International Journal of
INTELLIGENT SYSTEMS AND APPLICATIONS IN ENGINEERING
ISSN:2147-6799 www.ijisae.org Original Research Paper

Artificial Intelligence: An Analytical Study: Its Impact on Marketing Rate Through Electronic Applications in Saudi Arabia

Sabah Abdellatif Hassan Ahmed

Submitted: 14/02/2025 **Revised:** 14/03/2025 **Accepted:** 24/03/2025

Abstract. This study examines the role of artificial intelligence (AI) in shaping e-commerce trends and its impact on consumer behavior in Saudi Arabia. With the increasing integration of AI technologies, such as machine learning algorithms, chatbots, and virtual assistants, e-commerce platforms are experiencing a transformation in customer engagement, sales performance, and personalized shopping experiences. The research utilizes a mixed-methods approach, combining quantitative and qualitative data from a sample of 349 participants across various regions in Saudi Arabia. The findings reveal that AI-driven features significantly influence online shopping behaviors, with users reporting enhanced satisfaction, increased shopping frequency, and improved decision-making processes through personalized recommendations and dynamic pricing. Key insights from the study include gender-based preferences for specific e-commerce platforms and distinct challenges related to AI adoption, such as privacy concerns, mistrust in AI recommendations, and system complexity. The study also highlights the need for e-commerce platforms to address these challenges by enhancing transparency, refining AI-driven tools, and ensuring a balance between personalization and consumer privacy. Despite these challenges, the data suggest optimism regarding AI's potential to further transform the e-commerce landscape in Saudi Arabia, offering valuable opportunities for businesses to improve customer experiences and operational efficiency. This research provides a comprehensive analysis of AI's impact on digital shopping in Saudi Arabia, contributing to the growing body of knowledge on AI's influence in the global e-commerce market..

Keywords. *Artificial Intelligence (AI), E-commerce, Personalized Recommendations, Chatbots, Predictive Analytics, Saudi Arabia, Digital Marketing.*

1. Introduction

1.1. The Role of Artificial Intelligence in Shaping E-commerce Trends:

Artificial intelligence utilizes algorithms and machine learning models to process customer data, such as browsing history, past purchases, and even social media behavior. This data-driven approach allows AI systems to predict consumer preferences and make highly relevant suggestions.[1] With AI for social media and digital platforms like Facebook and Instagram advertising, digital marketing provides a distinctly enjoyable experience for customers. These platforms carefully evaluate user data before presenting them with offers that meet their needs. AI helps marketers predict and discover trends as well [2, 3]. AI is used by marketers to boost customer demand. Machine intelligence-powered integrated applications provide a satisfying user experience for customers. It records every purchase, including the location and time of the transaction. It has the ability to analyze data and provide clients with personalized marketing messages. These messages, which appear when a user visits a nearby retailer, offer advice and exclusive deals aimed at raising the customer's average order value.[4, 5] Increased user engagement has also been connected to AI-driven customization. Users stay on the platform longer and are more likely to convert when they see personalized content. indicates that user interaction measures, such as click-through rates and time spent on the app, significantly increase for e-commerce systems that use AI for customization.[6] Although there are many advantages to AI-driven personalization, there are also issues with data privacy and the possibility of over personalization. Businesses have to maintain a balance between personalization and consumer privacy, making sure that data is handled ethically and transparently [7].

Predictive analytics in e-commerce can forecast consumer behavior with remarkable accuracy. By analyzing past purchasing patterns, search queries, and even social media interactions, AI can predict what products consumers are likely to buy in the future. This allows e-commerce platforms to tailor their offerings to meet anticipated demand,

Assistant Professor, Faculty of Information Technology, University of Bisha, Kingdom of Saudi Arabia

improving customer satisfaction and increasing sales. AI-driven methods have significantly improved marketing metrics: customer segmentation accuracy has increased by 30%, conversion rates by 25%, customer engagement by 20%, and sales by 15%. The simulation results corroborate these findings, showing consistent enhancements in key metrics, including a 28% improvement in customer segmentation accuracy, a 27% rise in conversion rates, a 22% boost in customer engagement, and an 18% increase in sales [8]. By forecasting product demand, e-commerce businesses can optimize their inventory levels, reducing the risk of overstocking or stockouts. AI systems analyze trends such as seasonality, market demand, and even external factors like economic conditions to ensure that the right amount of stock is available at the right time [9]. AI-driven predictive analytics enables businesses to refine their marketing strategies by predicting which campaigns will resonate most with their target audience . By analyzing customer segmentation data, AI can suggest personalized marketing tactics that are more likely to succeed. For example, an AI system might identify a segment of users who are likely to respond positively to a discount campaign, allowing marketers to focus their efforts on those individuals, thus maximizing ROI [10, 11].

As a self-service tool, chatbots can improve provider-customer interactions and service quality. Studies show that chatbots can answer up to 80% of typical queries, speed up response times, free up staff for other activities, and reduce response times. As a result, there is a 30% decrease in global corporate expenses related to the 265 billion customer support requests that companies handle each [12]. By 2022, chatbots are expected to save organizations over 8 billion dollars in customer-supporting costs; in 2017, that number was only expected to save 20 million. Chatbots offer 24/7 electronic channels for customer service and are advertised as quick, easy, and affordable [13].

I-powered virtual assistants provide personalized shopping experiences by understanding user preferences and offering tailored product recommendations [14]. These virtual assistants use natural language processing (NLP) to interpret customer requests and provide relevant suggestions, making the shopping experience more interactive and engaging [15].

Because AI-enabled chatbots and virtual assistants are so scalable, e-commerce companies can handle high customer engagement volumes without seeing a corresponding rise in customer service expenses. When client inquiries spike during promotional events or high shopping seasons, this scalability proves very advantageous. Additionally, companies can optimize resource allocation by freeing up human agents to handle more difficult situations by automating regular queries [16]. While AI chatbots and virtual assistants offer many advantages, they also come with challenges, particularly in terms of understanding complex customer queries and maintaining a human touch. Ensuring that these tools are trained effectively and integrated smoothly into existing systems is crucial for maximizing their potential [17]. Consumers often lack understanding of how AI systems make decisions, such as recommending products or adjusting prices. This "black box" nature of AI can lead to mistrust and concerns about fairness [18]. e-commerce platforms should strive to make their AI processes more transparent by providing clear explanations of how algorithms work and how data is used in decision-making processes [19].

AI's ability to predict and influence consumer behavior raises ethical questions about the potential for manipulation. AI-driven personalization can sometimes cross the line into exploitation, where consumers are nudged or pressured into making purchases they might not otherwise consider. For instance, constant personalized recommendations or targeted ads can create a sense of urgency or fear of missing out (FOMO), leading to impulsive buying decisions [20, 21]. e-commerce companies must balance personalization with respect for consumer autonomy, avoiding manipulative practices that undermine consumer agency [22].

1.2. The Impact of AI on Consumer Behavior in Digital Shopping:

AI also impacts purchase decisions through dynamic pricing, where prices are adjusted in real-time based on various factors such as demand, competition, and consumer behavior [23]. This strategy allows businesses to optimize pricing to maximize sales and profits. For example, AI algorithms can detect when a consumer is likely to make a purchase and adjust prices accordingly to encourage the transaction [24]. dynamic pricing driven by AI can boost sales by up to 20%, as it allows businesses to offer competitive prices at the right moment [25, 26]. AI enhances the overall user experience on e-commerce platforms by providing seamless navigation, personalized content, and intuitive search functions [27]. By making the shopping experience more enjoyable and relevant, AI can influence consumers' willingness to purchase [28]. For instance, AI-driven virtual shopping assistants can guide users through the purchasing process, answer questions, and offer personalized advice, making consumers more confident in their buying decisions [15].

consumers are more likely to trust and act on AI-generated recommendations when they perceive them as personalized and relevant to their interests [29]. The psychological impact of AI-generated

suggestions on consumers is profound. When AI offers personalized recommendations, it can create a sense of being understood and catered to, which enhances consumer satisfaction and trust in the platform [30]. However, there is also a potential downside: consumers may feel overwhelmed by the abundance of choices presented by AI, leading to decision fatigue [31, 32]. Additionally, if AI recommendations are perceived as overly invasive or manipulative, they may trigger resistance or discomfort, negatively affecting the consumer's overall experience [33]. Achieving the optimal psychological benefit from AI recommendations requires striking a balance between personalization and respect for the privacy and autonomy of the user. businesses that integrate AI into their loyalty programs see a significant increase in customer retention rates, with personalized rewards boosting engagement by up to 35% [34]. Additionally, AI can uncover broader trends, such as which types of rewards are most effective at different stages of the customer lifecycle, enabling businesses to optimize their loyalty strategies [35, 36]. companies using AI-driven insights were better equipped to anticipate changes in consumer behavior and adapt their loyalty programs accordingly, leading to improved customer retention and satisfaction [37-39].

AI is increasingly integrated into mobile commerce apps to create smarter, more responsive shopping experiences [40, 41]. Apps can now use AI for a range of purposes, such as dynamic pricing, real-time customer support, and personalized suggestions, thanks to this connection [41, 42]. AI-driven mobile commerce apps can analyze user data to offer tailored product suggestions, predict purchasing behavior, and even provide personalized discounts, all of which enhance the shopping experience [43-47]. AI integration in mobile apps can increase user engagement by 40%, as customers are more likely to interact with an app that understands and anticipates their needs [48].

AI plays a crucial role in enhancing the user interface (UI) of mobile shopping apps, making them more intuitive and user-friendly [49]. By analyzing user behavior and preferences, AI can optimize the app's layout, streamline navigation, and personalize content displays [11, 50]. For instance, AI can automatically adjust the app interface to prioritize frequently used features or suggest shortcuts based on past behavior, making the shopping process quicker and more convenient [51]. AI-enhanced UIs significantly improve user satisfaction, with customers reporting smoother interactions and reduced friction when navigating mobile shopping apps [52].

The next wave of AI innovations in e-commerce is expected to bring transformative changes that will further enhance customer experiences and operational efficiency. Emerging technologies such as AI-powered augmented reality (AR) and virtual reality (VR) are set to revolutionize how consumers shop online, offering immersive experiences that allow customers to virtually try on products or explore virtual stores from the comfort of their homes. Additionally, advancements in natural language processing (NLP) will enable more sophisticated AI-driven chatbots and virtual assistants, capable of understanding and responding to customer inquiries with greater accuracy and empathy. Machine learning algorithms will also become more advanced, enabling hyper-personalization where every aspect of the shopping journey is uniquely tailored to individual preferences and behaviors.

While AI presents numerous opportunities, implementing it across diverse markets poses significant challenges. One of the primary challenges is the variation in technological infrastructure and digital literacy levels across different regions [53]. In emerging markets, where access to advanced technologies may be limited, businesses may struggle to fully leverage AI's potential[54]. Additionally, cultural differences can impact the effectiveness of AI-driven personalization, as consumer preferences and behaviors vary widely across regions [55]. Another challenge is ensuring compliance with local regulations and data privacy laws, which can differ significantly from one market to another. This adds complexity to the implementation of AI, particularly when dealing with cross-border data transfers and localization requirements [56, 57].

2. Results and discussions:

*2.1. **Methodology:***

This study employs a mixed-methods research design, integrating both qualitative and quantitative approaches to examine the impact of artificial intelligence (AI) on shopping rates through electronic applications within Saudi Arabia. Cross-sectional study: Data will be collected through structured surveys administered to a stratified random sample of 350 consumers across various regions in Saudi Arabia, gathering quantitative insights into their usage patterns and perceptions of AI-driven features in e-commerce. The data will be analyzed using statistical software for quantitative data and thematic analysis for qualitative data, with triangulation ensuring the validity of the findings

2.2. Results and discussions:

The demographic profile of the 349 participants reveals a balanced gender distribution, with **51.9%** female (181 participants) and **48.1%** male (168

participants). This nearly equal representation suggests a diverse sample in terms of gender.

In terms of age, the respondents are predominantly young adults. The largest age group is those aged **25-34**, representing **29.5%** of the sample (103 participants), followed by those aged **18-24** at **25.5%** (89 participants). Together, these two groups account for over half of the total sample, indicating that a significant portion of respondents are in the early stages of their professional or adult lives. The **35-44** age group comprises **14.9%** of participants (52 respondents), while those aged **45-54** represent **11.2%** (39 respondents). Finally, the **55 and above** category makes up **5.4%** (19 respondents), suggesting a relatively small representation of older adults in the sample.

Regionally, the majority of respondents are from the two largest cities in Saudi Arabia: **Riyadh** and **Jeddah**, contributing **43%** (150 participants) and **40.7%** (142 participants), respectively. This urban dominance highlights the concentration of participants from key economic hubs. Smaller regional representations include **Al-Namas** with **7.2%** (25 participants), **Medina Al-Munawwarah** at **3.7%** (13 participants), and minimal participation from **Asir Province** and **Abha City**, each contributing **1.1%** (4 participants). The region of **Makkah** accounts for **3.2%** (11 participants), indicating that the study predominantly involves respondents from major metropolitan areas.

Regarding educational background, the largest group of participants holds a **Bachelor's degree**, accounting for **45%** (157 participants), followed by **22.6%** (79 participants) with a **Master's degree**. Those with a **PhD** represent **13.5%** (47 participants), while **18.9%** (66 participants) have a high school education or below. This reflects a highly educated sample, with a majority of respondents holding advanced degrees, which may influence their familiarity and interaction with the subject matter of the study.

The demographic data show a predominance of young adults, urban residents, and highly educated individuals, particularly from major cities like Riyadh and Jeddah. These characteristics are crucial for interpreting the study's findings, as they reflect the views and behaviors of a tech-savvy, well-educated population likely familiar with e-commerce and AI technologies.

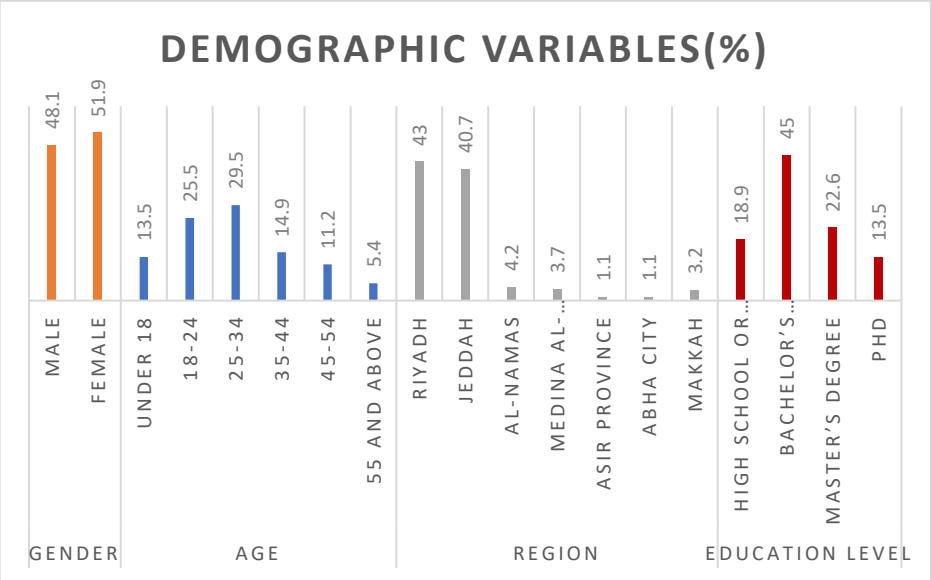

Figure1: the demographic database.

Amazon stands out as the most popular e-commerce platform, with **91 male respondents** and **85 female respondents**, totaling **176 users**. The usage is fairly balanced between genders, suggesting that Amazon's wide range of products and services appeals to both male and female shoppers. This broad appeal can be attributed to Amazon's global reputation, convenience, and diversity in product categories, from electronics to fashion. The slight male majority may reflect a higher interest in technology-related purchases, though the overall similarity in usage indicates that Amazon's appeal is not significantly gendered.

Noon, a regional e-commerce platform, is the second most frequently used, with **70 male respondents** and **52 female respondents**, totaling **122 users**. Males show a higher preference for Noon compared to females, which may be influenced by the platform's product offerings and marketing. Noon's appeal to men could be due to its focus on electronics, home goods, or regional brands that resonate more with male shoppers. The gap in usage suggests that Noon may benefit from enhancing its

appeal to female users by potentially expanding product categories like fashion or beauty, which have historically attracted more female buyers.

Souq, which is now part of Amazon, shows a contrasting trend, with **45 male respondents** and **61 female respondents**, totaling **106 users**. This indicates a higher preference for Souq among female shoppers. Souq's historical focus on affordable goods and a variety of household and fashion products may explain why it is more popular with women. Given the platform's integration with Amazon, it's possible that some female shoppers prefer the local appeal or product range that Souq offers, differentiating it from Amazon's more global product listings.

Namshi, a platform specializing in fashion and lifestyle products, has **38 male respondents** and **54 female respondents**, making up **92 users**. The platform's clear female dominance reflects the nature of its product offerings, which are tailored more towards fashion and beauty – categories that traditionally attract more female shoppers. The higher usage by women is consistent with industry trends, where women tend to shop more frequently for fashion-related items online. Namshi's focus on lifestyle products likely reinforces its appeal to female customers. Shein is exclusively used by female respondents in this sample, with **4 female users** and no male users. This is unsurprising given Shein's strong association with women's fashion. The platform is widely known for offering affordable, trendy women's clothing, which explains why it does not attract any male users. Shein's marketing and product focus are heavily oriented toward women, reinforcing its position as a female-dominant platform in the e-commerce space.

Gender and Platform Preference Link

The data clearly demonstrates a link between gender and e-commerce platform preferences. Males are more inclined to use general or tech-oriented platforms like Amazon and Noon, while females gravitate toward fashion and lifestyle platforms like Souq, Namshi, and Shein. This distinction likely arises from the types of products these platforms emphasize, with platforms focused on fashion and household goods drawing more women, while those with broader or more technology-driven product ranges attract more men. The differences in platform preference highlight the importance of product variety and targeted marketing in influencing online shopping behavior across genders.

Understanding these gender-based preferences can help e-commerce companies tailor their strategies. For instance, platforms like Noon may want to consider expanding their offerings in categories that appeal more to female users, while fashion-oriented platforms could explore ways to attract more male shoppers. Ultimately, this data provides valuable insights into the intersection of gender and online shopping behavior, which can be leveraged to improve customer engagement and satisfaction across e-commerce platforms.

The data highlights gender-based differences in the perception of the main challenges associated with using AI in e-commerce. This analysis provides insights into the concerns male and female respondents have regarding AI integration, such as privacy, trust, complexity, and accuracy.

Privacy Concerns

A total of **34 male respondents** and **40 female respondents** cited privacy concerns, making it a significant challenge for **74 respondents** overall. Privacy concerns appear relatively balanced between genders, although slightly more females express worry over data privacy. This aligns with broader trends where privacy is often a key issue in technology adoption, particularly in relation to personal data collection and how AI systems process this information. The similar level of concern across both genders suggests that privacy is a universal challenge in e-commerce AI systems.

Lack of Trust in AI Recommendations

The largest issue identified by respondents is the **lack of trust in AI recommendations**, with **79 males** and **73 females** highlighting this as a challenge, totaling **152 respondents**. Both genders show a comparable level of skepticism regarding AI's ability to offer trustworthy recommendations. This might be due to concerns about AI's decision-making processes, perceived biases, or inconsistencies in its recommendations. The relatively high level of mistrust indicates that building confidence in AI systems remains a significant challenge for e-commerce companies across both male and female consumers.

Complexity of Use

When it comes to the **complexity of using AI-powered systems**, **55 male respondents** and **36 female respondents** identified this as a challenge, for a total of **91 respondents**. Here, males express more difficulty with the complexity of AI, which could reflect concerns about the interface, user experience, or understanding AI-driven tools. While both genders find AI's complexity problematic, males seem to encounter more friction, which suggests that e-commerce platforms need to ensure that their AI features are intuitive and user-friendly, particularly for male users.

Inaccurate Recommendations

A total of **23 male respondents** and **61 female respondents** mentioned **inaccurate AI recommendations** as a major challenge, totaling **84**

respondents. Females appear to be significantly more dissatisfied with the accuracy of AI recommendations than males. This may be due to expectations related to personal shopping preferences, where AI recommendations do not align with individual tastes or needs. The disparity suggests that improving the precision and personalization of AI-generated suggestions could be particularly important for addressing the concerns of female shoppers.

Gender and AI-Related Challenges Link

The data reveals distinct gender-based differences in the challenges associated with AI in e-commerce. **Males** are more concerned with the **complexity of AI use**, while **females** report higher dissatisfaction with **inaccurate recommendations**. Both genders share a strong concern about **trust** in AI recommendations, with a relatively even split on **privacy concerns**. These insights suggest that e-commerce companies must address both the **technical usability** and **accuracy** of AI systems to enhance user trust and experience. While males may benefit from simpler, more intuitive interfaces, females may be more receptive to AI systems that offer highly personalized and accurate recommendations.

some recommendations to solve the challenges

Addressing the challenges of using AI in e-commerce requires a multifaceted approach tailored to the specific concerns raised by both male and female users. Privacy concerns, a significant issue for both genders, can be mitigated through stronger data encryption and anonymization techniques. E-commerce platforms should prioritize transparent data policies, allowing users to understand how their information is used and giving them greater control over what data they share. Additionally, user-friendly privacy settings, where customers can opt out of specific AI-driven features, can empower users to feel more secure while benefiting from personalized shopping experiences. Building trust in AI recommendations is another crucial area, especially given the widespread concern about inaccurate or irrelevant suggestions. Implementing explainable AI (XAI) models could demystify AI processes by providing clear, understandable reasoning behind product recommendations. Continuous feedback loops can further refine the AI's accuracy, as users share their input on the relevance of the suggestions they receive. To address complexity, platforms should focus on simplifying user interfaces and offering clear instructions or tutorials to ease users into AI-driven tools. AI-driven virtual assistants can also help guide users through more complex processes, making the overall shopping experience smoother and more intuitive. By addressing these challenges holistically, e-commerce platforms can create a more trusted and user-friendly environment, ensuring that AI plays a supportive role in enhancing the customer experience.

Table 1: the result of the survey.

Section 2: Usage of E-commerce Applications							
How often do you shop using electronic applications?	Never	Rarely	Monthly	Weekly	Daily	Mean	score
	57	106	92	62	32	2.73	Monthly
	16.30%	30.40%	26.40%	17.80%	9.20%		
How much do you spend on average per month on online shopping?	Less than 100 SAR	100-500 SAR	500-1000SAR	1000-5000SAR	More than 5000 SAR	Mean	score
	78	103	99	55	14	2.49	100-500 SAR
	22.30%	29.50%	28.40%	15.80%	4.00%		
Section 3: Perception of AI-Driven Features							
How familiar are you with AI-driven features like personalized recommendations, chatbots, or virtual assistants in e-commerce applications?			Not familiar	Somewhat familiar	Very familiar	Mean	score
			88	174	87	1.99	Somewhat familiar
			25.20%	49.90%	24.90%		
To what extent do AI-driven recommendations influence	Never effect	Don't effect	Slightly	Moderately	Significantly	Mean	score
	22	38	107	126	56	3.44	

your purchase decisions?	6.30%	10.90%	30.70%	36.10%	16%		Moderately
How satisfied are you with the personalized recommendations provided by e-commerce apps?	Very dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied	Mean	score
	20	35	114	131	49	3.44	Satisfied
	5.70%	10%	32.70%	37.50%	14%		
Do you find AI-powered chatbots and virtual assistants helpful in your shopping experience?	Not very helpful	Not helpful	Neutral	helpful	Very helpful	Mean	score
	25	47	73	144	60	3.47	helpful
	7.20%	13.50%	20.90%	41.30%	17.20%		
Section 4: Impact of AI on Shopping Behavior							
Have you noticed an increase in your online shopping frequency since using apps with AI-driven features?				Yes	No	Mean	score
				227	122	1.645	Yes
				65%	35%		
Do you think AI-driven features make the shopping process faster and more efficient?	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Mean	score
	40	41	62	144	62	3.42	Agree
	11.50%	11.70%	17.80%	41.30%	17.80%		
How likely are you to continue using e-commerce apps that heavily rely on AI features?	Very unlikely	Unlikely	Neutral	Likely	Very likely	Mean	score
	25	56	61	149	58	3.455	Likely
	7.20%	16%	17.50%	42.70%	16.60%		
Section 5: Future of AI in E-commerce							
Do you believe AI will continue to transform the e-commerce experience in Saudi Arabia?	very unsure significantly	No Significantly	Neutral	Moderately	Significantly	Mean	score
	23	28	56	144	98	3.762	Moderately
	6.60%	8%	16%	41.30%	28.10%		

The data reveals that while users are somewhat familiar with AI-driven features, they generally find them useful and believe that AI improves the e-commerce experience, making it faster and more efficient. Users also tend to increase their shopping frequency when using AI-enhanced applications. However, there is still room for growth in user trust and satisfaction with AI-driven features, as indicated by moderate scores on satisfaction and helpfulness. Looking ahead, there is optimism about the transformative potential of AI in the Saudi Arabian e-commerce market, though the full potential may not yet be fully realized.

The Chi-square test results from the table indicate that there is a statistically significant

relationship between gender and satisfaction with personalized recommendations provided by e-commerce apps. The Pearson Chi-Square value is 43.706, with a significance level (p-value) of less than 0.001. This means that the observed differences between male and female satisfaction levels are not due to random chance and suggest that gender influences satisfaction with these personalized recommendations. Additionally, the Likelihood Ratio (44.414) and the Linear-by-Linear Association (17.738) both reinforce this conclusion, as they also show significance at the $p < 0.001$ level. These tests suggest that there is a linear trend, where satisfaction changes across gender categories in a non-random way. In summary, the significant Chi-Square test implies a meaningful relationship between gender and how individuals perceive the satisfaction of personalized e-commerce recommendations. Further analysis could explore how males and females differ in their specific satisfaction levels, as seen in the Chart where more males appear satisfied, while females have higher counts in the "Neutral" and "Dissatisfied" categories.

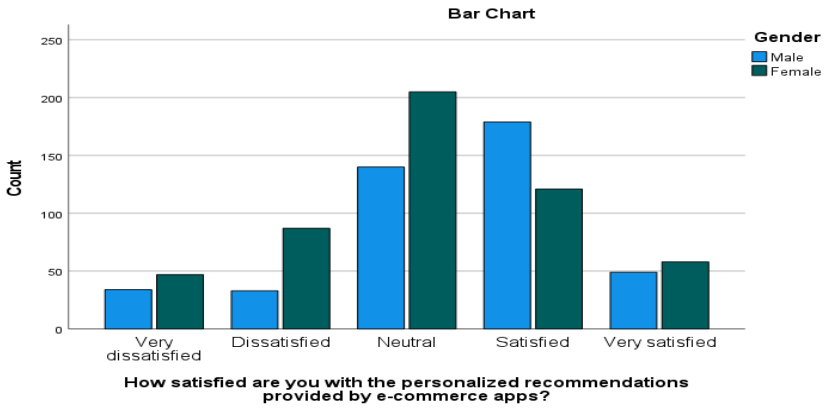

Figure 2: This chart shows the relationship between gender and their satisfaction with the personalized recommendations provided by e-commerce apps.

Table 2: One-way ANOVA test results according to the variable of academic degree				
the average of spend the money per month according to the education degree	Mean	Stander deviation	F Value	Sig.
High School or below	2.34	1.556	57.027	<0.001
Bachelor's Degree	1.983	0.918		
Master's Degree	2.609	0.79		
PHD	3.316	1.2		

Table 3: Scheffe's Multiple Comparison Test Results			
the average of spend the money per month according to the education degree	Mean Difference	Sig.	indication
High School or below-Bachelor	0.356	0.002	indication

Bachelor's Degree-Master	0.625	<0.001	indication
Master's Degree-PhD	0.7068	<0.001	indication

The results of the One-way ANOVA test reveal a significant relationship between the amount of money spent monthly on online shopping and the respondents' education levels. The analysis shows that individuals with higher educational qualifications tend to spend more on online shopping. Specifically, PhD holders report the highest average monthly expenditure at 3.316 units, followed by Master's degree holders at 2.609 units, and Bachelor's degree holders at 1.983 units. High school graduates or those with a lower degree spend the least, with an average of 2.34 units. The F-value of 57.027 and a p-value of less than 0.001 indicate statistically significant differences between these groups. The Scheffe post-haoc test further confirms significant spending differences between each pair of education levels, with PhD holders spending significantly more than those with a Master's degree, and Master's degree holders spending more than those with a Bachelor's or high school degree. These results highlight the influence of education on consumer behavior in online shopping, where higher education levels are associated with increased spending.

2.3. Conclusion:

The integration of artificial intelligence in e-commerce has significantly transformed the shopping experience, especially within the Saudi Arabian market. Through the use of machine learning algorithms, predictive analytics, and personalized recommendations, AI has enhanced customer engagement, satisfaction, and sales performance. The results demonstrate a clear gender-based preference for specific e-commerce platforms, with males gravitating towards tech-oriented platforms and females showing a preference for fashion-related platforms. The study also highlights the positive impact of AI on user experience, from improving the efficiency of online shopping to providing personalized suggestions through virtual assistants and chatbots.

While AI-driven features have proven beneficial in increasing online shopping rates and boosting customer loyalty, challenges related to privacy concerns, lack of trust in AI recommendations, and the complexity of AI tools remain. Gender-specific differences in AI-related concerns, such as the complexity of use for males and dissatisfaction with AI recommendations for females, indicate the need for e-commerce companies to refine their AI systems further.

In conclusion, AI's role in e-commerce continues to evolve, offering tremendous opportunities for businesses to enhance customer experiences. However, the successful implementation of AI requires addressing ethical concerns, improving transparency in AI processes, and ensuring user-friendly interfaces. By doing so, businesses can fully harness the potential of AI to drive customer satisfaction and operational efficiency in the e-commerce sector.

References

[1] Sharma, A. and M.O. Shafiq, *A comprehensive artificial intelligence based user intention assessment model from online reviews and social media.* Applied Artificial Intelligence, 2022. **36**(1): p. 2014193.

[2] Dumitriu, D. and M.A.-M. Popescu, *Artificial intelligence solutions for digital marketing.* Procedia Manufacturing, 2020. **46**: p. 630-636.

[3] Forrest, E. and B. Hoanca, *Artificial intelligence: Marketing's game changer.* Trends and innovations in marketing information systems, 2015: p. 45-64.

[4] Rizvi, A.T., et al., *Artificial intelligence (AI) and its applications in Indian manufacturing: a review.* Current Advances in Mechanical Engineering: Select Proceedings of ICRAMERD 2020, 2021: p. 825-835.

[5] Liu, Y. and W. Chen, *Optimization of brand marketing strategy of intelligent technology under the background of artificial intelligence.* Mobile Information Systems, 2021. **2021**(1): p. 9507917.

[6] Gupta, T. and S. Bansal, *The AI Advantage: Assessing Personalization Effects on E-commerce Shopping Behaviors.*

[7] Holmström, E. and A. Larsson, *From Data to Loyalty: A quantative study of consumer's response to AI-driven personalized marketing*. 2024.

[8] Sanakuiev, M., et al., *Information Marketing: A Comprehensive Review.* Futurity Economics&Law, 2023. **3**(1): p. 28-50.

[9] Qi, B., Y. Shen, and T. Xu, *An artificial-intelligence-enabled sustainable supply chain model for B2C E-commerce business in the international*

trade. Technological forecasting and social change, 2023. **191**: p. 122491.

[10] Lopez, S., *Optimizing Marketing ROI with Predictive Analytics: Harnessing Big Data and AI for Data-Driven Decision Making.* Journal of Artificial Intelligence Research, 2023. **3**(2): p. 9-36.

[11] Haleem, A., et al., *Artificial intelligence (AI) applications for marketing: A literature-based study.* International Journal of Intelligent Networks, 2022. **3**: p. 119-132.

[12] Techlabs, M. *Can chatbots help reduce customer service costs by 30?* . 2017; Available from: https://chatbotsmagazine.com/how-with-thehelp-of-chatbots-customer-service-costs-could-be-reduced-up-to30-b9266a369945.

[13] Meuter, M.L., et al., *Choosing among alternative service delivery modes: An investigation of customer trial of self-service technologies.* Journal of marketing, 2005. **69**(2): p. 61-83.

[14] Takale, D.G., *Revolutionizing Customer Interaction: NLP-Powered Virtual Shopping Assistants and Sentiment Analysis in E-commerce.*

[15] Misra, R.R., S. Kapoor, and M. Sanjeev, *The Impact of Personalisation Algorithms on Consumer Engagement and Purchase Behaviour in AI-Enhanced Virtual Shopping Assistants.* 2024.

[16] Kyrylenko, Y., *Chatbots and virtual assistants vs. human agents in IT customer support.* 2024.

[17] Jankovic, S.D. and D.M. Curovic, *Strategic integration of artificial intelligence for sustainable businesses: implications for data management and human user engagement in the digital era.* Sustainability, 2023. **15**(21): p. 15208.

[18] Gerlick, J.A. and S.M. Liozu, *Ethical and legal considerations of artificial intelligence and algorithmic decision-making in personalized pricing.* Journal of Revenue and Pricing Management, 2020. **19**: p. 85-98.

[19] Shrestha, Y.R., V. Krishna, and G. von Krogh, *Augmenting organizational decision-making with deep learning algorithms: Principles, promises, and challenges.* Journal of Business Research, 2021. **123**: p. 588-603.

[20] Owen, J., *AI-Driven Personalization: Balancing Customer Benefit and Ethical Concerns.* 2023.

[21] Kim, W., *Shopping with AI: Consumers' perceived autonomy in the age of AI*, in *Human-Centered Artificial Intelligence*. 2022, Elsevier. p. 157-171.

[22] Bjørlo, L.V., *Freedom from interference: Decisional privacy as a dimension of consumer privacy online.* AMS Review, 2024: p. 1-25.

[23] Markula, A., *The Use of Artificial Intelligence in Dynamic Pricing Strategies.* 2023.

[24] Phillips, R.L., *Pricing and revenue optimization*. 2021: Stanford university press.

[25] Dash, R., et al., *Application of artificial intelligence in automation of supply chain management.* Journal of Strategic Innovation and Sustainability, 2019. **14**(3).

[26] ACQUA ERA, C., *Dynamic Pricing and Consumer Behaviour: Analysis from a Consumers' Perspective.* 2018.

[27] East, A. and J. Smith, *The Future of E-commerce: AI's Role in Customer Experience Optimization*. 2024, EasyChair.

[28] Zimmermann, R., et al., *Enhancing brick-and-mortar store shopping experience with an augmented reality shopping assistant application using personalized recommendations and explainable artificial intelligence.* Journal of Research in Interactive Marketing, 2023. **17**(2): p. 273-298.

[29] Shin, D., *User perceptions of algorithmic decisions in the personalized AI system: Perceptual evaluation of fairness, accountability, transparency, and explainability.* Journal of Broadcasting & Electronic Media, 2020. **64**(4): p. 541-565.

[30] Rane, N.L., A. Achari, and S.P. Choudhary, *Enhancing customer loyalty through quality of service: Effective strategies to improve customer satisfaction, experience, relationship, and engagement.* International Research Journal of Modernization in Engineering Technology and Science, 2023. **5**(5): p. 427-452.

[31] Gal, M.S., *Algorithmic challenges to autonomous choice.* Mich. Tech. L. Rev., 2018. **25**: p. 59.

[32] Burlacu, C., *The Impact Of Ai-Powered Content Generation On Customer Experience*. 2023, University of Twente.

[33] Riegger, A.-S., et al., *Technology-enabled personalization in retail stores: Understanding drivers and barriers.* Journal of Business Research, 2021. **123**: p. 140-155.

[34] Krishnan, C., et al., *Impact of artificial intelligence-based chatbots on customer engagement and business growth*, in *Deep learning for social media data analytics*. 2022, Springer. p. 195-210.

[35] Bharadiya, J.P., *Machine learning and AI in business intelligence: Trends and opportunities.* International Journal of Computer (IJC), 2023. **48**(1): p. 123-134.

[36] Yau, K.-L.A., N.M. Saad, and Y.-W. Chong, *Artificial intelligence marketing (AIM) for*

enhancing customer relationships. Applied Sciences, 2021. **11**(18): p. 8562.

[37] Bag, S., et al., *Journey of customers in this digital era: Understanding the role of artificial intelligence technologies in user engagement and conversion.* Benchmarking: An International Journal, 2022. **29**(7): p. 2074-2098.

[38] Jayawardena, N.S., et al., *Artificial intelligence (AI)-based market intelligence and customer insights*, in *Artificial intelligence for marketing management*. 2022, Routledge. p. 120-141.

[39] Vemulapalli, G., *AI-Driven Predictive Models Strategies to Reduce Customer Churn.* International Numeric Journal of Machine Learning and Robots, 2024. **8**(8): p. 1-13.

[40] 4Balakrishnan, J. and Y.K. Dwivedi, *Conversational commerce: entering the next stage of AI-powered digital assistants.* Annals of Operations Research, 2024. **333**(2): p. 653-687.

[41] Chopdar, P.K. and J. Balakrishnan, *Consumers response towards mobile commerce applications: SOR approach.* International Journal of Information Management, 2020. **53**: p. 102106.

[42] Daqar, M.A.A. and A.K. Smoudy, *The role of artificial intelligence on enhancing customer experience.* International Review of Management and Marketing, 2019. **9**(4): p. 22.

[43] Sarker, I.H., et al., *Mobile data science and intelligent apps: concepts, AI-based modeling and research directions.* Mobile Networks and Applications, 2021. **26**(1): p. 285-303.

[44] Arachchi, H.D.M. and G.D. Samarasinghe, *Impact of embedded AI mobile smart speech recognition on consumer attitudes towards AI and purchase intention across Generations X and Y.* European Journal of Management Studies, 2024. **29**(1): p. 3-29.

[45] Raji, M.A., et al., *E-commerce and consumer behavior: A review of AI-powered personalization and market trends.* GSC Advanced Research and Reviews, 2024. **18**(3): p. 066-077.

[46] Krishnan, C. and J. Mariappan, *The AI Revolution in E-Commerce: Personalization and Predictive Analytics*, in *Role of Explainable Artificial Intelligence in E-Commerce*. 2024, Springer. p. 53-64.

[47] Chowdhury, S., et al., *Influence of AI driven Digital Marketing on Consumer Purchase Intention: An Empirical Study.* Journal of Informatics Education and Research, 2024. **4**(2).

[48] EMB, T., *Impact of Innovative App Features on User Engagement* 2024.

[49] Le, W., et al., *Can App Reviews Help Developers to Improve Mobile User Interface Design?* Journal of Internet Technology, 2023. **24**(4): p. 955-964.

[50] Li, X., et al., *User Interaction Interface Design and Innovation Based on Artificial Intelligence Technology.* Journal of Theory and Practice of Engineering Science, 2024. **4**(03): p. 1-8.

[51] Roffarello, A.M. and L. De Russis, *Understanding and streamlining app switching experiences in mobile interaction.* International Journal of Human-Computer Studies, 2022. **158**: p. 102735.

[52] Smith, R., M. Cubino, and E. McKeon, *The AI Revolution in Customer Service and Support: A Practical Guide to Impactful Deployment of AI to Best Serve Your Customers*. 2024: Pearson Education.

[53] Sharma, R., et al., *Digital literacy and knowledge societies: A grounded theory investigation of sustainable development.* Telecommunications Policy, 2016. **40**(7): p. 628-643.

[54] Lee, J., et al., *Emerging technology and business model innovation: the case of artificial intelligence.* Journal of Open Innovation: Technology, Market, and Complexity, 2019. **5**(3): p. 44.

[55] Kopalle, P.K., et al., *Examining artificial intelligence (AI) technologies in marketing via a global lens: Current trends and future research opportunities.* International Journal of Research in Marketing, 2022. **39**(2): p. 522-540.

[56] Chin, Y.-C. and J. Zhao, *Governing cross-border data flows: International trade agreements and their limits.* Laws, 2022. **11**(4): p. 63.

[57] Taylor, R.D., *"Data localization": The internet in the balance.* Telecommunications Policy, 2020. **44**(8): p. 102003.