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Research Article

AI-Powered Personalization and Consumer Purchase Behaviour in E-Commerce Platforms: The Serial Mediating Roles of Perceived Usefulness and Customer Engagement and the Moderating Role of AI Transparency

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Abstract: Given the fast advancement in the use of AI technology, the concept of e-commerce websites is considered outdated owing to intelligent recommendations, personalized marketing and the existence of search engines based on artificial intelligence. This study seeks to analyze the impact of personalization through AI technology on the behavior of customers in terms of purchase decisions with the help of mediating variables of perceived usefulness and customer engagement, while the moderating variable is the transparency of artificial intelligence. Using TAM and S-O-R model, it is hypothesized that personalization through artificial intelligence acts as the stimulus which affects the perceived usefulness and customer engagement, which in turn affects customer buying behavior. A quantitative, explanatory and cross-sectional research design was used where data was collected from 384 online consumers who faced AI personalization technology. Data collection process involved the use of structured survey questionnaire with valid scales. SEM analysis was used in testing the direct, serial mediation and moderating effects among variables. The study highlights the impact of AI-based personalization experience on consumer behavior as well as the role played by AI transparency in enhancing consumer acceptance and trust of AI recommendations. This study contributes to the AI marketing literature with a unique theoretical framework of how personalization results in consumer purchase behavior.

Keywords: AI-Powered Personalization, Consumer Purchase Behaviour, E-Commerce Platforms, Serial mediation mechanism, Perceived Usefulness, Customer Engagement, AI Transparency

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INTRODUCTION

In recent times, AI technology has been observed to become one of the key revolutionary technologies, which have revolutionized the manner in which activities are performed in the global economic and business arena. The effect of AI in changing the approach has been experienced from interactions with customers to the decision-making processes of managers. Technological advancements have had great effects on innovation, entrepreneurship, and knowledge production [1]. AI definition consists of all types of tools for complex analysis that function like people think, act, and analyze things in the same way [2].

Four different stages of AI have been witnessed throughout the history of AI development in businesses. The first stage of AI is referred to as rule-based AI, which was used for carrying out predefined tasks such as storing information in the database [3]. The above is how Predictive AI was developed using machine learning and big data to recognize patterns for purposes like predicting churn and forecast demand [4]. Generative AI technology, as evidenced by OpenAI's GPT, has brought yet another transformation to this process due to the creation of content and automation of customer service [5]. Currently, the highest stage of development is attained by the agentic AI, which can reason at a high level and undertake multiple actions, such as negotiating contracts and inventory management, but still operates under human control [6-7].

E-commerce refers to the business carried out by means of the Internet. The period during which the e-commerce industry has been booming is 2014 thanks to mobile phones and tablets along with the better connection via the Internet. There are some Indian companies which showcase what can be done thanks to competition with international companies. Some examples of such companies include Flipkart and Snap deal [8]. The launch of the 'Digital India Mission' by the Indian government is an effort to enhance the level of e-commerce due to better connectivity through the internet and governmental services. Factors like the emergence of the younger generation and their large number, along with the increased standards of living and improved connectivity, are bound to bring about development in the e-commerce sector. There are many forms of electronic commerce, including (B2C), (B2B), (C2C), and (C2B).

Personalization via Artificial Intelligence is using artificial intelligence in order to customize the product or service according to the profile of the user. The personalization approach is based on massive data analysis which is gathered from different sources including user interactions at e-commerce sites, social media behavior and user's previous buying experience [9]. Through the use of advanced algorithm and machine learning methods, companies are able to understand user behavior patterns and predict their future actions thus providing personalized recommendations for improving their shopping experience. AI-powered personalization encompasses the data collection, user profiling, recommendation algorithms and real time adaptation.

In marketing, the abundance of options complicates consumers' purchasing decisions. Consumer behavior studies individuals' needs, motivations, and the decision-making processes involved in selecting products [10]. Several background factors significantly influence these decisions, making it essential for marketing teams to understand what affects consumers' purchasing processes. Additionally, recent consumer protection movements highlight the importance of understanding how consumers make consumption decisions. Personal, societal, cultural, economic, and psychological aspects all have a role in shaping consumer behavior [11].

The studies thorough explanation of how AI-powered customization impacts consumer purchasing behavior is based on its serial mediation mechanism, which combines the mediating functions of perceived utility and customer involvement. Moderating role of AI transparency has acquired considerable significance during the recent years within the context of responsible and ethical implementation of AI. The theoretical basis of this research is derived from the Technology Acceptance Model (TAM) and Stimulus-Organism-Response (SOR). The combination of those two models will enable a more profound insight into the psychological and behavioral factors of personalization via AI in the digital commerce setting.

There are several issues with existing literature on personalization via AI that this research brings up, including lack of consideration of psychological factors influencing consumer behavior. It can be noticed that many scholars concentrate solely on direct relationships and do not take into account moderating effect of perceived usefulness and customer engagement. Moreover, there is no empirical research conducted on the moderating effect of AI transparency in case of personalization, particularly in rapidly developing area of e-commerce. Therefore, this research suggests conducting a study on the topic and developing a comprehensive model of how personalization influences customer behavior due to the moderating effect of perceived usefulness and customer engagement mediated by AI transparency. This work holds implications for marketers, technology developers, and policymakers focused on boosting consumer trust and fostering engagement in AI-enhanced e-commerce environments.

Literature Review and Hypotheses Development

AI-Powered Personalization and Perceived Usefulness in E-Commerce Platforms: Karthik [12] conducted a study that looked at the effect of personalized recommendation system on consumer purchase intention on ecommerce sites. The data was obtained from 1,000 online customers and was analyzed by use of descriptive analysis, SEM, mediation analysis, logistic regression analysis and Multigroup analysis. The results showed that the respondents had moderate perceptions on the levels of recommendation accuracy, personalization, trust, usefulness and satisfaction. The model showed excellent indices for goodness-of-fit; however, all the hypotheses were statistically insignificant and purchase intention did not have an effect on purchase behavior. The study showed the significance of looking at other factors that affect purchase decision making process. Khuong, G., Thuy, T., and Ngo, A. [13] investigated the function of perceived personalization as a mediator between other dimensions, including perceived relevance, trust, and usefulness, and its influence on purchase intention. We employed a quantitative technique to gather data from 402 Vietnamese internet users who had seen AI-powered tailored ads. The study model was tested using PLS-SEM. The results demonstrated that both perceived relevance as well as perceived utility are considerably enhanced by perceived customization. However, perceived personalization is not directly influential on trust but indirectly builds up trust. Perceived relevance, perceived trustworthiness, and perceived usefulness have been identified as important determinants of purchase intention, emphasizing the importance of these three constructs in any effective personalized marketing campaign. This study has

made an important contribution to the theory of consumer behavior in relation to AI-powered personalized advertising. Huy Dac Trung Nguyen, [14] seeks to explored the effect of AI-driven personalization on consumer purchase intentions within e-commerce advertisements through the exploration of the variables of perceived advertising value and flow. The results from the survey conducted on 547 respondents indicate that entertainment and incentive are the primary direct predictors of purchase intentions whereas in formativeness and credibility are indirect predictors. From the results obtained, it is evident that AI personalization increases perceived in formativeness, credibility and entertainment of ads leading to a reduction of consumer irritation. The study added to the current literature on advertising theories and demonstrates the significance of engaging advertisement in personalized advertising.

Consequently, it is necessary to conduct a contextualized study. The following hypothesis may be advanced in light of the evidence presented above:

- **H1:** AI-powered personalization has a significant positive effect on perceived usefulness in e-commerce platforms

Perceived Usefulness and Customer Engagement with E-Commerce Platforms

Subathra, [15] examined the influence of perceived usefulness, platform interactivity, and source credibility on customer engagement and trust, and their influence on purchase intention and buying. Between August and November of 2024, 247 frequent users of live streaming platforms in Chennai, Tamil Nadu, India, were surveyed using a standardized questionnaire and a purposive selection technique. Technology savvy consumers who regularly shop at major shopping centers in metropolitan areas were selected to obtain a representative sample of respondents. The findings showed that source legitimacy, platform interaction, and perceived utility significantly affect consumer engagement using Partial Least Squares Structural Equation Modeling. The results demonstrated that confidence is greatly affected by the reliability of the source, the level of platform interaction, and the perceived utility of the content. Customer interaction was also shown to have a beneficial effect on both buy intention and actual purchase. Purchase intention and completion are both positively affected by trust. Gamification is increasingly recognized as a strategic tool for improving customer engagement across various industries, including e-tailing in Sri Lanka, where online shopping is vital. Rajumesh *et al.* [16] investigated how gamification influences customer engagement, grounded in Self-Determination Theory, while considering the moderating roles of perceived utility and perceived usability. In order to test the theories, 541 people were surveyed using SmartPLS4's (PLS) technique. A combination of gamification, perceived utility, and perceived simplicity of use greatly increases consumer engagement, according to the results, with the latter two factors reinforcing the former's effect. It is important not only for the theory but also for practice, because this will help us define some directions for making the process of gamification effective and productive in order to draw more consumers.

Based on all the information mentioned above, we may come to the following conclusion:

- **H2:** Perceived usefulness has a significant positive effect on customer engagement with e-commerce platforms

Customer Engagement Has a Significant Positive Effect on Consumer Purchase Behaviour in E-Commerce Platforms

Consumers are a key determinant of brand perception and purchase decision based on various levels of consumer involvement such as social media, advertisements, products, and services. Vivek and Kathirvel [17] This researcher conducted a study to examine the effects of engagement on purchase intention and found that although engagement is important in creating brand awareness and developing emotions and building trust, it does not have any significant effect on purchasing intention. Additionally, highly engaged customers show stronger relationship-oriented behaviors, whereas low-engagement individuals may exhibit comparable or higher purchase tendencies depending on situational factors. Challenges such as information overload and inconsistent communication also impact engagement outcomes. Firdaus *et al.* [18] performed studies that looked at how consumer interaction in e-commerce platforms affects purchase choices by gaging the effect of customer experience. A quantitative approach was used for data gathering in this study. E-commerce consumers were surveyed using a purposive sample technique. Smart PLS, a kind of (PLS-SEM), was used to analyze the data. Customer involvement and purchasing choices are favourably impacted by customer experience, according to the results. Moreover, there was significant mediation of customer engagement. That means that customer experience impacts purchase decision indirectly through customer engagement. Nevertheless, there was no significant moderation effect among the variables under study. This research highlighted the significance of developing successful experience-based tactics to encourage consumer engagement and purchasing decision-making.

The following theory may be put up in light of the considerations mentioned above:

H3: Customer engagement has a significant positive effect on consumer purchase behaviour in e-commerce platforms

AI-Powered Personalization and Consumer Purchase Behaviour in E-Commerce Platforms

In this study, Sathish and Reddy [19] investigated how AI, using recommendations systems, machine learning, and NLP, can process the information so that pro-environmental decisions could be made in order to avoid waste and overconsumption. The current paper had focused on how AI can contribute to making green purchases, decreasing the number of returns and promoting circular economy. Using a mixed approach, case studies had been analyzed based on a set of KPIs including, for instance, conversion rate, retention, carbon footprint reduction and optimization of the lifecycle of the product. Advantages are obvious, but the problems related to privacy, bias and ethical concerns remain. Recent studies have shown that AI has to be both ethical and sustainable if it is to provide tailored information without negatively impacting the environment. Sipos, [20] presented a quantitative analysis with 473 participants to investigate the effect of personalized AI on these essential consumer outcomes. Results from structural equation modeling demonstrated that tailored AI significantly boosts confidence and contentment, with the latter serving as a crucial mediator between the former and the desire to buy. There is a positive relationship between customization and trust and, eventually, buying behavior; but, privacy concerns are a powerful moderating variable that might mitigate this impact. Recommendations for ethical data handling and communication that sustain customer confidence were included in the paper's conclusion. Pal *et al.* [21] examined the impact of AI-enabled personalization on the purchase behavior of consumers by focusing on personalized recommendations, relevance, trust, and issues related to privacy. The research employed a structured questionnaire administered to 150 participants online, which was subjected to statistical analysis through different techniques. From the results, there is an indication that the personalized recommendation has a lot of influence on the purchasing intention because the personalized recommendation is beneficial and thus, customers get involved in the marketing activities using AI. On the other hand, there is a negative influence of privacy concerns in the acceptance of AI because people who have privacy concerns have little trust.

According to the above results, there is 38.4% influence of the personalized recommendation on the purchase intention. From the above analysis, the hypothesis is as follows:

- **H4:** AI-powered personalization has a significant positive effect on consumer purchase behaviour in e-commerce platforms

Perceived Usefulness and Customer Engagement Are as Serial Mediators

Despite this fact, even though there is some prior literature which describes the significant influence of AI-based personalization in relation to consumer purchasing behavior, the majority of the research only analyses the impact of AI-based personalization or considers usefulness and involvement as separate mediators. Such an approach gives no information on how the psychological mechanisms can appear between those two. Within this study, based on the (S-O-R) Theory and TAM, the serial mediation process will be supposed, which means that AI-based personalization raises the consumer perceived usefulness through timely recommendations and, therefore, brings value to the purchase process. This, in turn, impacts the consumer's perception and makes consumers involved into using the website, which influences their behavior. Thus, the use of perceived usefulness and consumer involvement in the serial mediation model is a significant improvement of the prior literature and allows conducting a detailed analysis of the impact of AI-based personalization on the consumer behavior. It is a valuable theoretical contribution and one of the unique aspects of this research. Hence, the proposed theory is:

- **H5:** Perceived usefulness and customer engagement sequentially mediate the relationship between AI-powered personalization and consumer purchase behaviour in e-commerce platforms

AI Transparency as a Moderator

Since the personalization using AI becomes more advanced, issues related to algorithm transparency, data privacy, and decision-making automation have become common, thus making the issue of AI transparency crucial for the online business. Previous literature has recognized the significance of transparency in establishing consumers' trust and technology adoption; nonetheless, very little is known about the moderating effect of transparency on the personalization through AI models. Based on the (S-O-R) model, it is assumed in this paper that AI transparency is an extremely significant factor of the environment, which affects the consumers' cognitive responses towards personalization through AI. The more consumers know how AI collects information, generates recommendations, and personalizes the shopping experience, the higher the chance that consumers will find these personalized offerings valuable, trustworthy, and credible. On the contrary, if there is no transparency, the personalization using AI can become ineffective since consumers will be skeptical about the recommendations made by AI owing to their uncertainty and

ambiguity. Thus, AI transparency is considered as a moderating variable, which helps to add the contextual perspective which was largely overlooked by previous e-commerce research. Hence, the following hypothesis is provided:

- **H6:** AI transparency positively moderates the relationship between AI-powered personalization and perceived usefulness, such that the positive effect of AI-powered personalization on perceived usefulness is stronger when AI transparency is high

Research gap

It is important to mention that a number of studies have been conducted regarding the impact of personalized marketing through the AI technologies on consumers' purchase behavior within the context of e-commerce; however, there are some gaps in the existing literature on the issue related to some aspects of personalized marketing through AI. Most of the literature on the topic examines the correlation between the impact of personalized marketing through AI and consumer purchase behavior and intentions; however, the psychological process through which personalization impacts consumers has not received any attention in previous studies. Such constructs as consumer engagement and perceived usefulness have been studied in relation to personalized marketing in few studies only. In addition, although the issue of AI transparency has become more and more topical nowadays and raises many concerns, there is no literature on the moderating role of AI transparency in increasing the effectiveness of personalized marketing through AI. The purpose of this study is to fill the identified gaps in the literature and develop an integrated theory based on TAM and S–O–R theories.

Theoretical Framework

The above-mentioned study is based on the theories including the Stimulus-Organism-Response (S-O-R) theory by Mehrabian and Russell and the Technology Acceptance Model (TAM) by Davis. These theories can be helpful in investigating the effects of AI personalization on consumers' buying behavior during online shopping. According to the S-O-R theory, there are certain stimuli present in the environment that influence the internal state of mind of the consumer and result in consumers' behavior. In the case of the proposed research, the stimuli will be AI personalization; that is, the process of tailoring will occur in regard to the behaviors of consumers. The consequence of this process will be consumers' perception of AI personalization in terms of its usefulness and engagement (organism/O). The outcome of this process will be the behavior (R). Moreover, AI transparency is integrated as a moderating variable, indicating that consumers' comprehension of the mechanisms behind AI systems' suggestions and personal data usage either enhances or diminishes the impact of AI-driven personalization on their cognitive assessments.

Technology Acceptance Model (TAM) provides the theoretical basis for the cognitive process by which consumers accept AI-driven personalization technologies. As per TAM, an individual is more inclined towards adopting the technology if the individual finds it useful in terms of improving his or her effectiveness and decision making. The personalized recommendation, intelligent search facility, and customized content in AI-driven e-commerce help in increasing consumers' perceived usefulness by eliminating the problem of information overload, increasing the relevance of product recommendations, and making the purchase decisions easy. Increased perceived usefulness helps consumers in engaging with the platform, thus increasing consumer engagement, and ultimately leading to improved consumer purchase behavior. Therefore, perceived usefulness becomes the first cognitive mediator between AI-driven personalization and consumer engagement, while consumer engagement becomes the behavioral mediator that transforms positive technology perceptions into purchasing behavior.

Both the S-O-R theory and TAM contribute to the creation of a solid theoretical framework for the proposed conceptual model, providing an explanation of psychological and behavioral processes in AI-driven consumer decision-making. Whereas the S-O-R theory outlines the whole process of how AI-based personalization (stimulus) affects consumers' internal states (organism) and responses (behaviors), TAM provides an explanation of why consumers find AI-based personalization useful and how these perceptions lead to technology adoption. Together, both theories explain the relevance of the suggested serial mediating effects of the perceived usefulness and customer engagement, as well as the moderation effect of AI transparency. Therefore, the framework helps in creating a holistic view on consumer purchasing behavior in AI-enabled electronic commerce. This integrated framework adds to the existing body of knowledge on AI marketing in relation to the creation of customer value, engagement and purchase decision making using AI.

MATERIALS AND METHODS

Research Design

For the study, a quantitative approach, an explanatory approach, and cross-sectional survey methods will be used. This will involve analyzing the effects of AI-based personalization on the purchasing behavior of customers in e-commerce

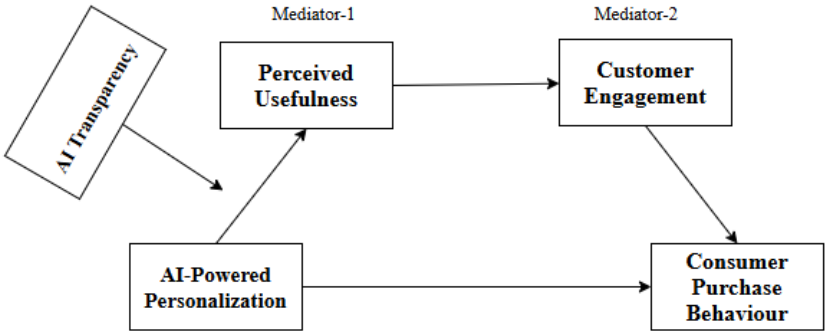


Figure 1: Conceptual Framework

Table 1: Summary of Research Variables and Number of Measurement Items

S.no	Variables	Number of items
1	AI-Powered Personalization	6
2	Perceived usefulness	5
3	Customer Engagement	5
4	AI transparency	6
5	Consumer Purchase Behaviour	5

in relation to other variables like the perceptions of usefulness and customer engagement. The main constructs in the research include: AI-based Personalization, Perceived Usefulness, Customer Engagement, AI Transparency, and Purchasing Behaviors of Consumers. It is appropriate for the research to use the quantitative approach because it will facilitate empirical analysis of relationships between the latent variables. The use of explanatory approach for this research will be due to its capacity to help in conducting investigation on the cause and effect relationship between different constructs of the theoretical model which is based on the theory of TAM and S-O-R. Cross-sectional survey method is useful in obtaining opinions of customers on their behavior in the present e-commerce.

Conceptual Framework

Sample Selection and Data Collection: The intended target audience in the present research will comprise individuals who operate e-commerce websites, as well as those who have employed AI-based personalization technology including personalized product recommendation, customized advertisements, AI-assisted searches, and purchase recommendations. This will be achieved using the method of intentional sampling where only individuals matching the aforementioned criteria will be considered participants in the research because they will best be able to judge the impact of AI-based personalization on their purchases. In the present research, the SEM methodology has been adopted, and the minimum sample size needed will be 384 individuals. A systematic, self-directed questionnaire with validated measurement questions adapted from authoritative studies will be employed for primary data collection. The questionnaire will be circulated using online survey tools such as Google Forms and will be communicated through email and social media to connect with a broad spectrum of e-commerce customers. Customer Engagement will be fully voluntary, with participants talked about the research's objective, guaranteed the confidentiality and anonymity of their responses, and requested to grant informed consent before undertaking the survey. The acquired data will be reviewed for comprehensiveness, deficiencies, and outliers before it is processed through statistical analysis Figure 1.

Measures

The information has been collected by means of a predetermined survey. Respondents will be asked to express their thoughts on several research issues using a questionnaire that has been developed using a 5-point Likert-scale (from strongly disagree to strongly agree). There are both open-ended and closed-ended questions on the questionnaire. In order to collect useful data related to the specified study variables, the questions have been carefully designed. Below you will find a detailed presentation of the variables and the accompanying measurement items that were utilized for the analysis Table 1.

RESULTS

To examine how AI-driven customization affects online shoppers' actions, this chapter delves into the findings as well as interpretations of the empirical data gathered for that purpose. The research is built upon the results obtained by

Table 2: Personalization Experience

	Category	Frequency (n)	Percentage
Online-shopping experience	Less than 1 year	29	7.6
	1–3 years	108	28.1
	4–6 years	147	38.3
	More than 6 years	100	26
Online-purchase frequency	Less than once a month	41	10.7
	Once a month	79	20.6
	2–3 times a month	146	38
	Once a week	88	22.9
	More than once a week	30	7.8
Most frequently used e-commerce platform	Amazon	148	38.5
	Flipkart	107	27.9
	Myntra	44	11.5
	Meesho	39	10.2
	Ajio	20	5.2
	Other platforms	26	6.8

Table 3: Factor Loadings

Variables		Loadings
AIP1	<--- AIP_	0.839
AIP2	<--- AIP_	0.758
AIP3	<--- AIP_	0.773
AIP4	<--- AIP_	0.738
AIP5	<--- AIP_	0.774
AIP6	<--- AIP_	0.791
PU1	<--- PU_	0.755
PU2	<--- PU_	0.864
PU3	<--- PU_	0.874
PU4	<--- PU_	0.654
PU5	<--- PU_	0.744
CE1	<--- CE_	0.751
CE2	<--- CE_	0.82
CE3	<--- CE_	0.856
CE4	<--- CE_	0.828
CE5	<--- CE_	0.798
AIT1	<--- AIT_	0.814
AIT2	<--- AIT_	0.808
AIT3	<--- AIT_	0.815
AIT4	<--- AIT_	0.655
AIT5	<--- AIT_	0.694
AIT6	<--- AIT_	0.594
CPB1	<--- CPB_	0.678
CPB2	<--- CPB_	0.854
CPB3	<--- CPB_	0.766
CPB4	<--- CPB_	0.764
CPB5	<--- CPB_	0.767

384 active users of e-commerce platforms with personalization experience in terms of product suggestions, advertising, promotions and personalized content. The study further analyses the direct relationships in the conceptual model. Moreover, serial-mediation analysis is performed to find out if perceived usefulness and customer engagement mediate the effect of AI-powered personalization on consumer purchase behavior. Additionally, moderation analysis is carried out to test if AI transparency moderates the effect of AI-powered personalization on consumer perceptions of the usefulness of AI in shopping. The findings provide light on how online shoppers' impressions, involvement, and spending habits are affected by AI-powered tailored shopping experiences. The paper further analyses the direct relationships in the conceptual model. Moreover, serial-mediation analysis is performed to find out if perceived usefulness and customer engagement mediate the effect of AI-powered personalization on consumer purchase behavior. Additionally, moderation analysis is carried out to test if AI transparency moderates the effect of AI-powered personalization on consumer perceptions of the usefulness of AI in shopping.

Table 3 represents the range of factor loadings for AI Personalization (AIP) is from 0.738 to 0.839, with AIP1 recording the maximum loading of 0.839 and AIP4 the minimum loading of 0.738. Regarding Perceived Usefulness (PU),

Table 4: Internal Consistency Reliability and Convergent Validity

Constructs	Cronbach's Alpha	Composite Reliability	Average Variance
AI-Powered Personalization	0.903	0.903	0.608
Perceived Usefulness	0.882	0.887	0.612
Customer Engagement	0.904	0.906	0.658
AI Transparency	0.871	0.874	0.541
Consumer Purchase Behaviour	0.875	0.877	0.590

Table 5: Discriminant Validity (Fornell-Larcker)

	AI-Transparency	AI-Powered Personalization	Perceived Usefulness	Customer Engagement	Consumer Purchase Behaviour
AI-Transparency	0.735				
AI-Powered Personalization	0.461	0.779			
Perceived Usefulness	0.597	0.478	0.783		
Customer Engagement	0.518	0.542	0.464	0.811	
Consumer Purchase Behaviour	0.448	0.393	0.420	0.365	0.768

Table 6: Direct Effect Hypothesis Results

Hypothesis	Path	Std. β	p-value	Result
H1	AI-powered personalization → Perceived Usefulness	0.494	<0.001	Positive and Significant
H2	Perceived Usefulness → Customer Engagement	0.411	<0.001	Positive and Significant
H3	Customer Engagement → Consumer Purchase Behaviour	0.239	<0.001	Positive and Significant
H4	AI-Powered Personalization → Consumer Purchase Behaviour	0.235	<0.001	Positive and Significant

the loadings fluctuate from 0.654 to 0.874, with PU3 recording the peak loading of 0.874 and PU4 the lowest at 0.654. The factor loadings for the Customer Engagement (CE) construct are notably strong, ranging from 0.751 to 0.856, where CE3 records the maximum loading of 0.856 and CE1 the minimum of 0.751. These results reveal a solid linkage between the indicators and their associated constructs, appropriately representing the core dimensions. Take the case of Artificial Intelligence Transparency (AIT), for instance, the loadings are between 0.594 and 0.815, where 0.815 is the maximum loading of AIT3 while 0.594 is the minimum loading of AIT6. Also, the loading of AIT6 is just slightly below the cut-off point of 0.60 and therefore should be retained. The indicators of Customer Purchase Behavior (CPB) exhibit loadings ranging from 0.678 to 0.854, with CPB2 demonstrating the highest loading at 0.854 and CPB1 the lowest at 0.678. In general, most factor loadings surpass the suggested 0.70 benchmark, providing convincing evidence of the trustworthiness of the indicators and the measurement model's convergent validity.

Table 4 displays the variables' convergent validity and internal consistency reliability. Composite reliability scores varied from 0.874 to 0.906, while Cronbach's alphas ranged from 0.871 to 0.904. With scores over 0.70, all of the constructs demonstrated a satisfactory degree of dependability in terms of internal consistency. Furthermore, AVE values are greater than the cut-off value of 0.50, falling within the range of 0.541 to 0.658. This indicates that, on average, the indicators of each construct were more than 50% explained by their own unique characteristics. As such, it reflects good convergent validity 0.658 followed by the lowest but still acceptable AVE of 0. 541 for AI Transparency. In sum, these results indicate that the measure is sufficiently reliable and valid within the measurement model, this would mean that we may go on to testing our hypothesis and structural models.

Discriminant validity of the study constructs is shown in Table 5 by applying the Fornell–Larcker criterion. The diagonal shows the square root of AVE for AI Transparency (0.735), AI-Powered Personalization (0.779), Perceived Usefulness (0.783), Customer Engagement (0.811), and Consumer Purchase Behaviour (0.768). All the diagonal values are greater than its corresponding values in row and column with which the diagonal values are located. For instance, the square root of AVE for AI Transparency was 0.735 which was above its maximum correlation 0.597 with Perceived Usefulness. The square root of AVE for AI-Powered Personalization was 0.779 which was also larger than its maximum correlation of 0.542 with Customer Engagement. The inter-construct correlations varied from 0.365 to 0.597, signifying moderate to low levels of associations with minimal common variance. Thus, the variance shared between a construct and its associated indicators is higher than that shared with other constructs. These results meet the Fornell–Larcker criterion, suggesting that sufficient discriminant validity was achieved for the measurement model.

For the proposed structural model, Table 6 displays the outcomes of the direct impact hypothesis tests. AI-based personalization significantly and positively affected perceived usefulness ($\beta = 0.494$, $p<0.001$), which implies that personalized recommendations, content, and promotions enhance consumers' perception of the usefulness of e-

Table 7: H5 Serial Mediation (Indirect Effects)

Indirect relationship	Standardized indirect effect	BC 95% LLCI	BC 95% ULCI	p-value	Result
AIP → PU → CE	0.242	0.084	0.36	0.001	Significant
PU → CE → CPB	0.117	0.015	0.183	0.007	Significant
AIP → CPB: total indirect effect	0.059	0.03	0.101	<0.001	Significant
AIP → PU → CE → CPB (Specific serial mediation effect)	0.048 (B)	0.024	0.084	0.001	Supported

Table 8: Moderating Effect of AI Transparency

Relationship	Estimate	Sig. p	Results
AI-Powered Personalization Perceived Usefulness	0.42	p<0.01	Positive and Significant
AI Transparency Perceived Usefulness	0.196	p<0.01	Positive and Significant
AI-Powered Personalization × AI Transparency Perceived Usefulness	0.116	P<0.05	Positive Moderation

Low transparency, −1 SD (0.420 − 0.134 = 0.286), Average transparency = 0.420, High transparency, + SD (0.420 + 0.134 = 0.554)

commerce platforms. Hence, H1 was supported. According to the results, consumers are more likely to engage and remain engaged on an e-commerce platform when they find the customization features beneficial (β = 0.411, p<0.001). This led to the confirmation of hypothesis H2. H3 was supported because customer engagement positively affected consumer purchase behavior (β = 0.239, p<0.001). This suggests that when consumers are more involved with the platform, they are more likely to make stronger purchases. In addition, the buying behavior of consumers was direct and positively affected by AI-based customisation (β = 0.235, p<0.001), implying that personalized e-commerce experiences may directly influence buying decisions. Therefore, H4 was supported. Among the tested links, AI-based personalization was the most influential in relation to perceived usefulness, which was followed by customer engagement in terms of perceived usefulness. Broadly speaking, all four direct-effect hypotheses were supported, indicating that AI-powered personalization significantly enhances perceived usefulness, increases customer engagement, and has a positive effect on consumer purchase behaviour.

As shown by the H5 serial-mediation findings in The relationship between AI-based customization and purchase behavior may be fully explained by the roles played by perceived utility and consumer involvement (Table 7). First, AI-based personalization had a positive indirect effect on customer engagement through perceived usefulness (β = 0.242, BC 95% CI (0.084, 0.360), p = 0.001). This means that a better impression of usefulness of the e-commerce platform caused by the personalized recommendation and services can lead to more customer involvement. Second, perceived usefulness also had a significant indirect effect on consumer purchase behaviour via customer engagement (β = 0.117, BC 95% CI (0.015, 0.183), p = 0.007), which implies that consumers who find personalized e-commerce options more useful tend to be more engaged with them and, in turn, their purchase-making behaviour will be positively influenced by it. The overall standardized indirect effect of AI-based personalization on consumer purchase behaviour was positive and significant (β = 0.059, BC 95% CI (0.030, 0.101), p<0.001). The most important finding was that the specific serial-mediation effect via perceived usefulness and customer engagement was statistically significant (B = 0.048, BC 95% CI (0.024, 0.084), p = 0.001). Since none of the bias-corrected confidence intervals contained zero, all the aforementioned indirect effects were significant. Therefore, H5 was supported. The results reveal that AI-based personalization increases perceived usefulness, which in turn raises customer engagement and finally enhances consumer purchase behavior. The results indicate partial serial mediation as the structural model nevertheless showed a strong direct influence of AI-based customization on customer buying behavior. It should be noted that β = 0.059 is a standardized total indirect effect while B =0.048 is a specific serial unstandardized indirect effect. Therefore, the conclusion is that the personalized AI recommendations enhance the buying behaviour by making the usefulness of the e-commerce platform as the first stage and then promote stronger customer engagement. As the direct effect of AI-enabled personalization on purchase behavior remained significant, the mediation is partial, suggesting that personalization affects purchase behavior both directly and indirectly through perceived usefulness and customer engagement.

Table 8's moderation findings demonstrate that AI-based customization significantly and positively affects perceived utility (β = 0.420, SE = 0.046, CR = 9.076, p<0.001). This means that consumers find e-commerce platforms more useful when offering relevant and personalized recommendations. Perceived utility is positively and significantly impacted by AI transparency (β = 0.196, SE = 0.046, CR = 4.276, p<0.001), suggesting that providing transparent information on the nature of AI-generated recommendations and how consumer data are processed enhances perceived usefulness of the platform. Most importantly, the interaction between AI-based personalization and AI transparency was positive and statistically significant (β = 0.134, SE = 0.039, CR = 3.009, p = 0.003). positive interaction term suggest that AI transparency moderates the positive effect of AI-based personalization on perceived usefulness. That is, personalized recommendations are recognized as more useful when consumers have been provided with transparent

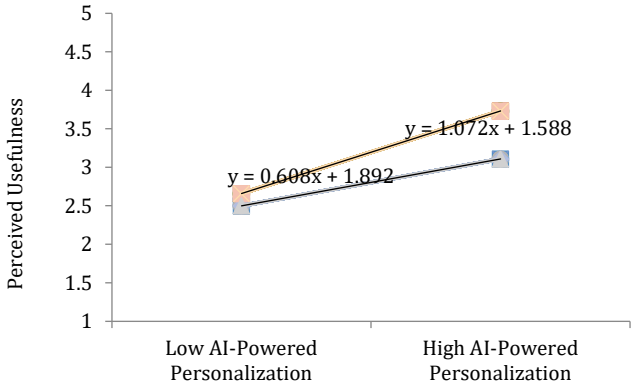


Figure 1: Effect of AI-Powered Personalization on Perceived Usefulness at Low and High Levels of AI-Powered

and comprehensible explanations about the associated AI system and the rationale of its recommendations. This pattern indicates that the effect of AI-based personalization on perceived usefulness becomes stronger with higher levels of AI transparency. However, these simple slopes should be tested for their statistical significance with an official simple-slope or conditional-effect analysis. In summary, H6 was supported, and AI transparency positively and significantly moderated the effect of AI-based personalization on perceived usefulness. The enhancement of perceived usefulness through AI-powered personalization was more significant when a higher level of AI transparency was indicated by consumers. Hence, clear elucidations of recommendation mechanisms and use of data enhance the functional value that consumers obtain through AI-based personalization Figure 2.

DISCUSSION

The results of the current research offer robust empirical support that AI-driven personalization markedly improves customer purchasing behavior on e-commerce platforms via cognitive and behavioral processes. The findings demonstrate that AI-driven personalization significantly enhances perceived utility ($\beta = 0.494$, $p<0.001$), which in turn bolsters customer engagement ($\beta = 0.411$, $p<0.001$) and ultimately elevates consumer purchasing behavior ($\beta = 0.239$, $p<0.001$). These results align with the research conducted by Khuong *et al.* [22], which examined AI-driven tailored advertising among 402 users of digital platforms in Vietnam utilizing PLS-SEM. Their research indicated that perceived customization greatly enhances perceived significance and perceived utility, which are crucial factors influencing purchase intention. This research shows that consumers consider AI recommendations to be useful as these recommendations provide them with relevant and personalized shopping experience. However, while Khuong *et al.* [22] Even though the main focus of the research is on the usage of the product that serves as an important direct variable affecting the purchase, the current research has made some contribution to the existing body of knowledge because it shows the influence of perceived usefulness of the product on involving the consumer into purchase.

The above mentioned points have been proved by statements of [20], The authors (s) of this study have researched the effect of personalization by means of using the AI technology on consumer trust, satisfaction, and purchase intention through structural equation modeling approach on 473 samples. The finding of this study is that personalization through AI technology has generated consumer trust and satisfaction where satisfaction mediates personalization and purchase intention. Based on the findings, this current study shows that AI personalization affects consumers' purchasing behavior ($\beta = 0.235$, $p<0.001$). In contrast to Sipos [20], While in the former research, trust and satisfaction were considered as the mediators, in the latter research, the impact of perceived usefulness and customer engagement were taken into consideration as sequential mediators. The conclusions drawn from the sequential mediation analysis (AI-based personalization → perceived usefulness → customer engagement → consumer purchase behavior; B = 0.048, BC 95% CI (0.024, 0.084), p = 0.001) provide a way to understand the transformation process from the experience of interacting with AI-based recommendation system to the consumer purchase behavior. Apparently, the consumer becomes engaged in the interaction with the website and makes purchases when it is useful for him/her.

Additionally, the findings of the current study are consistent with Pal *et al.* [21], which was intended to ascertain the level of impact brought about by the use of AI personalization on the buying behavior of consumers. It is found out that AI personalization has greatly impacted purchase intentions because of relevance and usefulness whereas the privacy concerns reduce the perception of the consumer on AI technology. In this research, AI transparency has been

applied as a moderating variable to build on past knowledge. It is found out that AI transparency strengthens the relationship between AI personalization and usefulness ($\beta = 0.134$, $p<0.05$). This means that the recommendations made by AI technology are perceived as being useful to the consumers when the organization is open about how the recommendations were made and use of customer data. Therefore, the current research enhances past research by applying an integrated framework in analyzing the effect of AI personalization on consumer behavior using the technology acceptance model and Stimulus-Organism-Response model. Unlike other research works which have focused on the direct effects, the current research uses a broader framework to study the effect of AI personalization on purchase behavior concerning the usefulness of AI personalization, customer involvement, and AI transparency.

CONCLUSION

Perceived utility and customer involvement mediate the relationship between AI-enabled customization and e-commerce platform users' purchasing behavior, whereas AI transparency acts as a moderator. Reliable and empirically distinct constructs were used in this investigation, as shown by the satisfying levels of internal consistency, convergent validity, as well as discriminant validity that were reached by the measuring model for 384 active e-commerce consumers.

The structural model reveals that AI-powered personalization is positively related to perceived usefulness, which in turn, is positively related to customer engagement. Customer engagement then had positive and significant impacts on consumers' purchase behaviour. AI-driven personalisation had a direct positive impact on buying behaviour as well. Thus, H1, H2, H3 and H4 were supported. Perceived utility and customer involvement were shown to be the indirect effects of AI-powered customization on consumer purchasing behavior, according to serial mediation analysis findings, in that order. The results show the significant serial indirect effect of personalized recommendations on purchase behaviour through functional value and platform involvement. Since the direct effect of AI-powered personalization continued to be significant after adding the mediators, the results supported partial serial mediation, and H5 was supported.

The moderation analysis also established that AI transparency strengthened the positive relationship between AI-powered personalization and perceived usefulness. Personalized recommendations were perceived as more useful when consumers received clear and understandable information about how the AI system worked, why specific products were recommended, and how personal data were used. Therefore, H6 was supported.

Results show that AI-powered customization works best when suggestions are accurate and relevant, but it also has to be able to make customers feel valuable, get them involved, and be honest about how it works. E-commerce platforms should therefore develop relevant and adaptive personalization systems while clearly communicating the basis of AI-generated recommendations and data-use practices. Such an approach can improve consumers' confidence in AI-enabled services, deepen their engagement with the platform, and contribute to stronger purchase behaviour.

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