Measuring the effect of Artificial Intelligence Factors on Consumer Behavior

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Abstract:

Recent years have witnessed a radical transformation in the world of business and marketing thanks to the development of artificial intelligence technologies, which have significantly impacted consumer behavior by analyzing massive amounts of data and instantly responding to their changing needs. This research aims to examine the impact of artificial intelligence on consumer behavior by analyzing the role of smart recommendations, data protection, and trust in these technologies. A quantitative approach was used to collect data from University of Nineveh employees and analyze it using Smart PLS 4 to test hypotheses.

The results showed that artificial intelligence positively impacts consumer behavior with an impact factor of 0.641 and a t-value of 9.633, indicating a strong and significant impact. Data protection also showed an impact with a coefficient of 0.393 and a t-value of 3.561, while trust had a lesser impact with a coefficient of 0.262 and a t-value of 2.446.

The study confirms that artificial intelligence enhances the consumer experience, but it requires balancing marketing benefits with privacy protection. The research recommends that companies optimize their marketing strategies to maximize the benefits of these technologies.

Keywords: Artificial Intelligence, Consumer Behavior, Smart PLS, Customer Satisfaction, Customer Service.

1. Introduction:

Recent years have witnessed a radical transformation in the world of business and marketing, driven by the growth and development of artificial intelligence technologies. These technologies have profoundly impacted consumer behavior, enabling them to analyze massive amounts of data and respond instantly to changing needs and desires. Instead of relying on traditional methodologies to study consumer behavior, AI enables companies to accurately understand customer purchasing patterns and preferences, allowing them to deliver personalized experiences that enhance customer loyalty and increase the effectiveness of marketing campaigns (Madanchian, 2024).

AI applications in marketing include data analytics tools, recommendation systems, and chatbots, all designed to provide seamless and rapid interactions with consumers. For example, the use of machine learning algorithms enables real-time analysis of customer behavior, enabling companies to quickly adjust their strategies to meet consumer expectations. This dynamic helps create a competitive environment that forces companies to be more innovative and adapt their offerings,

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while consumers, in turn, expect personalized experiences that align with their unique needs (Haleem et al.,2022).

On the other hand, these developments raise several challenges related to privacy and the data ecosystem. With the increasing reliance on personal data, it becomes imperative to implement strict measures to protect consumer information and maintain their trust. These issues are particularly important in light of the growing laws related to data protection and consumer rights, which require companies to balance achieving commercial objectives with maintaining the ethics of handling personal information. Understanding the impact of artificial intelligence on consumer behavior requires a comprehensive and in-depth study to arrive at conclusions that contribute to developing more effective and appropriate marketing strategies in the modern digital age (Massoudi et al., 2023).

2. Overview of Artificial Intelligence

Artificial intelligence (AI) refers to the ability of computer systems to perform tasks that typically require human intelligence, such as learning, reasoning, and interaction. AI goes beyond simply programming systems to perform specific tasks; modern applications incorporate sophisticated algorithms that learn from data, enabling them to improve their performance over time. One of the most prominent theoretical foundations of AI is the concept of artificial neural networks, which represent a simplified model of the human brain and enable systems to intelligently process complex information. AI is now an integral part of many industries, from healthcare to commerce, shaping our consumer experience like never before (Rashid & Kausik, 2024).

The history of artificial intelligence (AI) dates back to the mid-20th century, when it began as a collection of theoretical ideas in mathematics and logic. In 1956, the Dartmouth Conference was held, marking the official beginning of AI as an independent science. Since then, the field has witnessed periods of significant achievements, as well as periods of decline known as the "AI Winter," when funding and research declined due to disappointments. Despite these difficult periods, the late 20th and early 21st centuries have been a period of remarkable revival in the field, with advances in deep learning and machine learning techniques (Moor, 2006).

Artificial intelligence can be broadly classified into two main types: narrow AI, which is used to perform specific tasks, such as recommendation systems in e-commerce, and general AI, which aims to mimic human capabilities across a wide range of tasks. Both types reflect significant leaps in the evolution of technology and how it is used to change consumer behavior. AI, in all its forms, is a vital tool reshaping consumer behavior and helping companies more deeply understand and analyze market preferences (Babu & Banana, 2024).

3. Overview of Consumer Behavior

Consumer behavior refers to the decisions and actions individuals take when choosing products or services. This behavior is influenced by a range of psychological, social, cultural, and economic factors. Consumer behavior is central to economic understanding, as it determines how individuals interact with brands and markets. These behavioral patterns are intertwined with consumers' emotions, desires, and preferences, which are influenced by the contextual factors surrounding them. It is important to understand how artificial intelligence (AI) can shape these patterns by improving understanding of these factors and enriching the consumer experience.

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understanding of these factors and enriching the consumer experience (Ali and Raewf, 2021).

Consumer behavior is driven by a number of influencing factors, including individual motivations such as the desire for distinction or convenience, social factors such as peer and family influence, and prevailing cultural values. In today's digital environment, artificial intelligence (AI) is increasingly influencing consumer behavior, being used to perform advanced analytics on consumer data, enabling the automation of marketing processes and more precise personalization of offers. AI-based analytics contribute to personalized recommendations that significantly influence purchasing decisions, reflecting AI's potential to enhance the interaction between consumers and products.

Understanding consumer behavior becomes even more important in the modern age of technology, with increasing reliance on AI tools to analyze data and extract patterns. This understanding not only helps companies improve marketing strategies but also enhances consumers' ability to make informed purchasing decisions. AI-powered analytics apply to a wide range of industries, from e-commerce to customer service, demonstrating the profound impact these technologies have on purchasing habits and brand interactions. It is essential for marketing policymakers and practitioners to remain aware of these changing dynamics to ensure their efforts align with the ongoing and evolving desires of consumers amid the increasing influence of AI (Al-Delawi et al.,2023; Raewf et al., 2021; Li et al., 2022).

4. literature review and Hypotheses development

4.1 Literature Review

AI-based technologies play a crucial role in improving user experience and personalizing services based on individual needs. This review aims to analyze previous studies on the impact of AI technologies on consumer decisions and behavior, focusing on key factors such as smart recommendations, chatbots, and predictive analytics. Research indicates that AI-based recommendation systems improve the online shopping experience by analyzing user data and suggesting appropriate products to them. Studies have shown that these recommendations lead to increased conversion rates and encourage repeat purchases (Omeish et al., 2024).

Studies have also shown that the use of AI-based chatbots enhances customer satisfaction and influences their purchasing decisions. These systems provide immediate and interactive support, which increases customer loyalty to the brand. Recent research indicates that predictive analytics helps companies understand purchasing patterns and anticipate consumer behavior, enabling personalized marketing strategies. This contributes to improving customer satisfaction and increasing engagement with them (Kumar et al., 2024; Omeish et al., 2024).

One of the factors that influence consumer response to AI technologies is trust in this technology, as consumer trust in AI-based systems plays a major role in determining the extent of their adoption and acceptance. In addition, concerns related to data privacy and security may affect consumers' willingness to use AI-based applications. Ease of use and interaction also play a major role in consumers' acceptance of these technologies (Teodorescu et al., 2023).

Current literature indicates that AI has become an essential tool in shaping consumer behavior through smart recommendations, chatbots, and predictive analytics. However, challenges related to trust, privacy, and user experience remain. Therefore, future studies should explore the psychological and social impacts of using AI in digital marketing.

4.2 Hypotheses development

Based on the review of previous literature, the following hypotheses can be formulated to test the impact of AI factors on consumer behavior:

H1: AI technologies such as smart recommendations, chatbots, and predictive analytics positively impact purchasing decisions and consumer behavior.

H2: Consumer trust of AI technologies play a key role in driving adoption of these technologies and increasing engagement with brands.

H3: Concerns about privacy and data protection negatively impact consumers' willingness to use AI applications in online purchases.

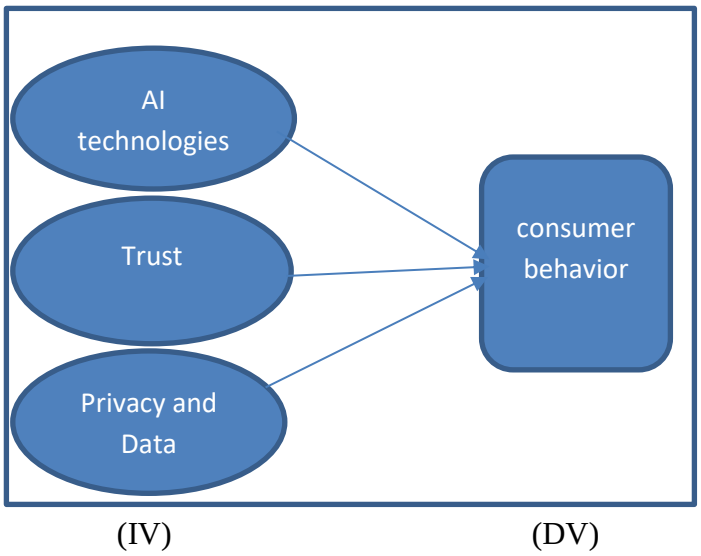

Figure 1. Hypothetical Framework

5. Methodology

This research relies on a quantitative approach by using a questionnaire to collect data related to the impact of artificial intelligence factors on consumer behavior. The questionnaire was designed based on measures used in previous studies to ensure reliability and validity.

It will include a set of questions measuring the impact of smart recommendations, chatbots, and predictive analytics on consumer decisions, as well as the impact of trust, ease of use, and privacy on the adoption of these technologies. The questionnaire was distributed to a sample of University of Nineveh staff members, who were randomly selected to ensure a diverse representation of opinions and perspectives.

The data were analyzed using Smart PLS 4, which enables structural path analysis (SEM) to test hypotheses and identify relationships between various variables. This approach provides a deeper understanding of how artificial intelligence technologies impact consumer behavior and provides recommendations for companies on how to improve their marketing strategies based on the research findings.

6. Results

By doing the analysis via SMART PLS 4, the researchers had to check the measurement model, as well as structural model.

6.1 Measurement Model

To confirm the reliability and validity of the instruments, we applied both convergent and discriminant validity as outlined below.

6.1.1 Convergent Validity

To ensure the accuracy of the measurements, internal consistency coefficients were calculated using Cronbach's Alpha and composite reliability (rho_a and rho_c) as well as average variance extracted (AVE) and the results showed the following values (Hair et al., 2014):

Table 1. Construct reliability and validity

Average variance extracted (AVE)	Composite reliability (rho_c)	Composite reliability (rho_a)	Cronbach's alpha	
0.677	0.893	0.997	0.861	AI Tech
0.598	0.874	0.867	0.809	Consumer Behavior
0.695	0.9	0.899	0.904	Privacy & Data Protection
0.659	0.885	0.89	0.832	Trust

Values in table (1), indicate a high level of reliability for all variables as all Cronbach's Alpha values exceed 0.8, indicating good internal consistency. AVE values also exceed 0.5, indicating good discriminant validity between different variables. These results confirm that the measurement tools used in the research achieve the reliability and validity standards required to accurately test hypotheses.

6.1.2 Discriminant Validity

The values in Table 2 represent the HTMT ratio between each two variables, which helps measure how distinct each concept is from the others. Following Henseler et al.'s (2015) approach, discrimination between variables is considered acceptable if HTMT values are less than 0.85 or, in some cases, 0.90, with higher values indicating potential problems in distinguishing the concepts studied. Given the values found, the discrimination between the variables in this study appears to be acceptable according to the HTMT < 0.85, which supports the discriminant validity between the different concepts in the model (Gold et al., 2001).

Table 2. Discriminant Validity (HTMT)

Trust	Privacy & Data Protection	Consumer Behavior	AI Tech	
				AI Tech
			0.114	**Consumer Behavior**
		0.116	**0.561**	**Privacy & Data Protection**
	0.378	**0.173**	**0.442**	**Trust**

6.2 Structural Model

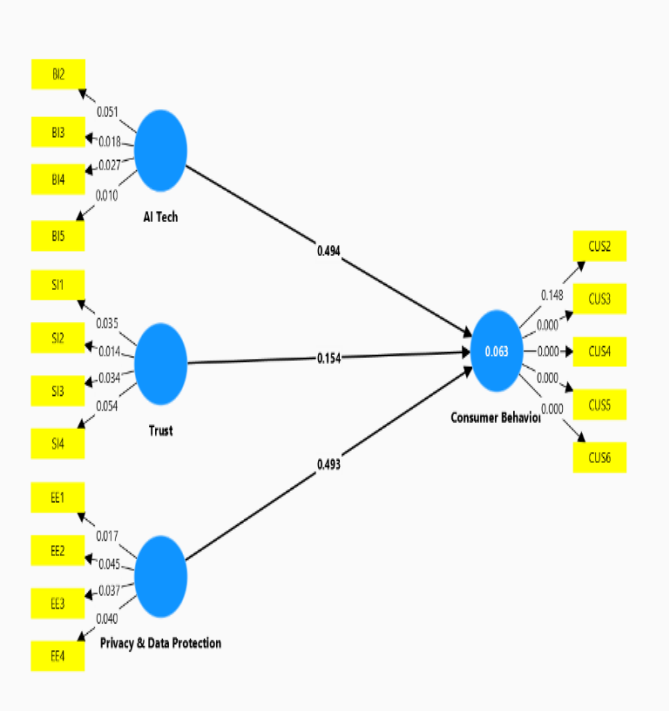

Figure 1. Structural Model

Table 3 presents the results of the analysis of the relationships between the variables. It shows that all P values are less than 0.05, indicating that the effects are statistically significant. Based on these results:

- Artificial Intelligence and its Impact on Consumer Behavior: Impact coefficient 0.641 with a t value of 9.633, indicating a very strong and significant effect (P = 0.000).
- Data Protection and Privacy and its Impact on Consumer Behavior: Impact coefficient 0.393 with a t value of 3.561, indicating a significant effect (P = 0.000).
- Trust and its Impact on Consumer Behavior: Impact coefficient 0.262 with a t value of 2.446, also indicating a significant effect (P = 0.014).

Since all P values are less than 0.05, all hypotheses are accepted, and the results indicate a statistically significant relationship between these factors and consumer behavior.

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Table 3. Path Coefficients

Decision	P values	T statistics (|O/STDEV|)	Standard deviation (STDEV)	Sample mean (M)	Original sample (O)	
Accepted	0	9.633	0.067	0.644	0.641	AI Tech -> Consumer Behavior
Accepted	0	3.561	0.11	0.408	0.393	Privacy & Data Protection -> Consumer Behavior
Accepted	0.014	2.446	0.107	0.268	0.262	Trust -> Consumer Behavior

7. Conclusion and recommendations

7.1 Conclusion

This study found that artificial intelligence plays a significant role in shaping consumer behavior through its impact on purchasing decisions, customer trust, and personal data protection. The results showed that smart technology, data protection, and trust each have varying impacts on consumer behavior, with AI having the greatest impact. These findings highlight the importance of balancing the benefits of AI technologies with ensuring consumer privacy and enhancing trust in these digital tools.

7.2 recommendations

The study recommends the following:

1. Improving user experience: Companies must develop AI technologies to enhance customer engagement by providing more accurate recommendations tailored to consumers' needs.
2. Enhancing data security: Stricter policies should be implemented to protect consumer data, through encryption and cybersecurity, to ensure their privacy is preserved.
3. Increase transparency: Companies must clarify how customer data is used and enhance transparency in smart recommendation technologies.
4. Building trust: Consumer trust can be enhanced by providing control mechanisms that allow them to manage their personal data and choose what they want to share.
5. Further research: Future studies are recommended to explore the impact of AI on different demographic segments and to examine other factors that may influence consumer behavior.

These recommendations help strike a balance between leveraging AI and protecting consumer rights, helping businesses achieve sustainable success in the digital age.

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