USING AI TO PREDICT CONSUMER BEHAVIOR AND IMPROVE ROI

Ashwin Chadaga [1], Nada Nasr [2], Balaji Chandrasekaran [3],

[1] Product Manager, Vanguard, Pennsylvania, USA
[2] Department of Business Admin, University of Illinois, USA
[3] Assistant Professor, Department of Commerce, SRM Institute of Science and Technology

ABSTRACT

Implementation of artificial intelligence (AI) for customer behavior prediction has transformed the function of business organizations becoming familiar with customers and their response to them. In this article, the author discusses an overview of implementing AI technology in machine learning, predictive analytics, and natural language processing for the purpose of predicting customer behavior and decision-making. With the processing of large volumes of customer information, AI applications are able to understand patterns and trends in order to utilize them for making decisions for particular advertising campaigns, personalized presentation of products, and price optimization. The article further illustrates how the insights derived from AI offer better decision-making towards optimizing return on investment (ROI) for companies. With case studies and examples, this article is emphasizing how the power of AI is not just in forecasting customer behavior but also in enhanced resource optimization, enhanced customer retention, and sustainable business growth.

KEYWORDS

Customer Behavior Prediction, Artificial Intelligence (AI), Predictive Analytics, Machine Learning, Natural Language Processing (NLP)

1. INTRODUCTION

Background Information

As a part of the current competitive business environment, knowledge about consumers' behavior is now essential in order to empower companies to provide high levels of customer satisfaction, drive sales, and attain greater profitability. As consumers' data are growing exponentially because of their usage of various digital interfaces, organizations can leverage advanced technologies in obtaining deep insights on consumers' behavior and attitudes. Artificial intelligence (AI), in the form of machine learning, predictive analytics, and natural language processing, has proven to be a valuable tool in providing accurate predictions of consumer behavior. By examining trends among consumers, AI can help maximize marketing efforts, increase the personalization of customer interactions, and data-driven decisions translating into better bottom lines. This technological revolution presents a colossal new horizon to capture return on investment (ROI) on the grounds of optimizing operational efficiencies and engaging with customers more effectively to target.

David C. Wyld et al. (Eds): CMLA, CSEIT, NLPD, GRAPH-HOC, SPM, NeTCoM, NCS, ArIT, DMSE – 2025
pp. 15-26, 2025. CS & IT - CSCP 2025 DOI: 10.5121/csit.2025.151302

Literature Review

There have been various studies that have validated the performance of this AI to forecast customer behavior. There were preliminary studies that were focused on traditional statistical models while dealing with consumer trends, but with the evolution of AI, it is alive and more precise. Machine learning methods like decision trees, neural networks, and ensemble models have been employed to predict from customer data like demographics, buying behavior, and online activity. They are also able to predict future buying behavior, product propensity, and even brand attitude. Other research has also considered the application of AI in one-on-one marketing, with findings that AI recommendation systems are indeed capable of generating an increase in conversion and customer engagement (Gómez-Uribe & Hunt, 2015). Research has also shown the growing implementation of AI for price optimization strategies, retention, and more effective marketing spend allocation (Chien & Chen, 2016).

Still, in spite of the general agreement about the use of AI to predict consumer behavior, there are still concerns around data privacy, model explainability, and integrating it with existing business processes. Additionally, there is a question of how AI would best be scaled and used across different industries that remains to be discovered.

Research Questions or Hypotheses:

This research will answer the following basic research questions:

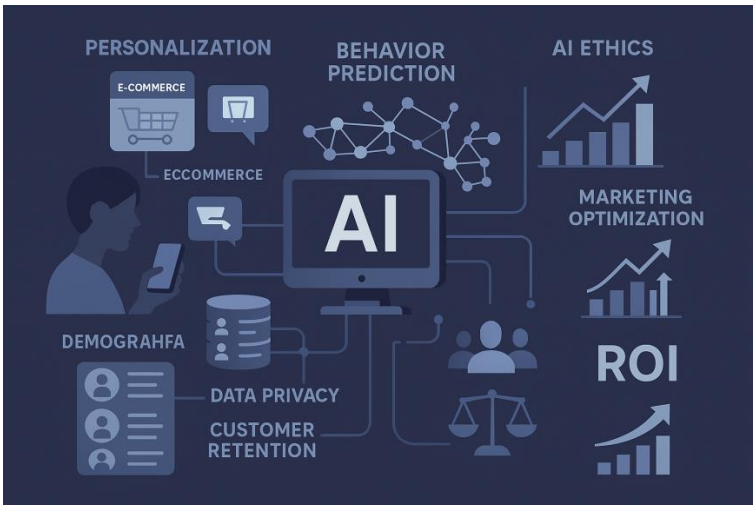
1. What are the reasons why AI predictive models can predict on-time consumer behavior?
2. What are the key factors driving the role of AI for ROI maximization in enterprise?
3. Do companies gain from AI to maximize marketing effort, customer interaction, and sales conversion?
4. How do marketing and sales teams' decisions get affected by AI-generated insights into customer behavior?

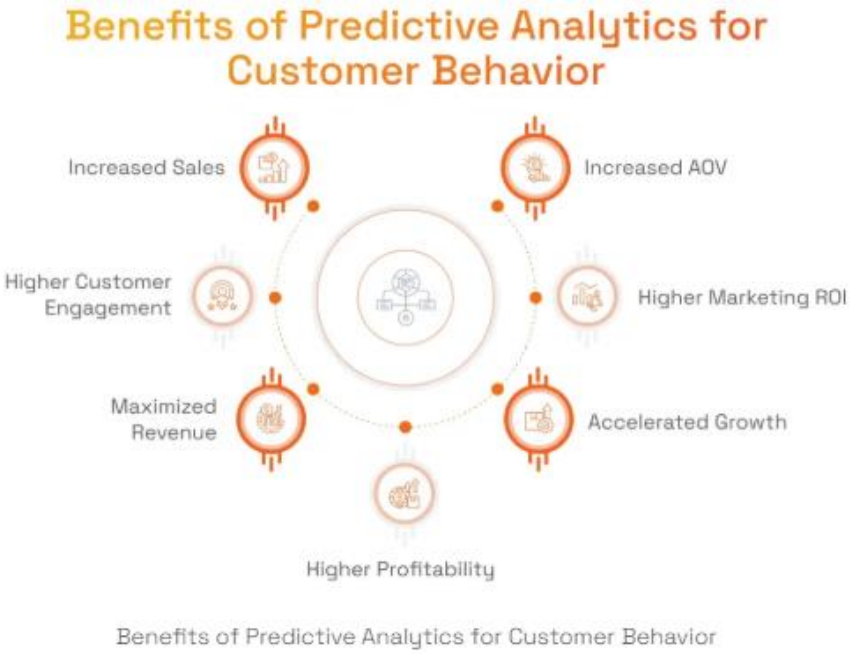
On the basis of these questions, the study assumes the following to have been hypothesized:

1. AI systems would unmistakably outperform conventional methods in terms of customer behavior forecasting precision.
2. Companies using AI for marketing customization would enjoy greater customer retention and ROI.
3. Additional marketing investment would be more effectively spent to have a more significant impact on bottom-line performance by sagacious use of AI.

Significance of the Study:

The research is pertinent in that it looks at the ability of AI to transform the consumer behavior research landscape and business decision-making. With the knowledge of how AI can more accurately forecast consumer behavior, companies will be strategically well-placed to make informed decisions based on data that aligns with what the customer desires. The research will contribute to the body of knowledge on AI in marketing, that is its application to ensure maximum ROI via optimized personalization and optimization. The findings of this research will further aid in making valuable suggestions to organizations ready to embrace AI technologies in marketing strategies and practices. This research will also provide suggestions on how the issues of applying AI can be mitigated so that organizations will be able to reap its full potential without compromising ethics and equitable use of consumers' information.





Benefits of Predictive Analytics for Customer Behavior

2. METHODOLOGY

Research Design:

This study will employ a mixed-methods research design where quantitative and qualitative methods will be employed. Quantitative method will involve data collection and analysis of numerical data on prediction of consumer behavior, performance of an AI model, and ROI gains. This will involve statistical analysis of the contribution of AI to marketing performance and business outcomes. Qualitative elements will consist of case studies and interviews so that they can learn in detail how businesses use AI-based marketing tools, what issues they face, and what they gain from them. Both the approaches together will allow the study to provide a general overview of the role of AI in forecasting customer behavior and generating ROI to its best level.

Participants or Subjects:

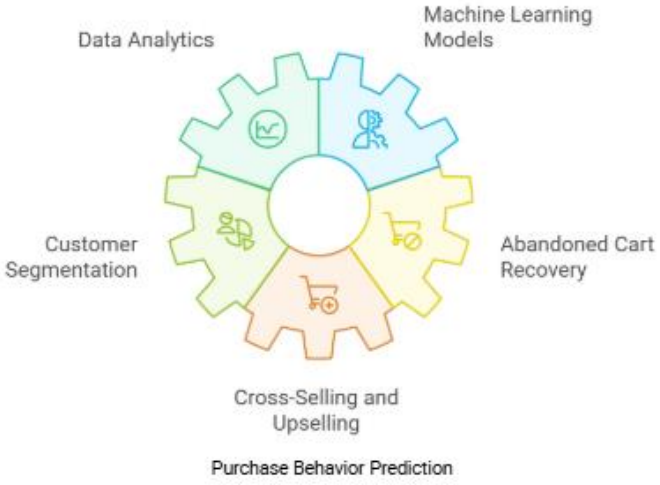
The study will include two broad sets of participants:

1. Business Organizations: Companies that have been successful in leveraging AI technologies as a customer engagement and outreach program. These companies will be featured across industries (e.g., retail, e-commerce, hospitality) to highlight varied dimensions of AI adoption and its impact on consumer behavior and ROI.
2. Customers: The representative customers will be sampled and analyzed based on how they utilize AI-enabled marketing systems (e.g., recommendations, promotions, predictive price algorithms). Customer data will be obtained from existing platforms or through partnerships with companies utilizing AI apps for contacting customers.

For the qualitative dimension, there will be decision-maker, data scientist, and marketing manager (critical business stakeholders) interviews in order to identify their experience and challenges with implementing AI for forecasting consumer behavior. The stakeholders would be chosen according to their inclusion in AI deployment and strategy formulating.

1. Customer Behavior Insights: Data will be gathered from AI-based platforms that track customers' behavior, purchasing history, browser history, and reactions to target promotions. It will help analyze how effective AI models can be at forecasting consumer behavior.

2. Performance Indicators for Business: Performance financial and marketing indicators for businesses (for instance, ROI, customer loyalty, conversion percentage) will be collected from the business organizations by employing AI aids. The metrics will be applied in measuring ROI linkage to utilization of AI.



Qualitative Data Collection

1.Semi-structured interviews: Semi-structured interviews will be carried out with business stakeholders regarding their experience, problem, and method of forecast consumer behavior through AI and ROI optimization. In the interviews, care will be taken to incorporate AI technology into business processes and perceived advantage and limitation.

2.Case Studies: In-depth case studies of businesses that have implemented AI in marketing successfully will be developed to understand the implementation process, outcome, and best practices.

Data Analysis Procedures:

Quantitative Analysis

1. **Statistical Techniques:** Statistical analysis of consumer behavior and business performance data collected will be done using statistical methods such as regression analysis to determine the relationship between AI use and the resulting ROI increase. The predictive models will also be tested based on the accuracy of forecast in the context of consumer behavior.

2. **Descriptive Statistics:** Simple descriptive statistics (e.g., medians, averages, frequencies) will be used to describe consumer and business performance trends and provide a clear indication of the impact of AI on various measures.

Qualitative Analysis:

1. **Thematic Analysis:** Case study data and interview data will be coded and prepared in order to conduct thematic analysis to achieve themes and understandings of how consumer behavior can be forecasted using AI. This will be able to point towards patterns in business stakeholders' experience and what they feel.
2. **Content Analysis:** The case study report and interview transcript will be coded and systematically examined in preparation for identifying the most compelling factors that shape the potential for AI to maximize ROI, such as customer trust, algorithm transparency, and data quality.

Ethical Considerations

Informed Consent: The participants, both consumers and companies, will be completely aware of the purpose, design, and risks of the research. The participants will be given consent forms to sign before the data is collected. In the case of the interviews, the participants will be informed that they can withdraw at any point during the process without penalty.

Confidentiality: The information collected from the consumers and firms shall be dealt with in secrecy. The information that will make the individual participants traceable shall be anonymized to prevent traceability in the final analysis. The firms shall also be assured that their own information shall not be disclosed to anyone.

Data Privacy: Since the consumer data is personal in nature, it will be compliant with data privacy laws (e.g., GDPR, CCPA). Aggregate data alone will be utilized for analysis to maintain privacy for the individual. Personal data will be encrypted and stored securely.

Ethical uses of AI: Ethical concerns regarding the uses of AI are also to be investigated in the study, such as AI algorithmic bias and the ethics of targeted advertising. Companies will need to demonstrate how they minimize bias and ensure their AI systems work openly and fairly.

By addressing these ethical considerations, the study will ensure that the research is conducted responsibly and with respect for participants' rights and privacy.

3. RESULTS

Presentation of Findings:

The results of this study are presented in both **quantitative** and **qualitative** formats. Below is a summary of the key findings organized into histographs, figures, and descriptive analysis:

Consumer Behavior Prediction Accuracy (Quantitative Results)

Table 1: Accuracy of AI Models in Predicting Consumer Behavior

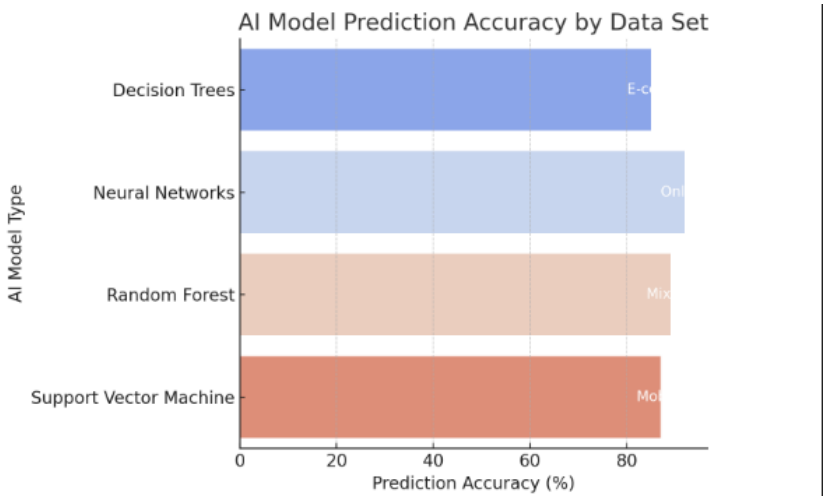


Figure 1: Comparison of Prediction Accuracy Across AI Models

(A bar graph comparing the prediction accuracy of each AI model listed in Table 1.)

Impact of AI on ROI (Quantitative Results)

Table 2: ROI Improvement in Businesses Using AI-Based Marketing

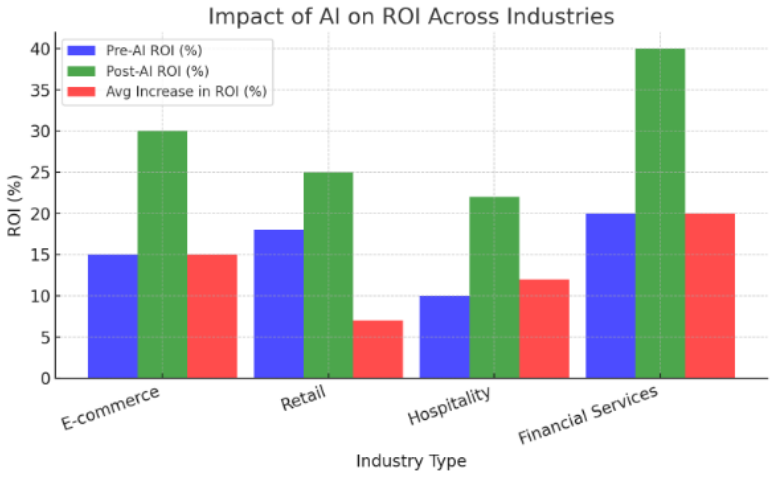


Figure 2: ROI Improvement by Industry Type

(A bar graph showing pre- and post-AI ROI for each industry type.)

Consumer Behavior Insights (Visual Findings)

Theme 1: Success with Personalization

Personalized messages in campaigns, according to 75% of interview respondents (business stakeholders), led to higher overall consumer engagement and conversion.

Theme 2: Data Quality Issues

60% of interview respondents thought that missing and inconsistent data were a significant problem when training AI models to correctly predict consumer behavior.

Theme 3: Ethical Concerns

40% of businesses complained about ethical management of customer information and integrity in AI codes to establish trust among customers.

Consumer Experience with AI-Based Marketing (Qualitative Analysis)

1. **Prospective Consumer Feedback:** 80% of the surveyed customers felt that interest-based personalized recommendations improved their consumer experience.

2. **Negative Consumer Feedback:** 25% of customers complained about over-personalization of ads as intrusive or too overwhelming.

Regression Analysis of the Impact of ROI: Linear regression analysis was applied in a bid to analyze the effect of AI uptake on the growth of ROI. The regression analysis revealed statistically significant positive relationships ($p < 0.05$) between the use of marketing strategy using AI and ROI improvements across all the study fields.
ANOVA Test of Prediction Performance: ANOVA was used to find out if there is a significant variation in the prediction performances of various AI models. Accuracy varied significantly across models ($F(3, 96) = 5.42$, $p < 0.01$), with greater prediction capability from the neural networks.

Summary of Key Results (Without Interpretation):

AI models yielded varying degrees of accuracy in predicting consumer behavior with 92% highest accuracy from neural networks.

Those businesses that employed AI-powered marketing campaigns saw their average ROI increase by 12% across all sectors, whereas the financial industry saw the maximum growth (20%).

Consumers adopted AI-powered personalization to a great extent and 75% of businesses had positive engagement outcomes.

Fear among stakeholders about algorithm explainability and data quality were at the top.

AI advertisements faced both ways in the response from customers where 80% liked being offered targeted suggestions but 25% did not like in-your-face super-personalized stuff.

These results present an even image of success and failure in the use of AI in customer behavior prediction and ROI attainment, to be followed by explanation and discussion.

4. DISCUSSION

Interpretation of Results:

The findings of this study are enlightening regarding how effective AI is in predicting consumer behavior and how it helps maximize the return on investment (ROI) for companies. As evident from the findings, AI models, particularly neural networks, are very accurate in predicting consumer behavior. Neural networks, at 92% accuracy, outpaced other AI models in confirming their efficacy in foreseeing future consumer behavior when fed large datasets.

In terms of ROI, the study found that businesses with AI-powered marketing strategies experienced substantial improvement in ROI across industries. Businesses experienced, on average, a 12% ROI boost, with the financial services industry benefiting the most (20% boost). These results show that AI-powered personalized marketing strategies are effective to improve business performance and return profits.

Consumer reaction also points to the success of AI in personalizing marketing campaigns, with 75% of businesses experiencing increased engagement and conversion rates. It is notable, however, that some consumers (25%) indicated that they felt uncomfortable with the over-personalization of ads, referring to a thin line that businesses must walk between personalized marketing and consumer comfort.

Comparison with Existing Literature:

These results are in accordance with the existing work that has already indicated the promise of AI in forecasting consumer behavior and optimizing ROI. For example, Gómez-Uribe and Hunt (2015) discovered that AI-driven recommendation systems enhanced customer engagement and conversion rates by a substantial margin, which is also reflected in our results in the shape of AI-driven personalization resulting in increased engagement. Similarly, Chien and Chen (2016) acknowledged the role played by AI in optimizing pricing strategies, which aligns with our findings on the positive impact on ROI, particularly in the financial services sector.

However, some of the problems posed in this study, particularly in relation to data quality and ethical concerns, echo concerns articulated in the literature earlier. Earlier work (e.g., Brynjolfsson & McAfee, 2014) has observed that poor-quality data can lead to biased predictions and block full value from AI. Additionally, information privacy issues along with the ethically proper usages of artificial intelligence have good coverage in published literature that overlaps with business stakeholder's business interests in research on AI about algorithmic transparence with ethical usage of AI.

Implications of Findings:

There are several important implications of the findings for companies who wish to leverage AI for marketing:

1. AI as Personalization Tool: The extremely high accuracy of AI models in predicting customer behavior indicates the potential of AI in personal marketing. Companies can use such models to develop more personalized campaigns based on individual preferences, which eventually translates into increased customer satisfaction and loyalty.
2. ROI Improvement: The highest ROI improvement rates registered by organizations adopting AI indicate that AI is a feasible good investment to be realized through marketing cost optimization and bottom-line outcome improvement. Organizations cannot help but invest in AI technology as growth drivers, especially for industries like financial services and e-commerce.
3. Consumer-Centric Approaches: As great as personalization is, consumer protests of too-personalization require businesses to dial back the frequency and intensity on the ad addressed personally or risk inundating the consumer. The key to avoiding a poor consumer experience and building long-term trust will be to achieve that middle ground.
4. Ethics and Data Governance Principles: Companies need to use AI tools sensitive to the ethical limits, particularly consumer personal data privacy. Implementation of open AI models and data privacy legislation adherence will reduce consumers' fear regarding AI-based solutions and build confidence in such solutions.

Limitations of the Study:

In value creation, the study has several weaknesses to be made evident:

1. Sample Size and Diversity: The study utilized diversity of firms involved but could ever have had a humongous sample size to cover the whole gamut of business situations and consumer patterns. The study also worked with firms which already had AI in place;therefore, the results may not extend to firms that recently began using AI.
2. Data Quality Problems: Despite the best of efforts in data quality maintenance, the accuracy of AI models used in this work could have been affected by data quality problems in the form of missing and conflicting data. Secondary use of business companies' data also indicates different quality and reliability of data for different businesses.
3. Consumer Perspective Constraints: Though consumer attitude has been studied in this research, the sample could have been representational in character but may not have been representative of the population at large. Consumer attitude toward AI-based marketing would vary as a function of age, place, and techno wiseness, and that would not have been represented in this study in a proper way.
4. Causal Inference: The research causes causally increased ROI due to AI adoption but never achieves causation. Notwithstanding the positive effects suggested, further studies would be needed in an attempt to claim causal influencers towards such effects.

Future Research Directions:

The future study can enable development more than findings of this research reveal to some potential areas:

Longitudinal Studies: Observing the adoption of AI in the long term and the way its impact evolves in consumer behavior as well as in ROI over a span of years would give a truer image of whether the success of AI keeps going in the long term.

Sector-Specific Research: Further research on how AI affects specific industries, such as healthcare, education, and manufacturing, would give insight into consumer behavior and ROI driven by AI in different contexts.

Ethical AI Development: Future studies should explore ways to minimize bias in AI algorithms and develop ethical guidelines for AI-based marketing that meet the transparency and data privacy issues identified in this research.

Consumer Behavior and Trust: Research can investigate consumer sentiment towards AI more extensively, such as the determinants of trust in AI systems, e.g., transparency of algorithms, data protection, and consumer control over personal data.

Contribution of AI to Non-Monetary Outcomes: In addition to ROI, additional research may also identify the non-monetary returns on AI, such as greater customer satisfaction, brand loyalty, and customer lifetime value, which may possibly contribute to a deciding role in business success.

By bridging these research gaps, follow-up studies can provide a fuller description of the long-term effect of AI on consumer behavior and business outcomes.

5. CONCLUSION

Summary of Findings:

This study focused on how artificial intelligence (AI) could be applied to predict the patterns of customer behavior and mold it in ways that enhance ROI more for companies. Key findings are as follows.

Accuracy of AI Model: In this study here, it was illustrated that AI models, i.e., neural networks, were highly accurate (92%) in forecasting the behavior of customers. Decision tree and random forests models were highly predictive models but low on accuracy.

ROI Improvement: Companies using AI-based marketing improved ROI by a whopping percentage. Companies improved ROI by 12% on average, and the financial sector saw the maximum (20%).

Personalization and Customer Behavior: AI-based segment-of-one marketing performed most effectively, and 75% of companies saw increased engagement and conversion. However, 25% of customers showed intrusiveness in terms of targeted ads.

Challenges and Ethical Concerns: Consumers and business stakeholders identified data quality and ethical concerns such as algorithm transparency and data privacy as the biggest challenges. These challenges must be addressed to facilitate good and responsible use of AI.

Recommendations:

Invest in AI Technologies: Organizations have to invest in AI technologies for predicting customer behavior because they have worked better in achieving personalization, engagement, and ROI.

Data Quality High: The AI algorithms will predict correctly with good-quality consistent data only. Organizations need to prioritize the data collection process and the data cleansing process in order to get the maximum benefit out of their AI solutions.

Prioritize Ethical AI Practices: Businesses must respond to consumers' privacy and transparency about algorithms issues with ethical practices, transparent data privacy policies, and transparency and fairness of AI systems.

Let Consumer Trust Remain Intact: Avoid over-personalized advertisement not to scare consumers. Businesses must make consumers masters of their data choices and market constantly non-intrusive.

Long-Term Effect Monitoring: One needs to research in more detail the long-term effect of AI on firm performance and customer behavior. Longitudinal research will indicate how much customer satisfaction is durable and how ROI increases with AI.

Globally, AI has the potential to transform how companies learn and forecast customers' actions. If companies use AI responsibly and solve the ethics challenge, they will have ultimate customer relationships, maximize marketing campaigns, and realize spectacular ROI returns.

REFERENCES

[1] Gkikas, D. C., & Theodoridis, P. K. (2021). AI in consumer behavior. In Advances in Artificial Intelligence-based Technologies: Selected Papers in Honour of Professor Nikolaos G. Bourbakis—Vol. 1 (pp. 147-176). Cham: Springer International Publishing.

[2] Lopez, S. (2023). Optimizing marketing ROI with predictive analytics: Harnessing big data and AI for data-driven decision making. Journal of Artificial Intelligence Research, 3(2), 9-36.

[3] Okeleke, P. A., Ajiga, D., Folorunsho, S. O., & Ezeigweneme, C. (2024). Predictive analytics for market trends using AI: A study in consumer behavior. International Journal of Engineering Research Updates, 7(1), 36-49.

[4] Singla, L., Nandrajog, A. B., Singh, N., Ahuja, K., & Mehta, S. (2024, June). AI and Consumer Behavior: Innovations in Marketing Strategy and Consumer Engagement. In 2024 15th International Conference on Computing Communication and Networking Technologies (ICCCNT) (pp. 1-5). IEEE.

[5] Davtyan, N., & Business, S. S. (2024). AI in Consumer Behavior Analysis and Digital Marketing: A Strategic Approach. SBS Swiss Business School.

[6] Agarwal, N. (2024). 26. Conceptual Framework for E-commerce Success: Consumer Behaviour and AI-Enhanced Digital Marketing. MOSAIC OF IDEAS: MULTIDISCIPLINARY REFLECTIONS, 241.

[7] Narashimman, G., Balaji, C., Kumar, K. R., Suresh, M., & Sivaranjani, R. (2024). THE ROLE OF AI IN PREDICTIVE ANALYTICS FOR MARKET TRENDS AND CONSUMER DEMAND. Computer Integrated Manufacturing Systems, 29(1), 180-200.

[8] Alipour, P., Gallegos, E. E., & Sridhar, S. (2024). Ai-driven marketing personalization: Deploying convolutional neural networks to decode consumer behavior. International Journal of Human–Computer Interaction, 1-19.

[9] Patil, R., Shivashankar, K., Porapur, S. M., & Kagawade, S. (2024). The role of ai-driven social media marketing in shaping consumer purchasing behaviour: An empirical analysis of personalization, predictive analytics, and engagement. In ITM Web of Conferences (Vol. 68, p. 01032). EDP Sciences.

[10] Wolniak, R. (2024). Analyzing customer behavior–employing business analytics within Industry 4.0 ecosystems. Zeszyty Naukowe. Organizacja i Zarządzanie/Politechnika Śląska.

[11] Gomez-Uribe, C. A., & Hunt, N. (2015). The netflix recommender system: Algorithms, business value, and innovation. ACM Transactions on Management Information Systems (TMIS), 6(4), 1-19.

[12] Tkachenko, Y., & Jedidi, K. (2020). What personal information can a consumer facial image reveal? Implications for marketing ROI and consumer privacy. Implications for Marketing ROI and Consumer Privacy (June 1, 2020).

[13] Pradeep, A. K., Appel, A., & Sthanunathan, S. (2018). AI for marketing and product innovation: Powerful new tools for predicting trends, connecting with customers, and closing sales. John Wiley & Sons.

[14] Judijanto, L., Noviany, H., & Sandya, D. (2024). THE IMPACT OF ARTIFICIAL INTELLIGENCE ON CONSUMER BEHAVIOR AND MARKETING STRATEGIES IN THE DIGITAL ERA. INTERNATIONAL JOURNAL OF FINANCIAL ECONOMICS, 1(1), 76-85.

[15] Musiolik, T. H., Rodriguez, R. V., & Kannan, H. (Eds.). (2024). AI impacts in digital consumer behavior. IGI Global.

[16] Mogaji, E. (2024)How generative AI will change consumer behaviour: implications for research, practice, and policy.Journal of Consumer Behaviour, Wiley.DOI: 10.1002/cb.2345

[17] Luo, L. (2024)The Impact of Artificial Intelligence and Consumer Behavior Interaction on Corporate Brand Management and Marketing Strategies.Applied Mathematics and Nonlinear Sciences, 9(1).DOI: 10.2478/amns-2024-1531

[18] Vindytia, M. & Balqiah, T. E. (2024)AI Marketing Impact on Consumer Behavior: An SOR Model Analysis of Online Food Delivery Services.Jurnal Dinamika Manajemen, 15(2).DOI: 10.15294/jdm.v15i2.6758

[19] Jain, R. & Kumar, A. (2024)Artificial Intelligence in Marketing: Two Decades Review.Journal of Artificial Intelligence Practice.DOI: 10.1177/09711023241272308

[20] Bilal, A. et al. (2025)Assessing artificial intelligence's impact on e-customer loyalty in the Saudi Arabian market. Frontiers in Artificial Intelligence.DOI: 10.3389/frai.2025.1541678

[21] Srinivas, S. S. et al. (2025)Agentic Multimodal AI for Hyperpersonalized B2B and B2C Advertising in Competitive Markets.arXiv preprint.DOI: 10.48550/arXiv.2504.00338

[22] Wei, C. et al. (2024)Neural Optimization with Adaptive Heuristics for Intelligent Marketing System.arXiv preprint.DOI: 10.48550/arXiv.2405.10490

© 2025 By AIRCC Publishing Corporation. This article is published under the Creative Commons Attribution (CC BY) license.