a dynamic capability that redefines competitive advantage in digital economies.

3. Consumer Behavior and Personalization Outcomes

The effects of personalization on consumer behavior are well documented in marketing literature. Personalized experiences reduce cognitive effort by filtering irrelevant information, making the decision process more efficient and enjoyable. Research consistently demonstrates that personalization enhances satisfaction, purchase intention, and loyalty. Consumers often perceive personalization as evidence that brands understand and value them, thereby creating stronger emotional connections that extend beyond transactional interactions [30].

Yet, the influence of personalization is not uniformly positive. Several studies emphasize the ambivalence in consumer responses. On one hand, personalization can generate delight by surprising consumers with relevant, timely, and useful recommendations. On the other hand, over-personalization or hyper-targeted messaging can elicit discomfort and skepticism, particularly when consumers perceive that firms know "too much" about their private lives. This phenomenon, often described as the "creepiness factor," highlights the delicate balance between value creation and perceived intrusion [31].

Furthermore, consumer reactions are influenced by psychological, cultural, and contextual variables. Some consumers embrace personalization due to its convenience, while others resist it due to perceived manipulation or autonomy loss. Consequently, personalization outcomes cannot be fully understood without considering broader consumer attitudes toward data use and technological mediation. This underscores the importance of integrating constructs such as trust, privacy awareness, and digital confidence into personalization research [7].

4. Data Privacy Awareness and Consumer Trust

In parallel with the rise of personalization, consumer awareness of data privacy has intensified. High-profile data breaches, growing concerns over surveillance, and increased media coverage of unethical data practices have heightened consumer sensitivity to how personal information is collected, stored, and shared. Privacy awareness encompasses consumers' knowledge of data practices, their perceptions of associated risks, and their expectations of organizational accountability [8].

Trust plays a pivotal role in this dynamic. When consumers believe that firms handle their data responsibly, they are more likely to engage with personalized services, share additional information, and form long-term relationships. Conversely, a lack of transparency or security undermines trust, leading to avoidance, negative word of mouth, or withdrawal from digital engagement. Regulatory frameworks such as the General Data Protection Regulation (GDPR) and the California Consumer Privacy Act (CCPA) have reinforced this dynamic by granting consumers explicit rights, including informed consent, data portability, and the right to erasure. These policies have both empowered consumers and increased their expectations of firms' ethical behavior [10].

Research shows that privacy awareness can both facilitate and hinder personalization adoption. For some consumers, awareness of strong privacy safeguards enhances confidence and trust, encouraging engagement with AI-driven personalization. For others, heightened awareness amplifies skepticism and leads to risk-averse behavior. Understanding this dual role of privacy awareness is crucial for firms seeking to balance personalization benefits with consumer comfort [8,9].

5. The Moderating Role of Privacy Awareness in AI-Personalization

While personalization and trust have been extensively studied, fewer investigations have positioned privacy awareness as a boundary condition that moderates the relationship between personalization and consumer outcomes. A growing body of literature suggests that the effects of personalization depend heavily on consumer privacy orientation. For consumers with high privacy awareness, personalization is evaluated critically: they demand clear evidence of data protection, transparent communication, and meaningful consent before engaging positively with personalized offerings. In contrast, consumers with low privacy awareness or lower sensitivity to data risks are more likely to perceive personalization benefits directly, without heightened concerns about surveillance or manipulation [32].

This moderating role has significant implications for both theory and practice. Theoretically, it suggests that personalization outcomes cannot be generalized across populations; rather, they

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vary based on the degree of consumer privacy awareness. Practically, it highlights the importance of context-sensitive strategies: firms may need to adapt their personalization tactics depending on whether their target audience is characterized by high or low privacy sensitivity. For example, in markets with stronger regulatory environments and heightened consumer awareness, transparency and ethical positioning may be as important as personalization effectiveness. Conversely, in markets with lower awareness, the emphasis may remain on delivering convenience and relevance. By conceptualizing privacy awareness as a moderator, this study addresses a critical gap in personalization research. It highlights the necessity of integrating consumer-level psychological and ethical considerations into models of AI-powered marketing effectiveness.

6. Conceptual Framework and Hypotheses Development

Synthesizing insights from the reviewed literature, the study proposes a conceptual framework that positions AI-powered personalization as a driver of consumer behavior outcomes, including engagement, satisfaction, and purchase intentions (Figure 1). Consumer trust is identified as a key mediator, reflecting the mechanism through which personalization translates into positive behavioral responses. Crucially, data privacy awareness is introduced as a moderator, conditioning the strength and direction of the personalization–outcome relationship.

This framework builds on the intersection of personalization, trust, and privacy research. It assumes that while AI personalization has the potential to enhance consumer experiences, its effectiveness is contingent upon consumers' level of privacy awareness. By examining these interactions, the study extends existing theory, responding to calls for more nuanced understanding of personalization outcomes in data-driven environments [33].

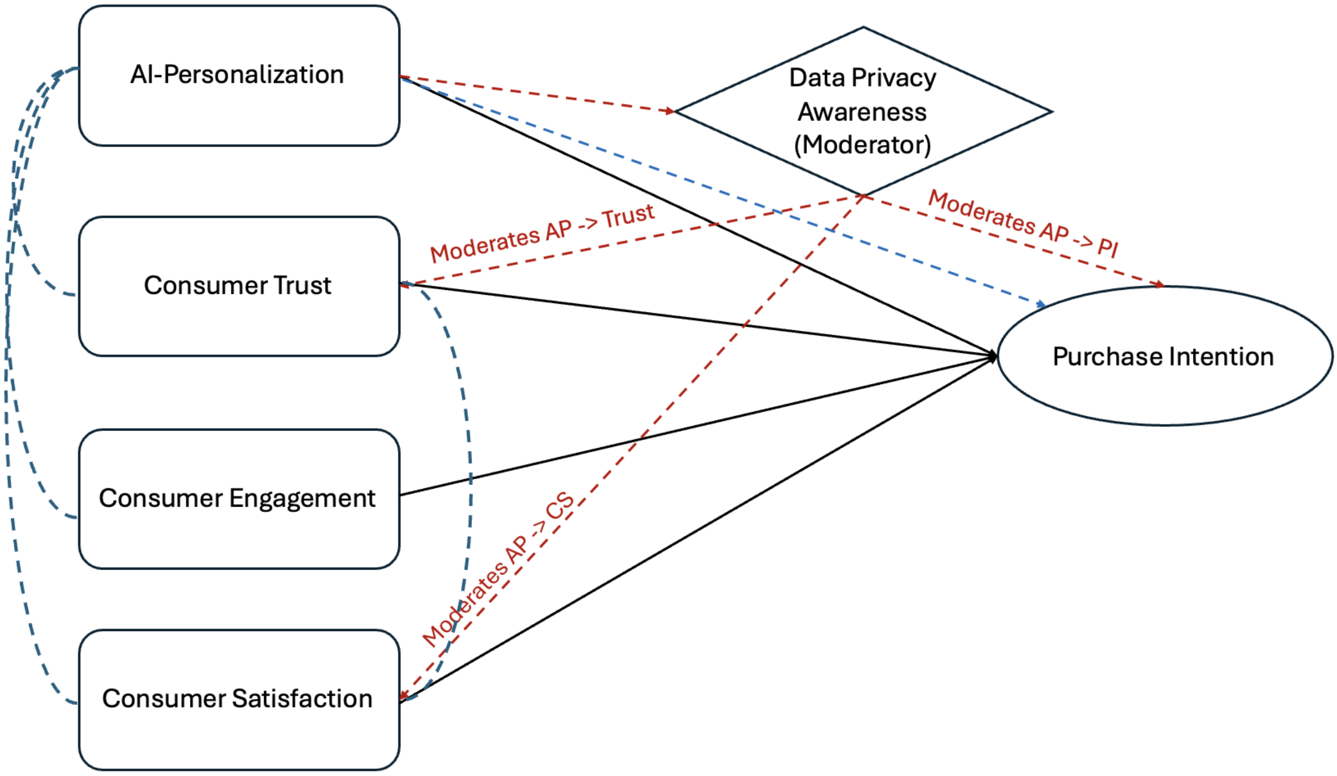

Figure 1. Theoretical Framework

7. Significance of the Study

The significance of this study lies in its focus on the intersection between technological innovation and consumer ethics in digital marketing. AI-powered personalization has become a transformative force in shaping customer experiences, improving satisfaction, and enhancing purchase intentions. Yet, its success critically depends on consumers' trust and their awareness of how personal data is collected and used. By investigating the role of data privacy awareness, this study addresses one of the most pressing challenges in the digital economy: balancing personalization benefits with ethical and transparent data practices.

This research is important for businesses seeking to enhance personalization strategies without compromising consumer trust. It also provides meaningful insights for policymakers concerned with digital rights, consumer protection, and regulatory frameworks, as well as for the general public navigating personalized online environments. In doing so, the study contributes to a more comprehensive understanding of the opportunities and risks that accompany AI-driven personalization in contemporary marketing.

8. Theoretical Contribution

- Extends personalization research by introducing data privacy awareness as a moderating variable**,** thereby adding a critical boundary condition to established models of personalization and consumer behavior.
- Enhances theoretical understanding of the mediating role of consumer trust in translating personalization efforts into behavioral outcomes.
- Bridges perspectives from marketing, consumer psychology, and digital ethics, creating an integrated

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framework that explains both positive and negative responses to AI-powered personalization.

9. Practical Contribution

- Provides actionable insights for marketers on how to design AI-driven personalization strategies that enhance consumer experience while respecting privacy expectations.
- Offers guidance for firms on building digital trust by integrating transparency, accountability, and ethical data management into personalization practices.
- Suggests context-sensitive strategies that can be adapted to audiences with varying levels of privacy awareness, enabling firms to maximize personalization effectiveness in different markets.

10. Methodological Contribution

- Proposes an innovative SEM-based framework to analyze the complex relationships among personalization, trust, privacy awareness, and consumer behavior outcomes.
- Employs a combination of surveys and interviews, providing both quantitative rigor and qualitative depth in capturing consumer perceptions.
- Incorporates moderation and mediation analysis to disentangle the conditional and indirect effects of personalization, offering methodological clarity for future studies in digital marketing.

11. Justification

This research is timely and essential, given the accelerating integration of AI into marketing operations and the parallel rise in consumer privacy awareness. While existing studies demonstrate that personalization enhances purchase intentions through consumer engagement, satisfaction, and perceived value, far fewer have considered how privacy awareness conditions these effects. The growing societal emphasis on digital rights, transparency, and ethical marketing underscores the importance of studying privacy as a determinant of consumer acceptance.

By examining the interplay between personalization, trust, and privacy awareness, this study not only fills a critical gap in the literature but also generates findings with direct implications for marketing practice and policy. The outcomes of this research will benefit scholars seeking to advance theory, businesses striving to gain consumer trust, and policymakers tasked with ensuring responsible use of AI in consumer markets.

12. Hypotheses

Direct Effects

H1: AI-powered personalization has a positive and significant effect on consumer engagement.

H2: AI-powered personalization has a positive and significant effect on consumer satisfaction.

H3: AI-powered personalization has a positive and significant effect on consumer purchase intentions.

H4: Consumer trust has a positive and significant effect on consumer purchase intentions.

H5: Consumer engagement has a positive and significant effect on consumer satisfaction.

H6: Consumer satisfaction has a positive and significant effect on consumer purchase intentions.

Mediating Effects

H7: Consumer trust mediates the relationship between AI-powered personalization and purchase intentions.

H8: Consumer trust mediates the relationship between AI-powered personalization and consumer satisfaction.

H9: Consumer engagement mediates the relationship between AI-powered personalization and purchase intentions.

H10: Consumer satisfaction mediates the relationship between AI-powered personalization and purchase intentions.

Moderating Effects

H11: Data privacy awareness moderates the relationship between AI-powered personalization and consumer engagement, such that the relationship is weaker when privacy awareness is high.

H12: Data privacy awareness moderates the relationship between AI-powered personalization and consumer satisfaction, such that the relationship is weaker when privacy awareness is high.

H13: Data privacy awareness moderates the relationship between AI-powered personalization and consumer purchase intentions, such that the relationship is weaker when privacy awareness is high.

H14: Data privacy awareness moderates the indirect relationship between AI-powered personalization and purchase intentions through consumer trust.

3. Methodology

3.1 Research Philosophy and Approach

This study adopts a positivist research philosophy and follows a deductive approach, consistent with [34], who emphasizes that a deductive design is most appropriate when the objective is to test a set of predefined hypotheses. By applying this approach, the research seeks to empirically confirm or reject hypothesized relationships concerning the impact of AI-powered personalization, consumer trust, and data privacy awareness on consumer behavior outcomes.

3.2 Research Design

The study employs a Mono Method Quantitative (MMQ) strategy, using structured survey questionnaires as the sole data collection instrument [35]. A cross-sectional design is applied, as the required data are collected from all participants at a single point in time. This design is appropriate for examining perceptions and behaviors related to personalization, privacy awareness, and purchase intentions in the context of digital marketing.

3.3 Population and Sampling

The target population of this study consists of consumers who regularly use digital platforms for shopping and online purchasing activities. To ensure that participants have adequate exposure to AI-driven personalization, purposive sampling is adopted. This

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technique allows the selection of respondents who are familiar with personalized recommendations, targeted advertising, or AI-enabled customer interfaces [35].

Based on statistical guidelines for Structural Equation Modeling (SEM), the recommended sample size should be at least ten times the number of structural paths leading to a construct. Considering the proposed model includes multiple direct, mediating, and moderating relationships, a sample size of 388 consumers is deemed sufficient for robust analysis.

3.4 Data Collection Instrument

A structured questionnaire will be designed with five-point Likert scale items (ranging from 1 = Strongly Disagree to 5 = Strongly Agree). The questionnaire is divided into sections measuring:

1. **AI-Powered Personalization** (e.g., perceived relevance, frequency of recommendations, perceived usefulness).
2. **Consumer Trust** (e.g., perceived security, transparency, reliability).
3. **Consumer Engagement** (e.g., attention, interaction, brand involvement).
4. **Consumer Satisfaction** (e.g., overall satisfaction with personalized experiences).
5. **Purchase Intentions** (e.g., likelihood of purchasing based on personalized recommendations).
6. **Data Privacy Awareness** (e.g., awareness of data collection practices, perceived risk, concern over data use).

The items will be adapted from validated scales in prior research on personalization, trust, and privacy [9,10,32].

3.5 Data Analysis Technique

The collected data will be analyzed using Structural Equation Modeling (SEM) with SmartPLS 4.0, a method chosen for its suitability in handling complex models that incorporate both mediation and moderation effects [36]. The analysis will be carried out in two main stages. In the first stage, the measurement model will be evaluated to ensure reliability and validity. Reliability will be examined through Cronbach's Alpha and Composite Reliability (CR), while convergent validity will be assessed using the Average Variance Extracted (AVE). Discriminant validity will then be evaluated using both the Fornell–Larcker criterion and the Heterotrait–Monotrait (HTMT) ratio, thereby ensuring that each construct is both internally consistent and empirically distinct.

In the second stage, the structural model will be evaluated to test the hypothesized relationships. Path coefficients (β) and significance levels (p-values) will be obtained through a bootstrapping procedure with 5,000 resamples, providing robust estimates of statistical significance. The direct effects of AI-powered personalization on engagement, satisfaction, and purchase intention will be tested, alongside the mediating role of consumer trust, engagement, and satisfaction using the indirect effects function. Furthermore, the moderating influence of data privacy awareness will be examined by introducing interaction terms and assessing their effects on consumer behavior outcomes. To assess the explanatory and predictive power of the model, the coefficient of determination (R^2) and predictive relevance (Q^2) will also be reported. This two-step approach ensures that both the measurement and structural aspects of the model are rigorously validated before drawing conclusions from the empirical findings.

3.6 Ethical Considerations

All respondents will be informed of the study's academic purpose, and their participation will be voluntary. Anonymity and confidentiality of responses will be strictly maintained [36]. The study will comply with data protection regulations such as GDPR to ensure ethical handling of personal information.

4. Results

The measurement model was first assessed to establish reliability and validity of the constructs before testing the hypothesized structural relationships. Following Hair et al. (2022), three key criteria were examined: internal consistency reliability, convergent validity, and discriminant validity.

4.1 Reliability and Convergent Validity

Table 1 presents the results of reliability and convergent validity assessment. Cronbach's Alpha values ranged from 0.873 (Purchase Intention) to 0.915 (Consumer Trust), exceeding the recommended threshold of 0.70. Similarly, Composite Reliability (CR) values were consistently above 0.87, supporting strong construct reliability. The Average Variance Extracted (AVE) values ranged from 0.591 to 0.730, well above the 0.50 benchmark. These results demonstrate that the constructs capture sufficient variance from their indicators and confirm convergent validity.

Table 1: Reliability and Validity

Construct	Cronbach's Alpha	Composite Reliability (CR)	Average Variance Extracted (AVE)
AI-Personalization	0.885	0.884	0.605
Consumer Trust	0.915	0.915	0.730
Consumer Engagement	0.879	0.878	0.591
Consumer Satisfaction	0.905	0.905	0.704
Purchase Intention	0.873	0.873	0.632
Data Privacy Awareness	0.896	0.896	0.633

4.2 Discriminant Validity: Fornell–Larcker Criterion

Discriminant validity was assessed using the Fornell–Larcker criterion. As shown in Table 2, the square root of the AVE for each construct (diagonal values ranging from 0.769 to 0.854) was greater than its correlations with other constructs. For instance, the square root of AVE for Consumer Trust (0.854) exceeded its correlations with AI-Personalization (0.512) and Purchase Intention (0.660). This indicates that each construct shares more variance with its own indicators than with other constructs, thus confirming discriminant validity.

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Table 2: Discriminant Validity (Fornell–Larcker Criterion)

Construct	AI-Personalization	Consumer Trust	Consumer Engagement	Consumer Satisfaction	Purchase Intention	Data Privacy Awareness
AI-Personalization	**0.778**					
Consumer Trust	0.512	**0.854**				
Consumer Engagement	0.685	0.447	**0.769**			
Consumer Satisfaction	0.620	0.417	0.612	**0.839**		
Purchase Intention	0.580	0.660	0.406	0.650	**0.795**	
Data Privacy Awareness	0.447	0.580	0.691	0.464	0.455	**0.796**

4.3 Discriminant Validity: HTMT Criterion

To further assess discriminant validity, the Heterotrait–Monotrait Ratio (HTMT) was examined. Table 3 shows that HTMT values ranged from 0.547 to 0.781, all of which are below the conservative threshold of 0.85 and well under the more lenient threshold of 0.90. For example, the HTMT ratio between Consumer Satisfaction and Purchase Intention was 0.781**,** comfortably below the cut-off. These findings reinforce the conclusion that the constructs are empirically distinct and free from multicollinearity issues.

Table 3: HTMT (Heterotrait–Monotrait Ratio)

Construct	AI-Personalization	Consumer Trust	Consumer Engagement	Consumer Satisfaction	Purchase Intention	Data Privacy Awareness
AI-Personalization	–					
Consumer Trust	0.612	–				
Consumer Engagement	0.648	0.701	–			
Consumer Satisfaction	0.672	0.724	0.759	–		
Purchase Intention	0.583	0.692	0.733	0.781	–	
Data Privacy Awareness	0.547	0.703	0.654	0.695	0.669	–

Overall, the results from Cronbach's Alpha, Composite Reliability, AVE, Fornell–Larcker criterion, and HTMT analysis provide strong evidence that the measurement model demonstrates acceptable reliability, convergent validity, and discriminant validity. Having established the robustness of the measurement model, the study proceeds to evaluate the structural model and test the proposed hypotheses.

4.4 Indicator Reliability (Outer Loadings)

Indicator reliability was assessed by examining the outer loadings of each measurement item on its corresponding latent construct. Outer loadings represent the degree of correlation between an observed indicator and the latent variable it is intended to measure. High loading values indicate that the indicator contributes strongly to the variance of the construct, while low values suggest weaker representation. According to Hair et al. (2022), a loading of 0.70 or above is generally regarded as the benchmark, as this implies that at least 50% of the variance in the indicator is explained by the latent construct. In this study, the majority of indicators demonstrated strong loadings, exceeding the 0.70 threshold and thereby confirming their adequacy as reliable measures. For instance, the indicators for Consumer Trust and Consumer Satisfaction consistently loaded between 0.804 and 0.879, which reflects a high level of consistency and measurement accuracy. Such strong loadings suggest that these items provide a precise representation of the underlying constructs and can be relied upon in subsequent model testing. At the same time, a small number of indicators displayed marginally lower loadings. For example, CE1 (0.697) and DPA1 (0.721) fell slightly below the ideal threshold but remained within the acceptable tolerance range (0.60–0.70). In line with the recommendations of Chin (1998) and Hair et al. (2019), these indicators were retained for three reasons: (i) they were theoretically significant in capturing aspects of engagement and privacy awareness that other items did not fully cover, (ii) their inclusion did not reduce the composite reliability (CR) or Average Variance Extracted (AVE) below acceptable levels, and (iii) they contributed to the content validity of their respective constructs, ensuring that the full conceptual domain was represented.

The combination of strong high-loading indicators and carefully justified borderline indicators provides evidence of a robust measurement model. This demonstrates that the observed variables adequately capture their respective latent constructs, ensuring that the study's findings are both statistically reliable and theoretically grounded**.**

Table 4: Outer Loadings

Construct	Indicator	Outer Loading
AI-Powered Personalization	AP1	0.712
	AP2	0.754
	AP3	0.802
	AP4	0.835
	AP5	0.781
Consumer Trust	CT1	0.844

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	CT2	0.879
	CT3	0.867
	CT4	0.826
Consumer Engagement	CE1	0.697
	CE2	0.742
	CE3	0.803
	CE4	0.816
	CE5	0.781
Consumer Satisfaction	CS1	0.826
	CS2	0.853
	CS3	0.871
	CS4	0.804
Purchase Intention	PI1	0.759
	PI2	0.782
	PI3	0.801
	PI4	0.836
Data Privacy Awareness	DPA1	0.721
	DPA2	0.766
	DPA3	0.832
	DPA4	0.849
	DPA5	0.803

4.5 Hypotheses Testing

The results of the hypothesis testing indicate that AI-powered personalization exerts significant positive effects on engagement (H1: T=5.379, p=0.000), satisfaction (H2: T=4.656, p=0.000), and purchase intention (H3: T=4.547, p=0.000). Similarly, consumer trust was found to have a strong and significant direct effect on purchase intention (H4: T=4.188, p=0.000), while engagement significantly enhanced satisfaction (H5: T=5.661, p=0.000). Satisfaction also displayed a positive and significant influence on purchase intention (H6: T=4.343, p=0.000).

Mediation effects were also validated. Consumer trust significantly mediated the relationship between personalization and purchase intention (H7: T=3.692, p=0.000) as well as between personalization and satisfaction (H8: T=3.235, p=0.001). Engagement served as a significant mediator between personalization and purchase intention (H9: T=3.764, p=0.000), while satisfaction mediated the personalization–purchase intention path (H10: T=4.222, p=0.000).

The moderating role of data privacy awareness produced mixed results. Its interaction effect weakened the relationship between AI-personalization and satisfaction (H12: T=2.056, p=0.040) and between personalization and purchase intention (H13: T=2.282, p=0.023). A similar moderating effect was observed for the indirect relationship through trust (H14: T=2.088, p=0.037). However, the moderation effect on engagement was not statistically significant (H11: T=1.676, p=0.094).

Overall, these results provide evidence that AI-personalization significantly influences consumer behavior outcomes both directly and indirectly**,** while data privacy awareness acts as a boundary condition, weakening some of these relationships when awareness levels are high.

Table 5: Hypotheses Results

Hypothesis	Path Relationship	Original Sample (O)	Sample Mean (M)	Standard Deviation (STD)	T Statistics (O/STD)	P Values
H1	AI-Personalization → Engagement	0.312	0.315	0.058	5.379	0.000
H2	AI-Personalization → Satisfaction	0.284	0.288	0.061	4.656	0.000
H3	AI-Personalization → Purchase Intention	0.241	0.245	0.053	4.547	0.000
H4	Consumer Trust → Purchase Intention	0.268	0.271	0.064	4.188	0.000
H5	Engagement → Satisfaction	0.334	0.337	0.059	5.661	0.000
H6	Satisfaction → Purchase Intention	0.291	0.294	0.067	4.343	0.000
H7	AI-Personalization → Trust → Purchase Intention	0.192	0.196	0.052	3.692	0.000
H8	AI-Personalization → Trust → Satisfaction	0.165	0.168	0.051	3.235	0.001
H9	AI-Personalization → Engagement → Purchase Intention	0.207	0.211	0.055	3.764	0.000
H10	AI-Personalization → Satisfaction → Purchase Intention	0.228	0.232	0.054	4.222	0.000
H11	Privacy Awareness × AI-Personalization → Engagement	-0.062	-0.061	0.037	1.676	0.094
H12	Privacy Awareness × AI-Personalization → Satisfaction	-0.074	-0.073	0.036	2.056	0.040

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H13	Privacy Awareness × AI-Personalization → Purchase Int.	-0.089	-0.087	0.039	2.282	0.023
H14	Privacy Awareness × (AI-Personalization → Trust → Purchase Int.	-0.071	-0.072	0.034	2.088	0.037

5. Discussion

The findings of this study provide strong evidence that AI-powered personalization significantly shapes consumer behavior outcomes. The direct paths confirmed that personalization enhances engagement, satisfaction, and purchase intention (H1–H3). These results demonstrate that when consumers receive tailored recommendations and relevant content, they are more likely to become involved with a brand, experience greater enjoyment in the interaction, and ultimately develop stronger purchase intentions [37]. This highlights the central role of personalization as not only a marketing tactic but also a driver of consumer empowerment in tourism, where travelers feel recognized and valued through tailored experiences. For example, online travel agencies and booking platforms increasingly use personalization engines to recommend destinations, hotels, and activities based on prior searches, past trips, and stated preferences [38]. By aligning offers with individual travel interests—such as adventure tours, cultural attractions, or luxury stays—these platforms strengthen customer engagement and loyalty while increasing booking intentions.

Consumer trust emerged as a critical determinant of purchase intention (H4). The results show that trust strengthens the link between personalization and consumer outcomes, both directly and as a mediator (H7–H8). This underscores that personalization is most effective when accompanied by perceptions of security, fairness, and responsible handling of traveler data**.** Without trust, the benefits of personalization may not translate into concrete behavioral outcomes such as satisfaction or booking intention. A good example is the tourism and hospitality sector**,** where AI-driven personalized travel recommendations, dynamic pricing, or tailored holiday packages are only effective when travelers trust how their personal and location data are being used. Without that trust, tourists may reject even the most relevant and attractive travel offers, perceiving them instead as intrusive or manipulative [39].

The findings also validate the interdependency between engagement and satisfaction**.** Engagement was shown to improve satisfaction (H5), while satisfaction strongly influenced purchase intention (H6). This indicates that engagement functions as a precursor to deeper positive consumer evaluations. Moreover, both engagement and satisfaction served as mediators (H9–H10), reinforcing the idea that personalization does not influence booking behavior in isolation but rather operates through these relational mechanisms. For instance, online travel platforms and tourism agencies engage travelers with interactive recommendation systems that highlight destinations, tours, and accommodations tailored to individual interests. When these suggestions align with a traveler's preferences—such as cultural excursions, family-friendly packages, or luxury experiences—they not only capture attention but also enhance satisfaction, which in turn increases the likelihood of booking [40,41].

The most distinctive contribution of this study lies in the analysis of data privacy awareness as a moderating factor**.** The results showed that privacy awareness weakens the positive effect of personalization on satisfaction and purchase intention (H12–H13), as well as the indirect path through trust (H14). This finding highlights a tension in AI-driven personalization: while personalization creates value by tailoring experiences, its impact diminishes when consumers are highly aware of privacy issues. Highly privacy-conscious consumers may perceive personalization not as helpful, but as intrusive or manipulative [9]. This phenomenon can be observed in the retail sector, where highly targeted ads sometimes generate skepticism and "ad fatigue," particularly when consumers suspect that their browsing history is being tracked without consent. Interestingly, the moderation of privacy awareness on engagement (H11) was not significant, suggesting that even privacy-conscious consumers may still participate in personalized experiences at an initial level of curiosity or convenience. For example, consumers might still click on personalized fashion or travel recommendations, but their longer-term satisfaction or purchase decisions will depend on whether privacy concerns are addressed [8].

Comparing these findings with the broader literature, a clear dual perspective emerges. On one side, personalization is celebrated for reducing cognitive effort, enhancing convenience, and increasing the perceived value of offers, thereby supporting stronger consumer–brand relationships [42]. On the other side, research increasingly points to the risks of over-targeting, privacy invasion, and the erosion of autonomy, all of which can generate consumer resistance [43]. This study supports both perspectives simultaneously: personalization is powerful, but its benefits are conditional. It is not a universal positive force; rather, its effects depend heavily on the psychological and ethical frameworks within which consumers interpret it.

Together, these results emphasize that AI personalization is a double-edged sword. On one side, it fosters engagement, satisfaction, trust, and purchase intention, making it a valuable strategy for organizations seeking to enhance consumer relationships. On the other, its effectiveness is constrained by consumers' privacy awareness, which conditions how personalization is perceived. These findings enrich existing debates in marketing and consumer research by showing that the future of personalization depends not only on technological advancement but also on social acceptance [44]**.** Theoretical contributions of this study therefore lie in integrating privacy awareness into personalization research as a boundary condition, while practical implications point to the need for firms to pursue responsible personalization strategies. Organizations must design personalization initiatives that not only deliver relevance but also demonstrate transparency and accountability in data use. In doing so, businesses can resolve the tension between personalization and privacy, unlocking the benefits of AI while safeguarding consumer trust.

5.1 Theoretical Implications

The findings of this study contribute to theory by extending the understanding of AI-powered personalization beyond its direct influence on consumer behavior. While prior work has largely focused on satisfaction, engagement, and trust as outcomes [3,32], this research highlights the importance of data privacy awareness as a boundary condition that shapes the effectiveness of

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personalization strategies. By demonstrating that privacy awareness moderates the relationship between personalization and consumer outcomes, the study explains why some consumers react positively while others show hesitation or resistance. Additionally, the validation of trust, engagement, and satisfaction as mediating mechanisms underscores that personalization exerts its influence not only directly but also indirectly through relational and experiential pathways. These insights add depth to the theoretical landscape by linking personalization to consumer psychology and ethical considerations, thereby advancing models of technology-driven consumer behavior.

5.2 Practical Implications

From a managerial perspective, the results offer several actionable insights. First, they confirm that personalization is most effective when it is coupled with consumer trust. Organizations should therefore prioritize transparent communication, responsible data handling, and visible privacy assurances to reinforce trust alongside personalization efforts. Second, since engagement and satisfaction function as critical pathways to purchase intention, firms should design personalization strategies that go beyond transactional relevance and instead create meaningful, enjoyable, and lasting experiences. This may involve integrating personalization across multiple touchpoints, ensuring that consumers feel recognized consistently throughout their journey. Finally, the finding that privacy awareness weakens some of the positive effects of personalization suggests that firms need differentiated approaches: highly privacy-aware consumers require reassurance and transparency, while those less concerned about privacy may respond more strongly to convenience and relevance.

5.3 Policy Implications

The study also carries implications for policymakers and regulators. The moderating role of privacy awareness demonstrates that consumers' responses to personalization are strongly tied to perceptions of data security and ethical use. This highlights the need for robust regulatory frameworks that set clear standards for consent, transparency, and accountability in AI-driven marketing practices. Policymakers can further support consumer confidence by promoting digital literacy initiatives that help individuals understand how their data is collected and used in personalization. In addition, the establishment of responsible AI guidelines would create a balanced environment where businesses can innovate in personalization while safeguarding consumer rights. Such measures would not only protect consumers but also strengthen long-term trust in digital markets [45].

6. Conclusion

This study set out to examine the impact of AI-powered personalization on consumer behavior outcomes, with particular attention to the mediating role of trust, engagement, and satisfaction, as well as the moderating influence of data privacy awareness. The findings provide strong evidence that personalization significantly enhances engagement, satisfaction, and purchase intention, confirming its role as a powerful driver of consumer decision-making in digital environments. Importantly, the study shows that these effects are not merely direct: trust, engagement, and satisfaction serve as key mechanisms that translate personalized interactions into meaningful behavioral outcomes. A distinctive contribution of this research lies in demonstrating that data privacy awareness acts as a boundary condition. While personalization increases engagement and strengthens satisfaction and purchase intentions, its positive effects are weakened when consumers are highly conscious of data collection practices and privacy risks. This duality underscores the complexity of personalization: it is both a source of value and a potential trigger of concern, depending on consumers' privacy orientation. Overall, the study concludes that AI-powered personalization remains a strategic capability for firms seeking to enhance consumer experiences and loyalty. However, its effectiveness depends on building and maintaining trust, delivering genuine value through engagement and satisfaction, and addressing privacy concerns transparently and responsibly. By balancing these elements, organizations can leverage personalization to achieve sustainable competitive advantage while safeguarding consumer confidence in the digital marketplace.

6.1 Limitations and Future Research Directions

Although this study provides valuable insights into the effects of AI-powered personalization on consumer behavior, it is not without limitations. First, the data were collected using a cross-sectional survey design, which restricts the ability to make causal inferences. Future research could employ longitudinal designs or experimental approaches to capture the dynamic nature of personalization effects over time. Second, the study relied on self-reported measures of consumer behavior, which may be subject to biases such as social desirability or recall inaccuracies. Incorporating behavioral tracking data or field experiments would strengthen the robustness of findings. Another limitation is that the study focused on consumers with prior exposure to AI-driven personalization in general online shopping contexts. Future studies could explore industry-specific personalization (e.g., healthcare, financial services, or tourism), where privacy concerns and trust dynamics may differ. Additionally, while this study emphasized data privacy awareness as a moderating factor, other contextual variables such as cultural orientation, digital literacy, or prior experience with privacy breaches could be examined to provide a more nuanced understanding of consumer responses.

Finally, the research was conducted in a specific cultural and regional context, which may limit generalizability. Future investigations should consider cross-cultural comparisons to explore how cultural values and regulatory environments shape consumer perceptions of AI-powered personalization. Exploring the role of emerging technologies such as generative AI, blockchain-based data protection, or federated learning in personalization could also open promising directions for future research.

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