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EXPLORING CUSTOMER PERCEPTION AND SATISFACTION WITH MACHINE LEARNING APPLICATIONS IN E-COMMERCE

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Abstract

This research paper explores customer perception and satisfaction with machine learning (ML) applications in the e-commerce sector. With the growing use of ML tools such as product recommendations, chatbots, and personalized marketing, understanding how users experience and respond to these technologies is critical for improving online retail strategies. The study adopts a quantitative, survey-based approach, analysing responses from a subset of 30 participants aged 18–30, selected from a larger dataset of 100 respondents. The survey focused on user awareness, experience, trust, and the overall impact of ML-driven features on their shopping behaviour. Results indicate that while most users are aware of and benefit from ML tools, concerns regarding data privacy and a desire for more personalized yet transparent services remain significant. The study highlights the importance of building user trust and continuously improving ML features to enhance customer engagement and satisfaction in e-commerce platforms.

Keywords: Machine Learning, E-commerce, Customer Perception, Product Recommendations, Chatbots, Personalization, User Satisfaction, Online Shopping, Customer Experience, Survey Analysis

1. INTRODUCTION

The swift evolution of digital technologies has radically transformed the world commercial landscape, creating smart, data-oriented e-commerce platforms that focus on individualized consumer experiences. Central to this change is Machine Learning (ML), a branch of artificial intelligence that allows systems to learn from massive amounts of data and make independent, adaptive decisions. In e-commerce, ML is now a must-have for product recommendations automation, powering customer support with smart chatbots, optimal pricing strategy optimization, fraudulent transaction detection, and real-time personalization of content. Not only do these applications improve business operational efficiency, but they also have a strong impact on how consumers engage with online marketplaces.

As ML applications continue to grow and spread across e-commerce sites, it becomes more important to study how customers view and react to these technologies. While companies gain through better targeting and engagement, customers are left to navigate an ecosystem where personalization, automation, and data tracking converge—leaving questions of trust, satisfaction, relevance, and privacy to be answered. Do people find algorithmic recommendations really useful, or do they think of them as intrusive? Do users rate their experiences with chatbots based on AI as more positive compared to the conventional human assistance? In what ways does customer loyalty, perceived value, and overall satisfaction with an online shopping platform depend on the implementation of ML technologies?

Despite the growing integration of ML in digital commerce, existing literature reveals a gap in understanding the user-centric dimensions of these technologies, particularly from the perspective of the end consumer. This is especially relevant for digitally active demographics, such as individuals aged 18 to 30, who are not only frequent users of e-commerce services but also shape digital consumption trends through their preferences and expectations. Their attitudes and satisfaction levels may provide useful indications of the efficiency and ethical acceptance of ML uses in the internet retailing space.

This research attempts to close this gap by systematically examining customers' attitudes and satisfaction towards ML-led features on e-commerce sites. By concentrating on this pivotal consumer group, the study hopes to contribute to the general debate on human-centered technology design, guide e-commerce strategy, and facilitate the creation of ML applications that are not only effective but also consistent with user expectations, trust, and values.

1.1 Objectives of the Study

The primary aim of this study is to explore and analyse customer perceptions and satisfaction levels regarding machine learning applications in the e-commerce sector. The key objectives are:

- To examine the awareness and frequency of use of ML-driven features such as chatbots and personalized product recommendations among online shoppers.
- To assess customer satisfaction levels with machine learning features, especially in terms of usefulness and interaction quality.
- To evaluate the level of trust users, place in ML technologies and understand how it influences their shopping behaviour.

- To identify concerns related to data privacy and personalization, particularly regarding transparency in how user data is collected and utilized.
- To collect qualitative insights from open-ended responses that suggest ways to improve ML applications from the user's point of view.

These objectives aim to provide a holistic understanding of how consumers engage with ML-enhanced e-commerce platforms and what improvements are necessary for wider adoption and satisfaction.

1.2 Structure of the Paper

This paper is organized into five major sections. Following this introduction, Section 2 presents a review of existing literature on ML and customer behaviour in e-commerce. Section 3 explains the research methodology, including the sampling strategy, survey structure, and analytical tools used. Section 4 discusses the results based on a detailed analysis of responses from 30 participants, both quantitatively (through frequency tables) and qualitatively (through thematic analysis). Section 5 concludes the study with a discussion of the findings, implications for e-commerce platforms, and suggestions for future research.

2. LITERATURE REVIEW

Aluri et al., (2019) carried out research that focused on the use of machine learning to co-create value through interactive customer engagement in hospitality brand loyalty programs. Their research underscored that machine learning tools enabled real-time and personalized interaction with customers, thus boosting customer engagement and promoting more robust brand loyalty. The research underlined the need to use customer data in creating customized loyalty programs that match unique customer behavior and preference.

Chatterjee et al., (2021) examined consumer satisfaction in the healthcare and health-product e-business industry using the integration of text mining and machine learning tools. Their research on customer feedback databases determined the factors that most heavily influence satisfaction. The results determined that factors of product quality, delivery speed, platform ease, and customer faith were among key determinants to influence overall satisfaction among customers across the e-health market. The research proved the effectiveness of machine learning in deriving relevant insights from unstructured customer feedback.

Hong et al., (2019) examined consumer satisfaction and logistics service in the case of fresh e-commerce. Employing text mining methods, the researchers identified customers' reviews to see which logistics attributes had the greatest impact on consumer satisfaction. From their findings, it was evident that delivery within a reasonable time, product freshness, and efficient packaging were essential to having high levels of customer satisfaction. The research indicated that logistics service quality is an important determinant of consumer attitudes and retention in the new e-commerce sector.

Hwang et al., (2020) utilized a machine learning method to forecast repeat visits of customers in the airline service industry. Their research aimed at determining behavioral attributes and customer preferences that led to repeat buying. The results indicated that factors like past service experience, booking behavior, and customer loyalty metrics could be utilized to predict future customer behavior effectively. The research illustrated the potential of predictive analytics in enhancing customer relationship management and strategic marketing in the airline sector.

3. RESEARCH METHODOLOGY

This research adopts a quantitative research design aimed at exploring customer perception, satisfaction, and trust regarding the use of machine learning (ML) applications in e-commerce platforms. The purpose of this methodology is to gather measurable and structured data from online shoppers to understand how they interact with ML-driven features such as chatbots, personalized recommendations, and predictive personalization tools.

3.1 Research Design and Approach

The study follows a descriptive survey-based approach, which is suitable for analysing trends, behaviours, and opinions among a defined population. The quantitative nature of this research allows for the collection of numerical data that can be statistically analysed to draw meaningful insights regarding customer experiences with ML features in the digital shopping environment.

3.2 Sampling Method and Data Collection

The study is based on a subset of 30 responses, selected from a larger dataset of 100 responses initially collected for the author's dissertation. This subset specifically focuses on participants aged 18 to 30 years, representing a tech-savvy and highly engaged segment of the online shopping population.

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Data was collected through a Google Forms survey, distributed digitally via email and social media platforms. The sampling technique employed was non-probability convenience sampling, chosen due to its practicality and ease of access to voluntary respondents during the data collection period.

3.3 Structure of the Questionnaire

The survey instrument was a **structured questionnaire** divided into two main sections:

- **Section A: Demographics** – included basic questions related to age and frequency of online shopping to help categorize the user base.
- **Section B: Awareness and Experience with ML Features** – included **multiple-choice** and **Likert-scale questions** to assess:
    - Awareness of ML-driven features (e.g., chatbots and product recommendations)
    - Satisfaction with ML tools
    - Trust in machine learning applications
    - Influence on shopping behaviour and decision-making

The questionnaire was designed to be simple, engaging, and accessible, requiring less than five minutes to complete.

3.4 Data Analysis Techniques

The collected responses were analysed using basic descriptive statistics, including frequency distributions, percentages, and graphical representations such as bar charts and pie charts. These tools were used to interpret trends and patterns in customer responses regarding the effectiveness and trustworthiness of ML applications in e-commerce.

3.5 Ethical Considerations

The study strictly adhered to ethical research practices. All participants were clearly informed about the voluntary nature of their participation. The survey included an introductory statement ensuring anonymity, confidentiality, and the academic purpose of the research. No personally identifiable information was collected, and participants were allowed to withdraw at any time without consequence.

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4. RESULTS AND DISCUSSION

This paper presents and interprets the key findings of the study based on the responses collected from 30 participants through a structured questionnaire. The analysis focuses on understanding how customers perceive and interact with machine learning (ML) applications in e-commerce platforms, including product recommendations and chatbot systems. The data is summarized in ten tables, each reflecting the respondents' views on aspects such as shopping behaviour, personalization effectiveness, chatbot satisfaction, and trust in ML-driven experiences. These results are critical in assessing the overall impact of ML features on user satisfaction, trust, and engagement in the digital shopping ecosystem.

Table 1: Age Group Distribution of Respondents (n = 30)

Age Group	Frequency	Percentage (%)
Below 18	1	3.33%
18–25	16	53.33%
26–35	11	36.67%
36–45	1	3.33%
Above 45	1	3.33%

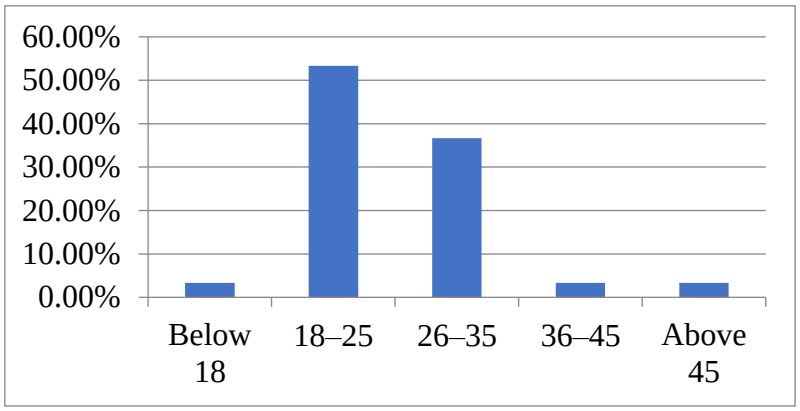

Figure 1: Graphical representation on Age Group Distribution

The data reveals that a majority (53.33%) of the respondents fall within the 18–25 age group, followed by 36.67% in the 26–35 range. This indicates that younger consumers are more engaged in online

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shopping and familiar with digital platforms, making them the most relevant demographic for analyzing machine learning applications in e-commerce.

Table 2: Frequency of Online Shopping Among Respondents (n = 30)

Online Shopping Frequency	Frequency	Percentage (%)
Rarely	4	13.33%
Occasionally	9	30.00%
Monthly	5	16.67%
Weekly	4	13.33%
Frequently	8	26.67%

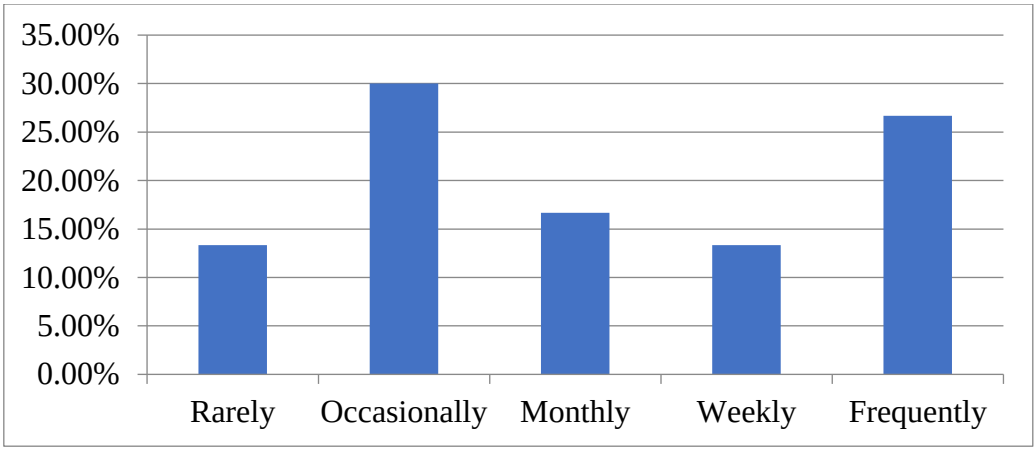

Figure 2: Graphical Representation On Online Shopping

Most respondents reported shopping online either occasionally (30%) or frequently (26.67%), showing that digital commerce is becoming a regular part of consumer behavior. This frequency supports the need for enhancing the user experience through advanced ML features that provide convenience and relevance.

Table 3: Awareness of Personalized Product Recommendations While Shopping Online (n = 30)

Response	Frequency	Percentage (%)
Yes	30	100.00%
No	0	0.00%

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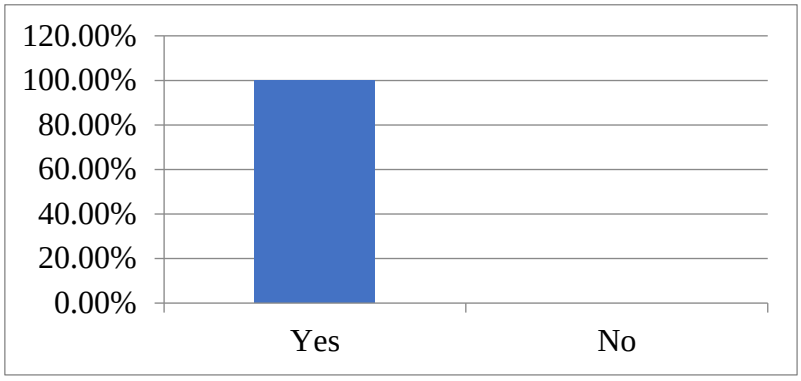

Figure 3: Graphical Representation on Personalized Product Recommendations

Every respondent (100%) acknowledged awareness of personalized product recommendations while shopping online. This demonstrates the widespread integration of ML features in e-commerce and also confirms consumer exposure to data-driven personalization strategies.

Table 4: Interaction with Chatbots on E-commerce Platforms (n = 30)

Response	Frequency	Percentage (%)
No	11	36.67%
Yes	19	63.33%

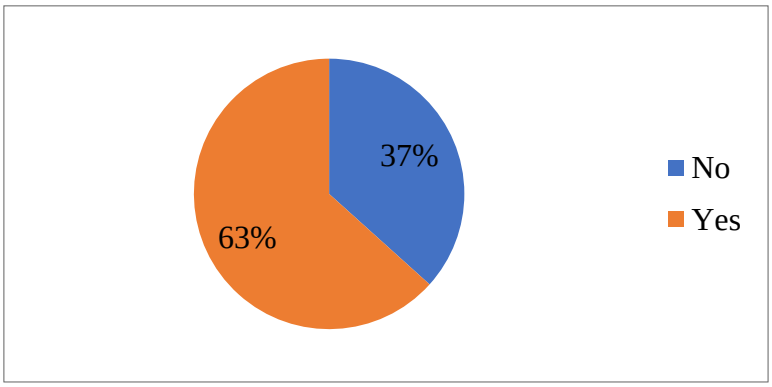

Figure 4: Graphical Representation on Interaction with Chatbots on E-commerce

A significant portion (63.33%) of respondents have interacted with chatbots on e-commerce platforms, indicating their growing use as a support mechanism. However, the 36.67% who have not used chatbots suggest there is still room to improve outreach and interface design to ensure broader adoption.

Table 5: Helpfulness of Product Recommendations in Shopping Experience (n = 30)

Response	Frequency	Percentage (%)
Very helpful	12	40.00%
Somewhat helpful	5	16.67%
Neutral	11	36.67%
Not helpful at all	2	6.67%

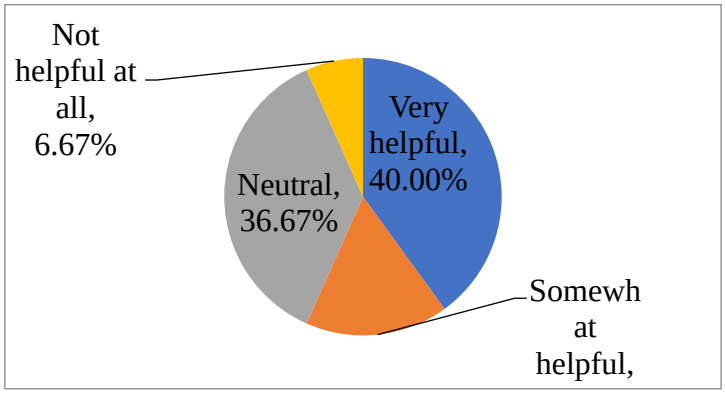

Figure 5: Graphical Representation on Product Recommendations in Shopping Experience

While 40% of respondents found personalized product recommendations to be very helpful, a combined 43.34% rated them as only somewhat helpful or neutral. This suggests that while recommendations are valuable, there is room for improvement in relevance and precision to meet individual customer expectations.

Table 6: Satisfaction Ratings for Chatbot Interactions on E-commerce Platforms (n = 30)

Satisfaction Rating (1 to 5)	Frequency	Percentage (%)
1 (Very Dissatisfied)	4	13.33%
2	5	16.67%
3	12	40.00%
4	6	20.00%
5 (Very Satisfied)	3	10.00%

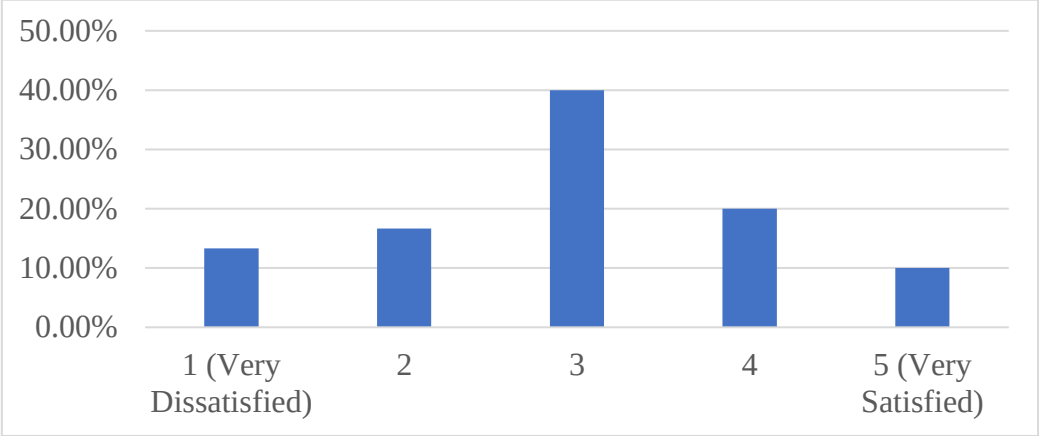

Figure 6: Graphical Representation on Satisfaction Ratings for Chatbot Interactions

Satisfaction with chatbot interactions was mixed, with 40% giving a neutral score of 3 and only 10% rating it as highly satisfying (5). These results reflect a moderate level of contentment with current chatbot capabilities and emphasize the need for enhanced interaction quality and contextual understanding.

Table 7: Trust That Machine Learning Improves Shopping Experience (n = 30)

Response	Frequency	Percentage (%)
Strongly disagree	1	3.33%
Neutral	6	20.00%
Agree	15	50.00%
Strongly agree	8	26.67%

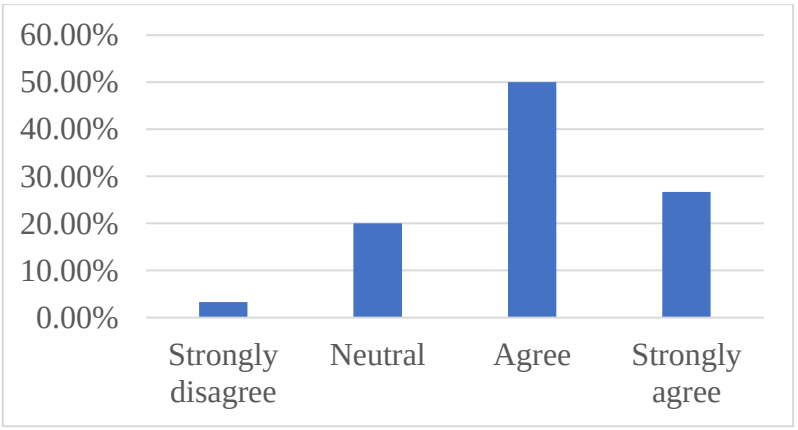

Figure 7: Graphical Representation on Improves Shopping Experience

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Half of the respondents (50%) agreed that machine learning enhances the shopping experience, while 26.67% strongly agreed. However, 20% remained neutral, and a small portion expressed skepticism. These insights indicate general trust in ML but also highlight the need for improved transparency and reliability.

Table 8: Concerns About How Data is Used for Personalization (n = 30)

Response	Frequency	Percentage (%)
No	14	46.67%
Yes	16	53.33%

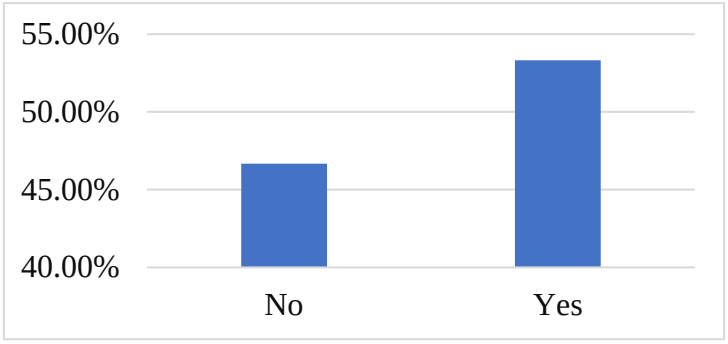

Figure 8: Graphical Representation on Data is Used for Personalization

Responses to data usage reveal a nearly even split: 53.33% expressed concern over how their data is used, while 46.67% were not concerned. This highlights an ongoing tension between personalization and privacy, suggesting that e-commerce platforms need to enhance data handling transparency and ethics.

Table 9: Influence of Personalized Recommendations on Buying Decisions (n = 30)

Response	Frequency	Percentage (%)
Yes	11	36.67%
No	10	33.33%
Maybe	6	20.00%
Not sure	3	10.00%

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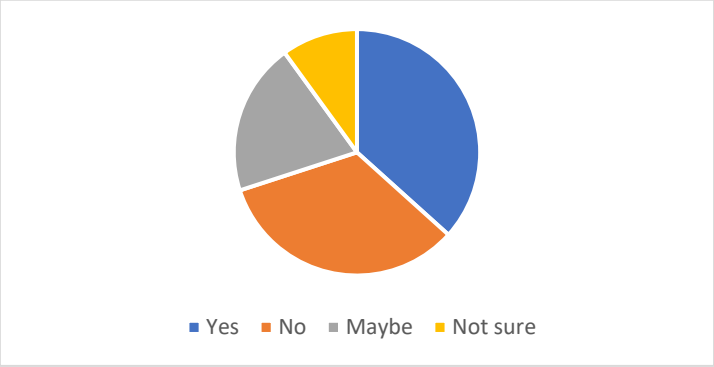

Figure 9: Graphical Representation on Personalized Recommendations on Buying Decisions

Opinions on the influence of personalized recommendations are varied, with 36.67% saying they are influenced, 33.33% not influenced, and 30% either unsure or only maybe influenced. This dispersion shows that while ML has an impact, its effectiveness is not universal and depends on relevance and timing.

Table 10: Thematic Analysis of Responses to Open-Ended Question on Improving ML Applications in E-commerce

Emerging Theme	Description	Example Responses
1. Improved Transparency	Users want clear information about how their data is used.	"Explain how data is used."
2. Personalized Recommendations	Requests for smarter, more accurate suggestions based on real preferences.	"Smarter search results." "Tailor suggestions to my recent behavior."
3. Chatbot Efficiency and UX	Desire for faster, human-like, and more intuitive chatbot responses.	"Improve chatbot interaction." "Make chatbots more efficient in suggestions."
4. User Skepticism or Disinterest	Some responses showed disinterest or distrust in ML suggestions.	"Naaaa." "I don't rely on them much."
5. Need for Human Touch	Users highlighted the value of human interaction in complex purchase decisions.	"Chatbots are fine, but sometimes I just want a human to assist me."

Thematic analysis of open-ended responses revealed five key user priorities: improved data transparency, smarter recommendation systems, enhanced chatbot efficiency, skepticism toward automation, and the value of human interaction. These themes provide qualitative depth to the quantitative data and emphasize the need for hybrid, user-centered design strategies in ML applications.

4.1 Discussion

The findings of this study offer important insights into consumer perceptions of machine learning (ML) applications in e-commerce environments. The age distribution of respondents, primarily concentrated in the 18–35 age group, underscores the increasing digital engagement of younger consumers—an audience highly familiar with and influenced by personalized technology. The high awareness of ML-driven product recommendations (100%) and significant interaction with chatbots (63.33%) indicate the successful integration of these features into mainstream online shopping platforms. However, responses on helpfulness and satisfaction levels suggest that while these tools are commonly encountered, their perceived effectiveness remains moderate. Many respondents rated recommendations as only somewhat helpful or neutral, and satisfaction ratings with chatbots were centered around average scores. This reflects a performance gap where user experience can be improved through better contextual understanding, smarter algorithms, and more intuitive conversational design.

Another notable theme is the coexistence of trust and concern regarding ML systems. While a majority agree that ML enhances the shopping experience, nearly half the respondents are still concerned about data privacy and usage. This duality emphasizes the need for greater transparency, consent-driven personalization, and ethical AI practices. The thematic analysis further reinforced that users not only value efficiency and accuracy but also desire a balance between automation and human assistance. This suggests a growing consumer expectation for hybrid service models that blend algorithmic personalization with human touchpoints. Overall, the results indicate that while ML in e-commerce has achieved high visibility and usage, its optimization lies in aligning technological capabilities with user trust, emotional intelligence, and personalized relevance.

5. CONCLUSION

This study provides a comprehensive understanding of how consumers perceive and interact with machine learning (ML) features in the context of e-commerce. The analysis reveals a high level of awareness and engagement with ML-based applications such as product recommendations and chatbots, particularly among younger, tech-savvy consumers. While these tools have become integral to online shopping platforms, their impact on user satisfaction and decision-making is mixed—highlighting the need for improved personalization accuracy, better chatbot functionality, and more intuitive system design.

Equally important is the emerging concern around data privacy and the ethical use of personal information in ML-driven systems. Although many users appreciate the convenience and relevance offered by such technologies, a significant portion remains wary of how their data is being used. This suggests that trust, transparency, and ethical alignment must go hand-in-hand with innovation. In conclusion, for e-commerce platforms to fully leverage the potential of machine learning, they must prioritize not just technological efficiency but also user-centric values—building systems that are intelligent, respectful, and human-aware.

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