NOVA IMS Information Management School

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Navigating the Digital Marketplace: Understanding How AI Alters Consumer Behavior in E-commerce.

Mafalda Gomes Simões

Master Thesis

presented as a partial requirement for obtaining a master's degree in Data-Driven Marketing

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
Universidade Nova de Lisboa

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by

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Master Thesis presented as a partial requirement for obtaining the master's degree in data-driven Marketing, with a specialization in Marketing Intelligence.

Supervised by

Maria do Carmo Barradas Leal, PhD

2024

STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism, any form of undue use of information, or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledged the Rules of Conduct and Code of Honor from the NOVA Information Management School.

Lisbon, 2024

DEDICATION

To my beloved family and friends,

I dedicate this thesis to you, as you have been my pillar of strength and unwavering support while pursuing a master's degree in data-driven marketing. Your encouragement has been invaluable, and I am deeply thankful for your unwavering belief in my ambitions.

With heartfelt gratitude,

Mafalda Simões

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My heartfelt thanks.

ABSTRACT

This study investigates the impact of Artificial Intelligence (AI) on consumer behavior in e-commerce, focusing on automated personalization and sentiment analysis. Using a quantitative research methodology, data was collected from e-commerce users to understand how AI-driven personalization affects consumer satisfaction and customer loyalty. The results indicate that AI significantly enhances consumer attitudes and satisfaction, increasing loyalty. The study also underscores the value of real-time sentiment analysis in improving brand reputation. Fundamental limitations include the cross-sectional data and the need for a more diverse sample. Ethical and privacy concerns related to AI usage are addressed, highlighting the importance of transparency and data protection. The findings suggest that investing in AI technologies can help e-commerce businesses provide personalized experiences, boosting customer loyalty and growth. Future research should consider longitudinal studies and cultural differences in AI acceptance.

KEYWORDS

Artificial Intelligence, Consumer Behavior, E-commerce, Personalization, Sentiment Analysis, Customer Loyalty, Consumer Satisfaction, Data Privacy

Sustainable Development Goals (SDG):

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LIST OF ABBREVIATIONS AND ACRONYMS

AGI	Artificial General Intelligence
AI	Artificial Intelligence
ANI	Artificial Narrow Intelligence
ASI	Artificial Super Intelligence
EC	E-Commerce
F&A	Fashion and Apparel
IMS	Information Management School
NLP	Natural Language Processing
SPSS	Statistical Package for the Social Sciences

1. INTRODUCTION

As Krais (2020), points out, technological advances perpetually pave the way for new possibilities across various fields, enhancing operational efficiencies and service quality and reducing business costs. However, these innovations can also lead to upheaval by making existing technologies obsolete. E-commerce companies are integrating Artificial Intelligence to provide chatbot services, analyze customer feedback, and tailor assistance to online shoppers' preferences (Areiqat et al., 2021).

The primary goal of this master's thesis project is to delve into the specific influence of AI[1] technologies on apparel online shopping behavior. It aims to investigate how Machine Learning, Conversational AI, Generative AI, and Data Mining shape and continuously reshape consumers' perceptions and experiences when purchasing clothing online. This detailed examination will uncover how AI-driven advancements impact consumers' decision-making processes, influence their shopping preferences, and fundamentally transform the experience of shopping for apparel online.

Fundamentally, this study seeks to develop our conception of AI technologies' positive and negative impact on shaping consumer behavior and perceptions in online apparel shopping. By delving into the evolving relationship between AI and online shopping experiences, this research attempts to offer valuable insights for businesses, marketers, and industry specialists. These insights aim to guide the strategic utilization of AI, optimizing consumer engagement, satisfaction, and overall effectiveness in e-commerce.

1.1. CONTEXTUALIZATION

The swift advancement of technology, particularly in science and the economy, is making AI an increasingly routine part of our professional and personal lives. This technology has been particularly effective in EC[2], improving online business operations and customer interactions (Song et al., 2019).

[1] Artificial Intelligence
[2] E-Commerce

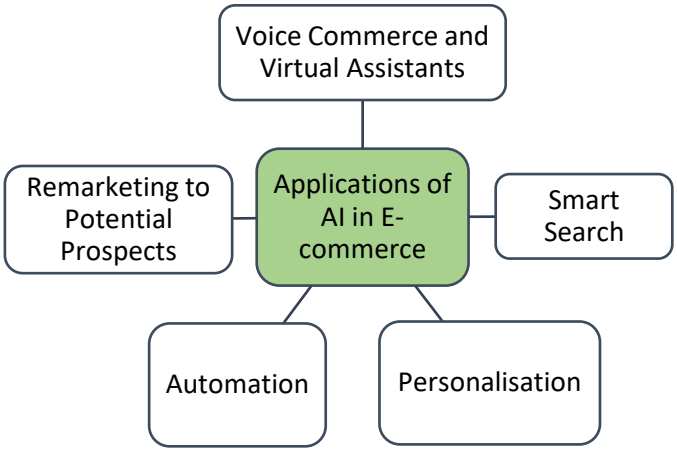
In modern e-commerce, businesses are strategically working to shape consumer preferences towards their offerings. The deployment of AI tools is on a steep upward trajectory, with predictions indicating that by 2030, nearly 70% of companies will have adopted AI technologies (Bughin et al., 2018). E-commerce companies increasingly leverage AI to transform customer service, with projections showing AI could assume most service roles by 2020. Online companies like Alibaba and Amazon use AI to parse customer feedback and suggest products. The technology's relevance is underscored by data revealing that chatbots have become a popular shopping tool for many consumers, with many turning to them for shopping deals (Wang et al., 2023).

Incorporating artificial intelligence into e-commerce is generally viewed as a progressive move, offering innovative solutions to enhance the sector (Fedorko et al., 2022). While AI provides advantages in e-commerce, challenges persist. Many AI projects reportedly fail to meet expectations, leading many companies to adopt a cautious, wait-and-see approach. Integrating AI with existing systems and staff is a significant hurdle, as highlighted in a Deloitte survey, where nearly half of senior managers noted difficulties in merging AI with current operations and personnel (Zhang et al., 2021).

Figure 1 illustrates the various applications that AI has in the field of E-commerce, these four only being the main ones that we are going to focus on:

Figure 1

Examples of AI in e-commerce

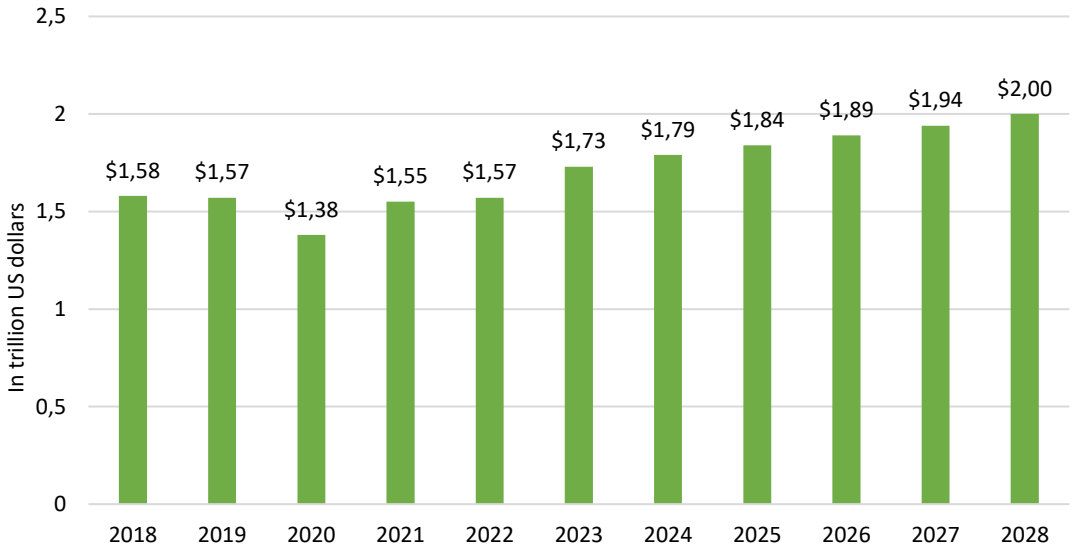


Source: Wang, et. Al., 2023

But how can AI and the evolution of the internet help, specifically, the fashion industry? As shown in Figure 2, the apparel market has a general upward trend in revenue over the forecasted period, beginning at 1.58 trillion dollars in 2018 and projected to reach 2 trillion dollars by 2028. One of many reasons behind this is the digitalization and improvement of supply chain processes like apparel production, fabric inspection, and distribution (Giri et al., 2019). Also, AI can be used to analyze and respond quickly to changes in trends and evolving consumer demands and to improve the efficiency of marketing strategies and automation (Yeo et al., 2022).

Figure 2

Revenue of the apparel market worldwide from 2018 to 2028



Source: Statista, 2023

The F&A[3] industry stands at the cusp of a revolutionary transformation. The advent of machine learning, computer vision, and broader AI applications within the fashion realm is unlocking many possibilities for the industry. This technological integration promises to bestow significant advantages upon retailers and consumers in the fashion domain. Consequently, AI is poised to remodel the industry, heralding a new era of "smart fashion" (Mohammadi & Kalhor, 2021).

[3] Fashion and Apparel

1.2. PROJECT APPROACH

Over recent decades, AI has become a fundamental component in e-commerce technology, significantly altering consumer behavior and online shopping (Wang et al., 2023). This research will delve into the direct impact of AI on consumer behavior within the apparel industry based on the following goals:

- Understanding AI in E-commerce of Apparel:
  - Approach: Define AI and EC, explore its types, trace its historical evolution, and describe the current state of the digital transformation of the apparel industry.
- Analyzing Consumer Behavior with AI in E-commerce:
  - Approach: Analyze the impact of AI-powered systems, like, chatbots, on user satisfaction, delve into the psychological aspects influenced by algorithmic personalization, and understand consumers' emotional engagement with AI features during online apparel shopping.
- Identifying Challenges and Opportunities:
  - Approach: Investigate privacy concerns arising from AI applications and propose strategies to address them. Discuss ethical considerations related to AI algorithms and suggest approaches for ethical practices.
- Concluding with Practical Recommendations:
  - Approach: Recommend strategies for enhancing transparency in AI utilization and propose initiatives to educate consumers about the nuanced aspects of AI in E-commerce.

1.3. SPECIFIC GOALS

The main goal of this report is likely to explore, analyze, and understand how artificial intelligence impacts various aspects of the e-commerce industry, specifically in the F&A. Furthermore, the aim of this project is disclosed in the following objectives:

1. Understand AI, E-Commerce, and the current state of the digital transformation of the apparel industry. (See segment 1 in Table 5)
2. Analyzing Consumer Behavior Through Direct Interaction with Various Methods of AI Applications in the industry of F&A:
    a. Personalized Recommendations: Explore the psychological aspects of AI-driven algorithms on consumer choices. (See segment 2 in Table 5)
    b. Chatbots and Virtual Assistants: Investigate the impact of AI-powered chatbots on satisfaction and user experience. (See segment 3 in Table 5)
    c. Customization Services: How AI enables the personalization of products, allowing customers to tailor their purchases to their exact preferences. (See segment 4 in Table 5)
    d. Sentiment Analysis: Understand how AI assesses comments and feedback on social media to gauge consumers' perceptions of the brand. (See segment 5 in Table 5)
3. Identifying Challenges and Opportunities, like:
    a. Enhanced Customer Experience: Discuss how AI-powered personalized recommendations can improve the customer shopping experience.
    b. Privacy Concerns: How AI can collect personal data for personalized experiences raises privacy issues.
4. Lastly, I will conclude with practical recommendations for businesses integrating AI in E-commerce, such as:
    a. Enhancing Transparency: Recommend strategies for businesses to enhance transparency in AI utilization, including how it is being used to improve their shopping experience and how their data is used for personalized recommendations.

b. Management of Customer Expectations: Implement clear communication about what customers can expect from AI tools to prevent misunderstandings or unrealistic expectations.

2. LITERATURE REVIEW

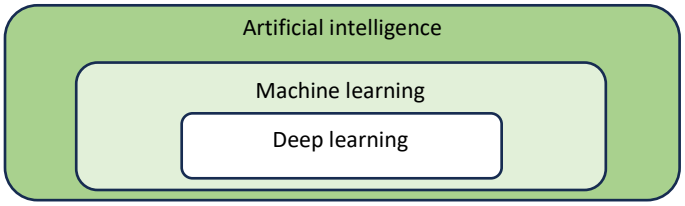
2.1. ARTIFICIAL INTELLIGENCE

What is AI, exactly? While defining AI precisely may be elusive, attempting to do so inevitably reveals a variety of challenges. Given AI's complex and diverse nature, which spans an extensive range of techniques, methods, and applications, and considering its rapid and continuous evolution marked by frequent advancements and innovations, understanding AI fully presents a significant challenge (Samek et al., 2019).

More technically, AI encompasses a spectrum from traditional machine learning to advanced artificial neural networks. It processes vast data sets to mimic human decision-making and planning capabilities (Sperlich et al., 2023) (see Figure 3).

Figure 3

The layers of Artificial intelligence



Source: Delipetrev et al. (2020).

According to Delipetrev et al. (2020), defining AI is challenging due to its complexity and evolving nature, which varies according to users' objectives. This difficulty is compounded by AI's broad scope and rapid advancement. The growth of AI is enhanced by the accessible sources of code, frameworks, datasets, scientific publications, and overall knowledge sharing, which is why AI spreads fast and more people adopt it.

Table 1 illustrates AI's journey, from processing handwritten texts to advancing through autonomous vehicles, recognizing images from massive datasets, mastering complex games, and developing sophisticated language models. These milestones underscore AI's rapid evolution and profound impact on technology and society.

Table 1

AI breakthroughs from 1989 until 2019

1989	In the late 90s and early 2000s, convolutional neural networks efficiently processed 10-20% of the United States' handwritten checks and zip codes.
1995	The 'No Hands Across America' initiative witnessed a semi-autonomous car completing a remarkable journey of 4,501 km from coast to coast across the United States, showcasing the prowess of computer-controlled steering in navigation.
2012	In the Cat experiment, an artificial intelligence program successfully acquired the ability to identify and recognize cats from an extensive dataset comprising 10,000,000 unlabeled images randomly sourced from YouTube. Impressively, the program demonstrated a performance improvement of nearly 70% compared to prior endeavors in unsupervised learning.
2018	OpenAI Five achieved victory by defeating an amateur human team in Dota 2[4], showcasing the prowess of artificial intelligence in mastering complex strategic gameplay.
2019	GPT-25 is a powerful unsupervised language model that excels in various tasks, such as language modeling, reading comprehension, machine translation, question answering, and summarization, all without task-specific training.

Source: Delipetrev et al., (2020)

First, to understand what type of AI can be used in apparel e-commerce, we need to understand what kinds of AI exist. The different types of AI depend on the level of intelligence we need and the situation in which it is used. Fourtané (2019) writes that, in general, AI can be divided into three types:

1. Artificial Narrow Intelligence – Also known as Narrow AI or Weak AI, ANI[5] is dedicated to a specific task, exhibiting limited capabilities. Currently, it constitutes the predominant form of AI in existence. Narrow AI is encountered in various daily interactions, exemplified by technologies like Google Assistant, Google Translate, Siri, Cortana, or Alexa. These systems enable them to comprehend and respond to human speech and text in a personalized and natural manner, which is why this will be the primary type of AI we will study. Examples include Speech Recognition Systems, Chatbots, Game-playing AI, and others (Fourtané, 2019).
2. Artificial General Intelligence – This occurs when AI attains and surpasses human intelligence levels, signifying its capability to engage in activities such as reasoning, planning, problem-solving, abstract thinking, understanding complex ideas, rapid

[4] Dota 2 is a popular multiplayer online battle arena video game developed and published by Valve Corporation. It is a sequel to the original Defense of the Ancients (DotA).

[5] Artificial Narrow Intelligence

learning, and learning from experience (Strelkova). Nonetheless, AGI[6] remains an evolving field. Given that the creation of General Intelligence is modeled after the human brain, realizing this goal appears unlikely to occur soon due to the lack of comprehensive knowledge regarding the human brain's functionality (Fourtané, 2019). Since it is a technology that, in a way, has not happened yet, the examples that we can find are mainly fiction, such as Ava from the movie Ex-Machina and Data from the movie Star Trek: The Next *Generation.*

3. Artificial Super Intelligence – Lastly, beyond the AGI, ASI[7] lies far ahead in the future, or at least that is our current perception. Attaining the status of Artificial Super intelligence involves surpassing humans in every conceivable aspect. ASI will happen when AI exceeds human capabilities across the board. Just like AGI, the examples are mainly fiction, *Skynet* from the movie *Terminator*.

According to Stoica et al. (2017) while AI has the potential to revolutionize numerous sectors, it is not without challenges. If improperly implemented, AI can yield inaccurate results or fail to produce meaningful outcomes. Recognizing and addressing the limitations and obstacles inherent in AI is crucial as we continue to integrate it into various aspects of our lives and industries. Table 2 illustrates some of these challenges.

Table 2

Advantages and Disadvantages of using AI

Advantages	Disadvantages
Automatization of time-consuming tasks.	Could be historical and may not always capture emerging trends.
Efficiently handling extensive datasets.	Can draw conclusions that could be fallacious.
Identifying correlations and patterns.	Risks to data privacy.
More automated data- and evidence-based decision-making.	Data integrity and manipulation.
More collaboration and data sharing.	Legal and regulatory challenges.

Source: Delipetrev et al. (2020)

[6] Artificial General Intelligence
[7] Artificial Super Intelligence

2.2. E-COMMERCE

Undeniably, the internet has emerged as the primary platform for business expansion in recent years, if not decades. Since the 1990s, EC has gained significant traction as a practical business approach and academic research subject (Chan & Swatman, 1999). Web-based commerce is increasingly viewed as a strategic avenue for developing countries to strengthen their role in the global trade system. This expansion is vital for promoting economic growth and generating substantial financial gains in these nations (Kadam, 2019).

Unlike AI, E-Commerce has a more established definition. With the internet's widespread adoption, EC has also seen significant evolution, expanding its scope and impact globally. Table 3 shows the evolution (Sharma et al., 2023).

Table 3

EC breakthroughs from 2005 until 2011

2005	Blog and e-commerce sites started to appear.
2007	The advent of search engines and the rise of social networking functions, including blogs, social networking sites, and user-generated video content, marked the onset of the social media era.
2009	Users began to feel empowered as they gravitated towards social networks of their preference, with Twitter emerging as the go-to app for many.
2010	Concurrently, F-commerce introduced a new avenue, enabling customers to operate online businesses through the Facebook app.
2011	Online auction sites like eBay amassed over 106 million active registered accounts across approximately 190 markets.

Source: (Wang et al., 2023).

With the significant growth of e-commerce, businesses are increasingly leveraging it in ways that align with their specific goals and company profiles. E-Commerce has diversified into various forms to meet a wide range of objectives. Today, we can identify multiple types of E-Commerce, each tailored to different needs and market niches (Shafiayh et al., 2013).

- Business-to-Business (B2B) – In B2B commerce, businesses primarily sell products or services to other businesses. This model allows companies to manage supplier costs effectively by reducing the expenses and time associated with processing purchase

orders. As a result, companies can process a higher volume of orders at a lower price (Shafiayh et al., 2013).

- Business-to-Consumer (B2C) – B2C commerce involves businesses engaging directly with customers, typically through retail and online stores. This business model has seen significant growth due to the Internet. It includes online shops offering products like electronics, books, accessories, vehicles, food items, financial services, and digital publications to customers (Jain et al., 2021).

In this context, our focus will narrow to the B2C e-commerce sector. This decision stems from the observation that implementing AI services is predominantly featured in large-scale enterprises, exemplified by giants such as Inditex and Amazon. By delving into the practices of these industry leaders, this research aims to uncover valuable insights into the successful application of AI in the B2C e-commerce sector, offering a lens through which to view the potential for AI-driven evolution in online retail.

- Consumer-to-Consumer (C2C) - Consumer-to-consumer e-commerce enables consumers to sell goods and services to each other through an online platform. A prime example is eBay, a digital marketplace facilitator for these transactions (Shafiayh et al., 2013).
- Business-to-administration (B2A) – Business-to-Government e-commerce involves all online transactions between businesses and government entities. It encompasses various programs and services, including taxation, social care, healthcare, legal documents, and records management. Any digital interactions or transactions between companies and government bodies fall into this category (Sharma et al., 2023).
- Customer to Business (C2B) - Consumer-to-business e-commerce occurs when individuals sell goods or services to businesses or organizations. An example would be a photographer licensing their photos to a company for commercial use. This model reverses the traditional business-to-consumer approach, allowing consumers to contribute value to businesses directly (Taher, 2021).

Sharma et al. (2023) suggests that the 21st century's rapid advancement in information technology and the widespread dissemination of knowledge have spurred new incentives and

innovative thinking globally. This technological and intellectual surge has opened many new opportunities in e-commerce, transforming commerce and expanding its possibilities.

→ Internet - E-commerce has seen significant growth alongside the widespread adoption of the Internet and smartphones. Since its nascent stages in the 1980s, the internet experienced a steady user rise, notably spiking around 1994. By 2015, the United Nations International Telecommunication Union (ITU) predicted there would be about 3.2 billion online users in a world population of 7.2 billion. Back in 2000, there were only around 400 million Internet subscribers globally, illustrating the rapid expansion and integration of the Internet into daily life, fueling e-commerce growth (Jain et al., 2021).

→ Payment Gateway - Payment transfer in e-commerce is a solution that facilitates credit card transactions for various types of businesses, including e-commerce platforms, online and physical stores (including those that operate both online and offline, known as brick-and-clicks), and traditional brick-and-mortar locations. This application enables seamless financial transactions across diverse retail environments (Sharma et al., 2023).

→ Social Media - Companies must proactively connect with customers, nurture relationships, and build communities in the contemporary digital economy. The strategic use of social media emerges as a powerful tool in amplifying a company's e-commerce endeavors. Social media platforms provide a space where customers can interact, network, and share insights about products and services, leading to deeper connections and lasting relationships with the brand. This approach is pivotal in cultivating a loyal customer base and enhancing the customer experience (Linda, 2010).

As e-commerce has evolved from being incredibly local to incorporating artificial intelligence and offering even intangible products and services, today's marketplace is more than just an online marketplace for people to buy and sell. However, with this evolution came some advantages and disadvantages that are illustrated in Table 4 (Sharma et al., 2023).

Table 4

Advantages and Disadvantages of using E-Commerce

Advantages	Disadvantages
For the company	
By utilizing e-commerce, businesses can magnify their marketplace to countrywide and worldwide marketplaces with the least money investing. It helps organizations gain a higher return on advertisements.	The product bought online can be damaged or spoiled during delivery. Connectivity to the web or online access is required; however, if the business lacks proper domain, network, software issues, and so on, it can affect customers' reach.
For the customer	
Buying 24/7 all year long. It can be a very convenient way to shop. Consumers are provided with more opportunities to see different price points. It is accessible because clients can search the merchandise categories or use the webpage's search.	To shop online means to wait up to one week, or sometimes more. The lack of reliable security systems creates a risky online experience for customers. One of the main risks regarding security is credit card fraud, and some people even claim that scams will eventually result in the vanishing of EC.
For the society	
Online shops can reduce the price point range of items due to less fixed expenditures, so consumers with lower incomes can also buy items. It has allowed remote zones in the countryside to contact items.	A specialized workforce is required to get the whole eCommerce and delivery process right. Companies must shed a good amount of money and employ a talented pool of people to get all these in the right shape. However, this leads to child labor or a lousy work environment.

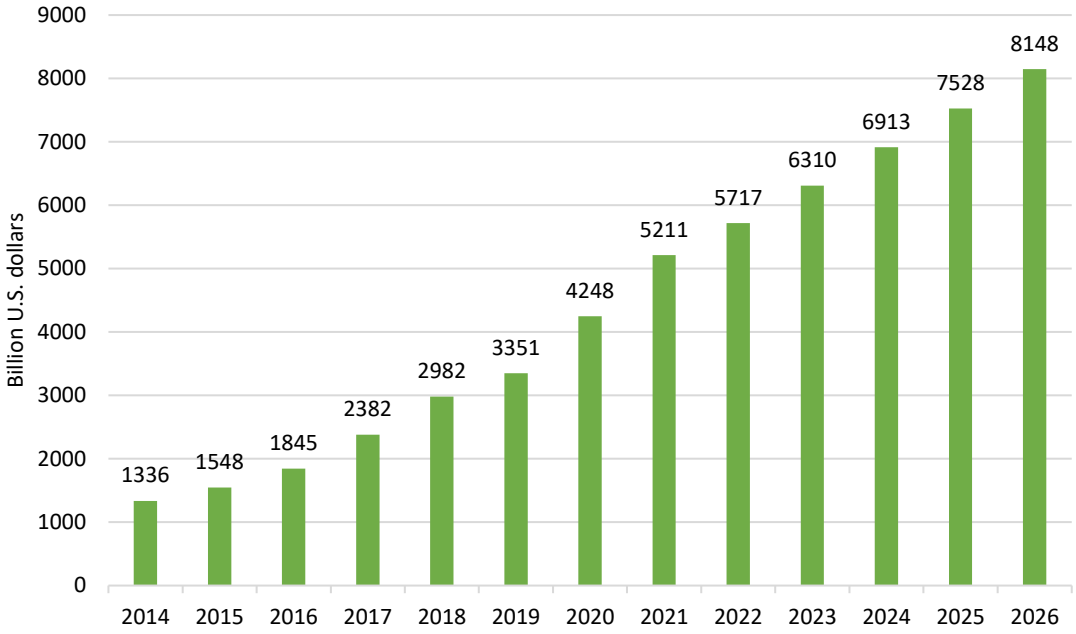
Source: (Taher, 2021)

The use of AI and machine learning in the e-commerce sector is experiencing significant growth. These changes are driven mainly by integrating AI technologies, reshaping how e-commerce operates and interacts with customers, and leading to evolving sales dynamics (Kumar & Trakru, 2019).

Figure 4 illustrates the growth of global retail e-commerce sales from 2014, projecting a steady and robust increase in revenue up to 2026. The Figure starts from a substantial base in 2014 and show a trend of significant year-over-year growth, suggesting a solid upward trajectory in e-commerce activity worldwide over 12 years. This indicates increasing consumer reliance on digital shopping platforms and the expanding reach of online retail.

Figure 4

Retail e-commerce sales worldwide from 2014 to 2026



Source: Statistica, 2024.

AI technology is used to identify organizations' and customers' needs and preferences according to the history and trends in the market. With the assistance of AI, different new ideas that help identify customers' buying behavior were developed. AI technology has a significant role in e-commerce marketing (Wang et al., 2023). Every business firm needs to earn more profits and increase sales of services and goods through promotional tools. Now, e-commerce firms implement effective advertising strategies and tools for product selling based on AI technology to reach the desired customers. It can also identify potential buyers and predict market demands, trends, and behavior.

2.3. AI ADOPTION IN THE F&A INDUSTRY

The journey of developing fashion items from Conceptualization to the End User consumer encompasses five key stages: Conceptualization, Design, Manufacturing, Supply Chain, and the End User, as shown in Figure 5. Presently, AI is integral at every point in this spectrum, from helping to predict trends in the Design stage to monitoring production line performance and tracking inventory in the Supply Chain (Rathore, 2023).

Figure 5

Five Vital Processes of AI in the Fashion Industry

Source: Rathore, (2023)

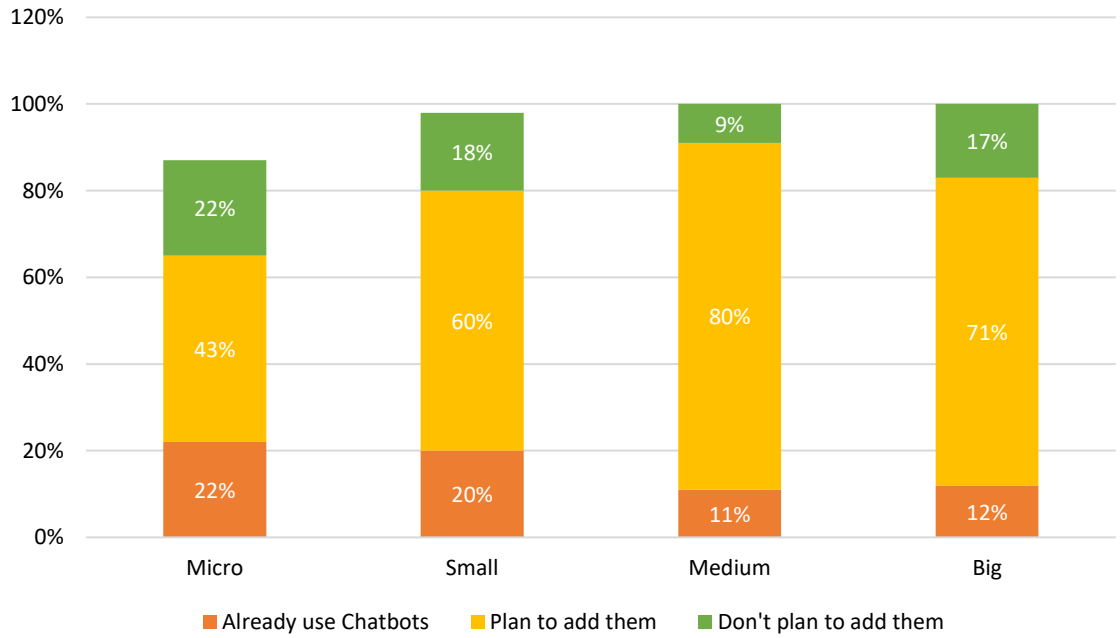
Within the intricate process of apparel production, the end user phase is the ultimate destination, where consumer behavior intersects with technological innovation. In this phase, consumers, empowered by Artificial Intelligence (AI), navigate a virtual marketplace tailored to their preferences. AI algorithms analyze data to offer personalized recommendations, transcending temporal and spatial constraints and fostering innovation through real-time feedback loops. Here, the end user transforms from a passive recipient to an active protagonist, shaping the digital marketplace with each interaction. Given that the end user phase is where the consumer comes into play, it is the primary focus of this research.

How has the evolution of businesses and the adoption of AI services such as a chatbot been progressing to reach the end user? According to (Fokina, 2024) statistics, a staggering 1.5 billion individuals engage with chatbots daily. Furthermore, there is a notable surge in business interest regarding integrating chatbot technology into their operational frameworks (Dmytro & Pavlo, 2023).

Figure 6 displays the adoption of chatbot technology by businesses worldwide in 2022, categorized by company size. It shows that a higher percentage of medium-sized companies have already implemented chatbots, with 80% usage. In contrast, micro and small businesses are less likely to have adopted chatbot technology but have plans to do so, as indicated by a significant percentage in the 'Plan to add them' category. Large businesses show a balanced approach between current use and future chatbot adoption.

Figure 6

Chatbot technology adoption by businesses based on size worldwide *(2022)*



Source: Fokina, (2024)

As science and technology progress swiftly, artificial intelligence profoundly reshapes everyday life, notably impacting e-commerce. Its applications in this domain are apparent across diverse areas and pivotal in improving industry dynamics and shaping operational efficiency and consumer interactions. These applications represent a fundamental shift in how e-commerce enterprises connect with customers and conduct their operations (Deepansh et al., 2021).

- Smart logistics - Artificial Intelligence plays a crucial role in overseeing the operational aspects of online warehouses and managing the intricacies of delivery processes, akin to the functions performed by platforms such as Amazon.com and JD.com (Kumar & Trakru, 2019).
- Visual and voice search - In online marketing, voice search progressively supplants traditional text-based search methods. Noteworthy mobile devices equipped with voice-controlled personal assistants, such as the Apple HomePod powered by Siri, exemplify this trend. Another illustration is the Amazon Echo, which operates with the

voice-activated Alexa. Through a voice-based Alexa search, users can seamlessly place orders on Amazon for delivery (Deepansh et al., 2021).

- Optimal Pricing Recommendation - Advanced AI technologies proficient in handling substantial volumes of big data have effectively tackled pricing automation for many products. The final detailed ranking results intricately influence product ratings, logistics efficiency, pricing strategies, and service quality (Deepansh et al., 2021).
- AI assistants and chatbots – These virtual assistants excel in addressing customer inquiries and offering valuable suggestions for the issues at hand. Moreover, they are pivotal in powering product recommendation systems through NLP[8] . Notable examples of platforms utilizing such capabilities include Alibaba and eBay (Kumar & Trakru, 2019).

As mentioned before, one of the types of AI we will focus on, ANI, can be used for many fields; however, in e-commerce, several authors concur that the four primary natures of ANI technologies are particularly relevant and frequently used. These are the ones that we will be focusing on in this research:

1. Machine learning—Machine learning comprises a suite of algorithms that constantly assess data and results, allowing the system to "learn" and adjust its operations dynamically. Click stream-based web mining plays a role in conducting usability analysis and supporting business decision-making. The utilized performance metrics and incorporated usability factors are crucial aspects of exploration (Kumar et al., 2023).
2. Conversational AI – Known as Digital Assistants, these entities incorporate AI-powered algorithmic chatbots utilizing NLP to engage in conversations with customers. While human-assisted chatbots are prevalent across various business verticals, digital assistants provide a seamless AI experience without human intervention in dialogues (Balakrishnan & Dwivedi, 2021).
3. Generative AI - Designed to generate diverse content types such as text, images, and video in response to user prompts, Generative AI exemplifies capabilities seen in platforms like ChatGPT, a prime driver of conversational commerce (Blanckenberg, 2023).

[8] Natural Language Processing

4. Data Mining—In the realm of e-commerce, data mining involves integrating statistics, databases, and artificial intelligence with relevant subjects. The objective is to formulate innovative ideas or integrated technologies to enhance decision-making processes. In this context, data mining proves instrumental in managing e-commerce enterprise services and uncovering patterns related to online customer behavior (Ismail et al., 2015).

The hypotheses and corresponding variables are visible in the following Table, forming a structured framework to guide the research. This Table links directly to the fundamental questions identified in the project approach, helping to focus the study. It aligns the research activities with the thesis objectives, ensuring systematic and purposeful progress.

Table 5

Hypotheses and Variables

Segments		Hypotheses	Variable Independent	Variable Dependent
Segments	Segment 1 – AI in E-commerce	The extensive presence of artificial intelligence **(AI) in e-commerce** and the apparel industry positively influences operational efficiency and consumer experience.	- AI technologies incorporated into e-commerce and apparel industry processes, including inventory management, recommendation systems, and customer service.	- The integration and utilization of AI technologies influence the effectiveness and productivity of business processes within e-commerce and the apparel industry. - The degree of fulfillment and contentment experienced by customers interacting with e-commerce platforms and apparel brands that employ AI-driven features and services.
	Segment 2 - Personalized Advertisements	The impact of **personalized advertisements** for clothing items, driven by AI algorithms, on consumer behavior and perception varies.	- The degree or extent to which personalized advertisements for clothing items, driven by AI algorithms, are utilized by companies or brands.	- Consumers' comfort level with websites using AI to personalize their shopping experience. - Whether consumers have ever purchased due to clicking on a personalized advertisement for a clothing item. - The extent to which personalized clothing advertisements based on previous online browsing behavior enhance consumers' shopping experience.

Table 5

Hypotheses and Variables (continuation)

Segments		Hypotheses	Variable Independent	Variable Dependent
Segments	Segment 3 – Chatbots	Utilizing AI-powered **chatbots** and virtual assistants positively impacts user satisfaction and experience.	- The utilization, accuracy, and availability of AI-powered chatbots and virtual assistants.	- User satisfaction and user experience. - The level of user involvement and interaction with chatbots and virtual assistants over time. - The effectiveness of chatbots in successfully resolving consumer inquiries or problems as perceived by the users.
	Segment 4 - AI-enabled Customization	The utilization of **AI-enabled customization** services in online shopping significantly influences consumer attitudes.	- Utilization of AI-enabled customization services in online shopping.	- Enhance consumers' overall satisfaction with the online shopping experience. - The probability of consumers purchasing customized products compared to standard, non-customized products. - Whether consumers have encountered challenges or limitations using AI-powered customization services on clothing websites.
	Segment 5 - AI-powered sentiment	Using **AI-powered sentiment analysis** on social media significantly impacts consumer perceptions, brand reputation, and business decision-making.	- Utilization, accuracy, and effectiveness of AI-powered sentiment analysis.	- Influence consumers' perception of the brand by responding to comments or feedback on social media platforms. - Change consumers' perception of the effectiveness of AI-powered sentiment analysis in accurately assessing consumer sentiments on social media.

3. METHODOLOGY

3.1. DATA PREPARATION

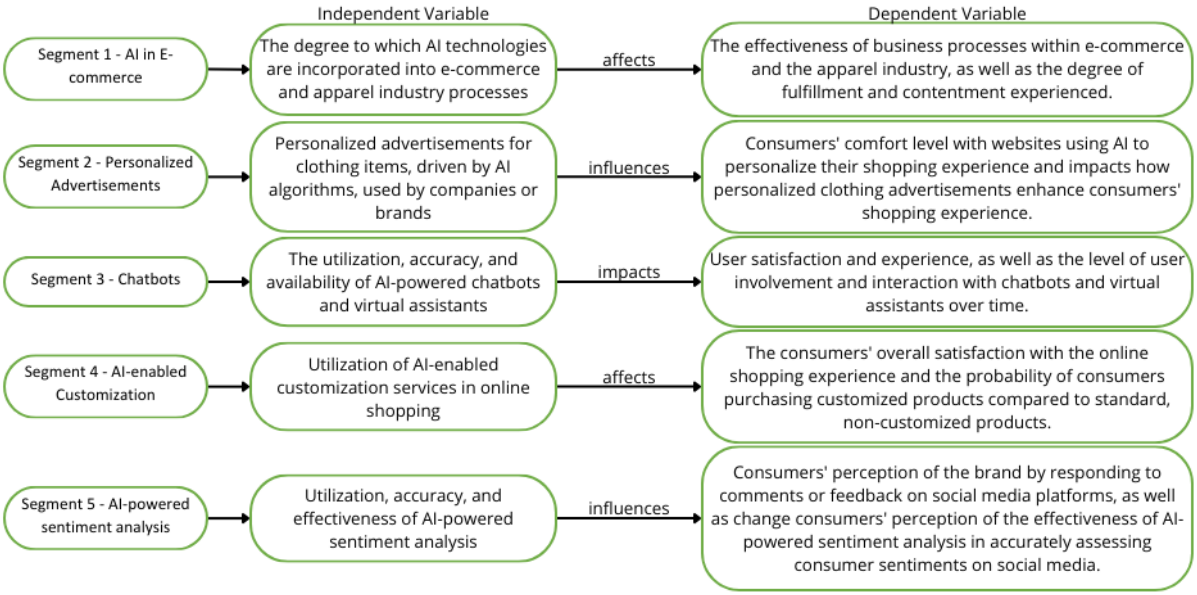
For this research, we chose the quantitative method because, according to Firestone (1987), it is the best method for ensuring objectivity and reliability. This approach uses structured tools like surveys to minimize bias and produce replicable results. Quantitative methods also allow for the generalization of findings from a sample to a larger population, essential for understanding broad trends and informing policy and practice.

The following chapter outlines the research methodology adopted to examine the hypotheses formulated and the conceptual model derived from them. It will also address the instruments and procedures used to analyze the collected data. This study's primary objective is to examine AI's influence on consumers' behavior regarding online shopping for clothes.

Based on the variables identified above[9], the questionnaire was designed to investigate the following areas:

Figure 7

Hypotheses and Variables of this research



[9] See Table 1

For this study, to collect data, we used an online questionnaire[10] crafted using Qualtrics. This method and questions were selected to closely align with the research goals and hypotheses, explicitly targeting the essential variables under examination. The questionnaire was efficiently disseminated across various online platforms and channels, including specific websites and social media platforms, to reach the target audience established for this study.

Before distributing the questionnaire, we conducted a one-day test involving approximately eight individuals, comprising friends and family members. The aim was to assess various aspects of the questionnaire, including its clarity, formatting, and average completion time. Through this test, we identified areas for improvement and ensured that the questionnaire was accessible to all participants.

3.2. DATA COLLECTION AND PARTICIPANTS

After ensuring that the questionnaire had been corrected and finalized based on the test's feedback, we could launch the survey and commence data collection from April 3rd, 2024, to April 17th, 2024, spanning two weeks. The questionnaire garnered around 191 responses, with 13 deemed incomplete, resulting in approximately 178 valid responses. We implemented a screening question to ensure the data's quality and relevance. Respondents who indicated they did not engage in online shopping were redirected to the end of the questionnaire. This filtering question was crucial to ensure that the subsequent analysis focused exclusively on participants with relevant experiences and insights into online apparel shopping behavior. Approximately 12 respondents reported not engaging in online shopping, which excluded their responses from the analysis, resulting in 166 valid responses.

Being a non-random convenience sample, Table 6 reveals that the survey attracted a mostly young (18–24-year-old) female audience with a high level of education (bachelor's or master's degree). Most respondents are employed full-time and reside in Portugal. Income distribution leans towards the $1,000-$1,500 monthly range.

[10] See Appendix A

Table 6

Survey respondent's profile

Classifications	Options	Results
Gender	Male	39%
	Female	52%
	Non-binary/Third gender	2%
	Prefer not to say	6%
Age	18 - 24	55%
	25 - 34	31%
	35 - 44	1%
	45 - 54	1%
	55 - 64	11%
	65 or older	0%
Education Level	High School or equivalent	11%
	Bachelor's Degree	48%
	Master's Degree	38%
	Doctorate or higher	3%
Employment Status	Student	21%
	Employed full-time	54%
	Employed part-time	6%
	Self-employed	4%
	Unemployed	4%
	Retired	0%
	Other (please specify):	11%
Income	Less than 700€	13%
	700€ - 1.000€	19%
	1.000€ - 1.500€	37%
	1.500€ - 2.000€	11%
	2.000€ - 3.000€	4%
	3.000€ - 4.000€	0%
	4.000€ - 5.000€	0%
	> 5.000€	0%
	Prefer not to say/N.A	16%
Country	Portugal	89%
	Sweden	4%
	UK and NI	3%
	USA	4%

3.3. DATA ANALYSIS

This study gathered personal information from participants, which was solely used for academic purposes and handled with utmost confidentiality and ethical standards. Participants were informed about the research's objective and asked to provide their consent to participate voluntarily. The Ethics Committee of NOVA IMS and MagIC Research Center also approved the study.

The data obtained from this study was analyzed using SPSS[11] software from a quantitative perspective. Various statistical tests, such as descriptive statistics, correlation analyses, and regression models, were conducted using SPSS to examine the relationships and trends within the data. Proper data preparation was crucial before conducting any analysis in SPSS. This involved importing the data into SPSS and accessing the "Variable View" tab to define variable attributes such as name, type, and measure.

Additionally, it was essential to clean and verify the data, ensuring there were no inconsistencies or missing values. This preparation step guaranteed that the data would be accurately interpreted during analysis. Once completed, frequencies and crosstabs were used to explore relationships between variables. This thorough preparation ensured accurate and meaningful analysis results.

[11] Statistical Package for the Social Sciences

4. EMPIRICAL STUDY

The empirical study's findings were derived using SPSS, as previously detailed in section 3. The data analysis focused on various aspects of AI's impact on consumer behavior and perceptions in e-commerce, particularly within the apparel industry. It is important to note that not all survey questions yielded noteworthy results; therefore, only the most relevant findings are presented in this section. The sample utilized for this study was a convenient and random sample, meaning the results cannot be considered representative of the entire population. Consequently, the conclusions drawn from this study should be interpreted with caution, acknowledging the limitations of the sample.

4.1. AI IN E-COMMERCE

The survey results, based on the responses of 166 participants, provide valuable insights into consumer perceptions regarding the presence of artificial intelligence on clothing websites. The following analysis focuses on the frequency of online clothing purchases, as detailed in Table 7.

Table 7

Frequency of Online Clothing Purchases Among Respondents

	Frequencies	Percentage	Cumulative Percentage
2-3 times a month	33	19,9%	19,9%
More than once a week	3	1,8%	21,7%
Rarely	67	40,4%	62%
Once a month	59	35,5%	97,6%
Once a week	4	2,4%	100%
Total	100	100%	

The Table categorizes the participants' purchasing habits into five frequency groups: 2-3 times per month, more than once a week, rarely, once a month, and once a week. The data reveals that 40,4% of participants purchase clothing online rarely, and 35,5% do so once

a month. Only 1,8% and 2,4% shop more frequently, purchasing more than once a week and once a week, respectively. The cumulative percentage column shows that nearly all participants fall into the first three categories, indicating that most consumers do not frequently purchase clothing online. It was possible to observe distinct trends regarding how people prefer to discover items and their age. The analysis includes responses divided into five age groups: 18-24, 25-34, 35-44, 45-54, and 55-64.

As seen in Table 8, the majority of the 18-24 and 25-34 age groups prefer browsing categories (52 and 20, respectively) and searching for specific items (21 and 26, respectively). Few in these groups favor social media ads or site recommendations. The smaller sample sizes in the 35-44, 45-54, and 55-64 age groups show varied preferences, with a tendency towards browsing categories.

Table 8

Correlation between the preferred method of discovering new items online and age - Frequencies

		How do you prefer to discover new products when shopping for clothes online?				Total
		Social media ads	Browsing through categories	Searching for specific items	Recommendations from the website	
What is your age?	18-24	14	52	21	5	92
	25-34	3	20	26	3	52
	35-44	0	2	0	0	2
	45-54	0	1	0	1	2
	55-64	3	9	5	1	18
Total		20	84	52	10	166

The chi-square test results, presented in Table 9, indicate a statistically significant association between age and the preferred discovery method (Pearson Chi-Square value = 22.229, p = 0.035). This significance suggests that younger participants show a stronger preference for browsing categories and searching for specific items, while older participants have more varied preferences, though the sample sizes are smaller for these groups.

Table 9

Correlation between the preferred method of discovering new items online and age - Chi-square test

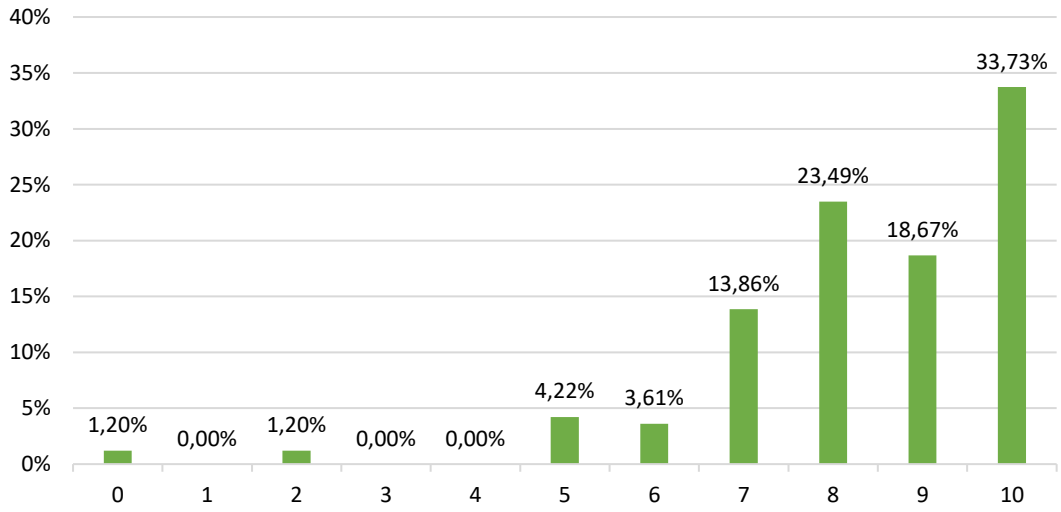
	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	22,229[12]	12	,035
Likelihood Ratio	19,685	12	,073
Number of Valid Cases	166		

Lastly, Figure 8 presents the distribution of responses from 166 participants regarding the importance of having a user-friendly online shopping experience on a scale from 0 to 10, where 0 represents the least importance and 10 represents the highest importance. A significant portion of respondents (52,4%) rated the importance as either 9 or 10, highlighting a strong preference for ease of use in online shopping platforms. Specifically, 33,7% rated it as 10, and 18,7% rated it as 9. Moderate importance ratings (7 and 8) accounted for 31,4% of responses, while only 8,4% rated the importance as low (0, 2, 5, and 6). Most respondents (83,8%) consider a user-friendly online shopping experience highly important. This underscores the critical role of usability in consumer satisfaction and preference in online shopping.

[12] 11 cells (55,0%) expected a count less than 5. The minimum expected count is .12.

Figure 8

Importance of a User-Friendly Online Shopping Experience



A significant portion of participants (83,8%) highly rated the importance of a user-friendly online shopping experience, demonstrating AI's role in enhancing usability and satisfaction. Younger participants preferred browsing categories and searching for specific items, indicating that AI-driven personalization and ease of navigation are critical in meeting consumer expectations and improving overall satisfaction in the online apparel market.

4.2. Personalized Advertisements

The hypothesis that AI-driven personalized advertisements for clothing items impact consumer behavior and perception was explored through a survey segment where participants rated their agreement on a scale from 1 to 5 (1 = strongly disagree, 5 = strongly agree). Responses varied significantly, with some participants appreciating the enhanced shopping experience and tailored suggestions, while others expressed concerns about privacy and intrusiveness.

When asked if they noticed personalized ads for clothes they had recently searched for, Table 10 shows that 80,1% of the 166 participants noticed personalized ads on social media for clothing items they had recently searched for, with only 7,2% answering that they didn’t notice these ads.

Table 10

Noticing Personalized Advertisements on Social Media for Recently Searched Clothing Items

	Frequencies	Percentage	Cumulative Percentage
Agree	69	41,6%	41,6%
Strongly Agree	64	38,6%	80,1%
Disagree	6	3,6%	83,7%
Strongly Disagree	6	3,6%	87,4%
Neutral	21	12,7%	100%
Total	100	100%	

Although most people notice personalized ads on social media for products they recently searched for, the data analysis indicates that this awareness only significantly influences the likelihood of clicking on these ads.

The results of the Spearman correlation analysis are shown in the table below. The Spearman correlation between noticing personalized ads and the likelihood of clicking on them is -0.061. This indicates a weak negative correlation, suggesting that the probability of clicking slightly decreases as people notice more ads.

Table 11

Correlation between noticing personalized ads and the likelihood of clicking on them - The Spearman correlation

			Noticing	Probability
Rô Spearman	Noticing	Correlation Coefficient	1,000	-,061
		Sig. (2-tailed)		,434
		N	166	166

Table 11

Correlation between noticing personalized ads and the likelihood of clicking on them - The Spearman correlation (continuation)

			Noticing	Probability
Rô Spearman	Probability	Correlation Coefficient	-,061	1,000
		Sig. (2-tailed)	,434	
		N	166	166

The two pie charts below provide insights into respondents' perceptions of personalized ads on social media for clothing items. The first chart shows that 35,5% of respondents agree that these ads are intrusive, and 12,7% strongly agree, indicating that a significant portion finds them bothersome. However, 18,1% disagree and 9,6% strongly disagree, while 24,1% are neutral, highlighting mixed feelings. The second chart addresses privacy concerns when companies use AI to track browsing behavior for personalized ads. Here, 33,1% agree and 21,1% strongly agree that their privacy is compromised, whereas 18,1% disagree and 6,6% strongly disagree. Another 21,1% are neutral, showing varied opinions.

Figure 9

Perception of Intrusiveness of Personalized Ads on Social Media for Clothing Items

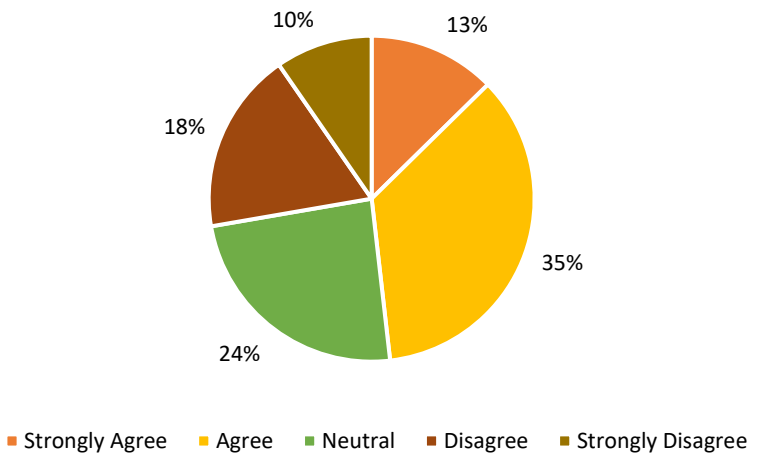
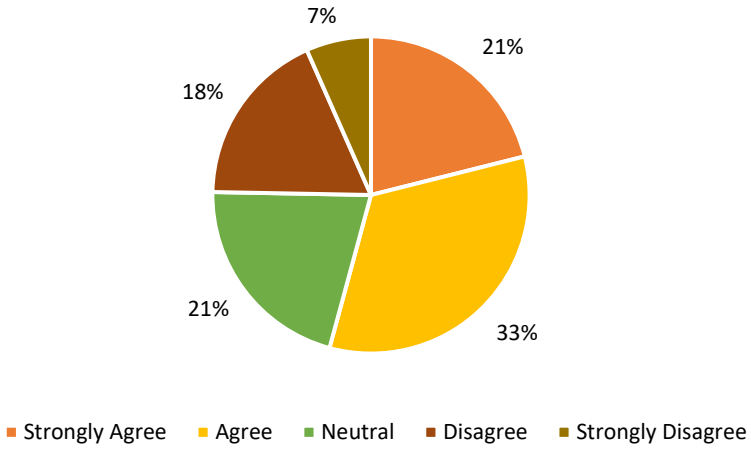


Figure 10

Perception of Privacy Compromise Due to AI-Tracked Browsing Behavior in Personalized Ads



While many find personalized ads intrusive and have privacy concerns, a notable segment either disagrees or remains neutral. This suggests that companies must balance effective advertising with addressing privacy and intrusiveness concerns to maintain consumer trust.

4.3. CHATBOTS

Building on the previous examination of AI-driven personalized advertisements, we now explore the impact of AI-powered chatbots and virtual assistants on user satisfaction and experience.

To test the hypothesis that "Utilizing AI-powered chatbots and virtual assistants positively impacts user satisfaction and experience," a survey was conducted. Participants rated their agreement with several statements about their experiences with AI chatbots and virtual assistants using a Likert scale from 1 to 5 (1 = strongly disagree, 5 = strongly agree). This segment analyzes whether integrating AI chatbots and virtual assistants enhances user interactions and overall satisfaction. The findings will provide insights into the effectiveness of AI in improving customer service experiences.

Based on the responses from individuals who agreed with the statement " I use the chatbot available on the website to seek assistance with returns or exchanges," we obtained the following satisfaction results: A significant majority of 61,9% of respondents strongly agreed that they were satisfied with the chatbot's effectiveness. Additionally, 19,0% disagreed, and 14,3% remained neutral. Only a tiny minority of 4,8% strongly disagreed with the statement.

Table 12

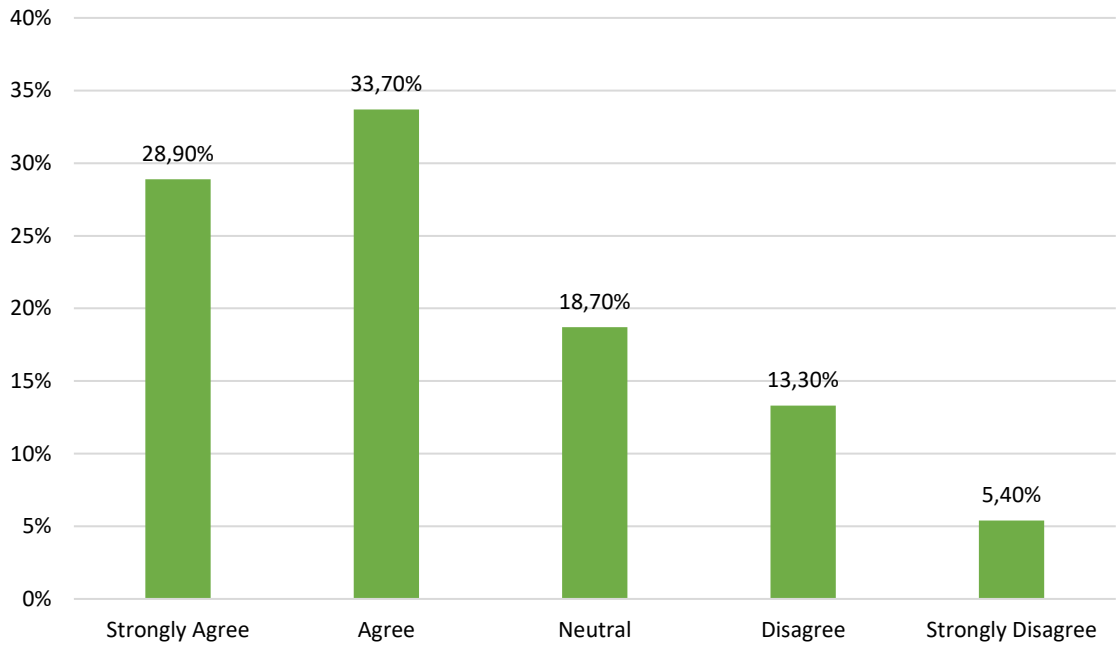
Satisfaction Levels Among Users Who Utilize Chatbots for Returns or Exchanges

	Frequency	Percentage	Cumulative Percentage
Agree	0	0%	0%
Strongly Agree	13	61,90%	61,90%
Disagree	4	19%	80,90%
Strongly Disagree	1	4,80%	85,70%
Neutral	3	14,30%	100%
Total	21	100%	100%

Figure 11 shows responses to the statement, "I prefer interacting with a customer service representative instead of a chatbot when shopping for clothes online." Most of the respondents, 62,6%, either agreed or strongly agreed, indicating a clear preference for human interaction. In contrast, 18,7% disagreed or strongly disagreed, suggesting satisfaction with chatbot interactions. Additionally, 18,7% were neutral, showing no strong preference.

Figure 11

Preference for Interacting with a Customer Service Representative Over a Chatbot When Shopping for Clothes Online

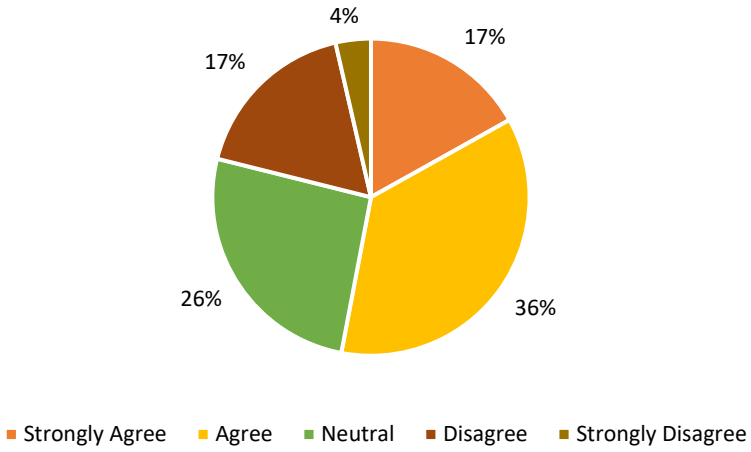


The previous analysis indicated that 62,6% of individuals prefer interacting with a human customer service representative instead of a chatbot when shopping for clothes online. This preference is likely influenced by users' challenges and frustrations when using chatbots, as shown in the Table below.

According to Figure 12, approximately 53% of respondents reported encountering challenges or frustrations while interacting with chatbots on clothing websites. Expressly, 36,1% of respondents agreed, and 16,9% strongly agreed that they faced difficulties with chatbots. This significant portion of users who experienced issues highlights why many prefer human interaction.

Figure 12

Challenges or Frustrations Encountered While Interacting with Chatbots on Clothing Websites



Lastly, as shown in Table 13, we analyze users' comfort level with websites that use chatbots. The data shows that 34,3% of respondents agreed, and 17,5% strongly agreed, resulting in a combined total of 51,8% who feel comfortable with chatbots. Additionally, 39,2% of respondents were neutral, suggesting that many users neither favor nor oppose using chatbots.

Table 13

Comfort Level with Websites Using Chatbots

	Frequency	Percentage	Cumulative Percentage
Agree	57	34,30%	34,30%
Strongly Agree	29	17,50%	51,80%
Disagree	10	6%	57,80%
Strongly Disagree	5	3%	60,80%
Neutral	65	39,20%	100%
Total	166	100%	100%

While chatbots are effective in specific contexts and enjoy a level of user satisfaction, there is an apparent demand for human interaction and a need to address the challenges that users face with chatbot technology. Improving chatbot functionality and providing better user education can help increase comfort levels and overall satisfaction with AI-driven customer service tools. Balancing AI with human support is essential for meeting diverse customer preferences and enhancing the shopping experience.

4.4. AI-Driven Personalization

The hypothesis "The utilization of AI-enabled customization services in online shopping significantly influences consumer attitudes" explores how personalized shopping experiences facilitated by AI impact consumer perceptions and behaviors. AI-enabled customization services, such as personalized recommendations and tailored marketing, aim to enhance the shopping experience by aligning with individual preferences.

To investigate this hypothesis, a survey was conducted where participants rated their agreement with various statements using a Likert scale from 1 to 5 (1 = strongly disagree, 5 = strongly agree). This analysis will examine consumer familiarity with AI personalization, perceived benefits, and concerns, providing insights into the effectiveness of AI in shaping consumer attitudes and identifying areas for improvement.

Table 14 shows responses to the statement, "I am familiar with the concept of AI-based personalization services for online shopping." 42,2% of respondents agreed, and 21,1% strongly agreed, indicating high familiarity. Conversely, 13,9% disagreed, and 4,2% strongly disagreed, showing some lack of familiarity. Additionally, 18,7% remained neutral.

Table 14

Familiarity with AI-Enabled Customization Services in Online Shopping

	Frequency	Percentage	Cumulative Percentage
Agree	70	42,20%	42,20%
Strongly Agree	35	21,10%	63,30%
Disagree	23	13,90%	77,10%

Table 14

Familiarity with AI-Enabled Customization Services in Online Shopping (continuation)

	Frequency	Percentage	Cumulative Percentage
Strongly Disagree	7	4,20€	81,30%
Neutral	31	18,70€	100%
Total	166	100%	100%

Overall, 63,3% of respondents are familiar with AI-based personalization services, while 18,1% are not, and 18,7% are neutral. This indicates a high general awareness but highlights the need for further education about these services.

Table 15 shows the Chi-square test results for the relationship between familiarity with AI-enabled customization services and the perception of privacy being compromised. The Pearson Chi-Square value is 20.550, with a significance level of 0.015, indicating a statistically significant association. Since the p-value is less than 0.05, we conclude that there is a substantial relationship between familiarity with AI customization services and perceived privacy compromise. The likelihood ratio test supports this with a value of 22.828 and a p-value of 0.007. The linear-by-linear association value is 0.711 with a significance level of 0.399, indicating no linear relationship.

Table 15

Correlation between the familiarity with AI-enabled customization services and the perception that privacy is compromised - Chi-square test

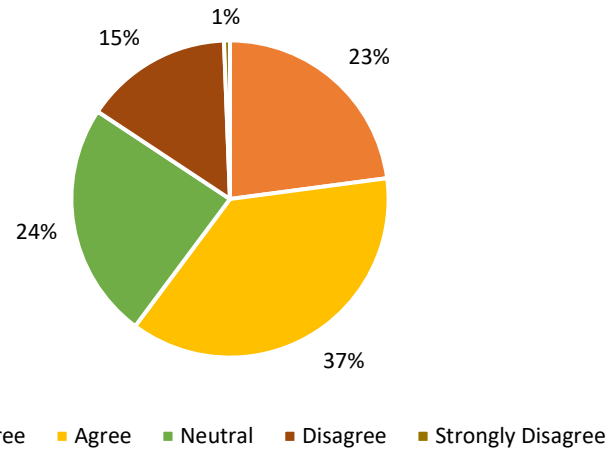
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	20,550[13]	9	,015
Likelihood Ratio	22,828	9	,007
Linear-by-Linear Association	,711	1	,399

[13] 8 cells (50,0%) have expected counts less than 5. The minimum expected count is 0.59.

Figure 13 shows that 60,2% of respondents trust AI algorithms to understand and meet their personalization preferences, with 37,3% agreeing and 22,9% strongly agreeing. On the other hand, 15,7% of respondents do not trust AI for personalization, with 15,1% disagreeing and 0,6% strongly disagreeing. Additionally, 24,1% of respondents are neutral. This indicates a generally positive perception towards AI-driven personalization among most respondents, although a significant portion remains neutral or distrustful. The high level of trust suggests that many consumers are comfortable with AI handling their personalization needs.

Figure 13

Trust in AI Algorithms to Understand and Fulfill Customization Preferences Accurately



Overall, the analysis suggests that while AI-enabled customization services positively influence consumer attitudes and satisfaction, addressing privacy concerns and increasing transparency about AI functionalities are crucial for enhancing overall consumer confidence. These insights provide valuable guidance for further development and implementation of AI-driven personalization in online shopping, ensuring that consumer needs and concerns are adequately addressed.

4.5. Sentiment Analysis

Lastly, we turn our focus to analyzing the hypothesis "Using AI-powered sentiment analysis on social media significantly impacts consumer perceptions, brand reputation, and business decision-making." This hypothesis explores the profound effects of leveraging AI to interpret and analyze consumer sentiments expressed on social media platforms. Sentiment analysis, a powerful AI-driven tool, enables businesses to gauge public opinion, identify trends, and

respond to consumer feedback in real time. The questions posed in the questionnaire were designed to measure respondents' agreement on a scale from 1 (strongly disagree) to 5 (strongly agree), providing a comprehensive understanding of their attitudes towards the use of AI in sentiment analysis on social media. This analysis will provide valuable data on the effectiveness of AI in enhancing consumer engagement and its impact on the strategic decisions made by businesses.

The Table below shows respondents' awareness of the concept of sentiment analysis and its use by companies to gauge consumer perceptions on social media platforms. 18,10% agree and 12% strongly agree, totaling 30,10% who are aware. However, 21,10% disagree, and 30,70% strongly disagree, indicating that 51,80% are not aware. Additionally, 18,10% are neutral. Overall, awareness of sentiment analysis is relatively low, with over half of the respondents not recognizing its use and only about one-third showing awareness.

Table 16

Awareness of Sentiment Analysis Used by Companies to Gauge Consumer Perceptions on Social Media Platforms

	Frequency	Percentage	Cumulative Percentage
Agree	30	18,10%	18,10%
Strongly Agree	20	12%	30,10%
Disagree	35	21,10%	51,20%
Strongly Disagree	51	30,70%	81,90%
Neutral	30	18,10%	100%
Total	166	100%	100%

Table 17 shows the results of the Spearman correlation between two variables the perception that companies' responses influence brand perception and the belief that companies should consider consumer feedback when making business decisions.

The Spearman correlation coefficient (ρ) between the two variables is 0.313 which indicates a a positive correlation means that as the perception that companies' responses influence brand perception increases the belief that companies should consider consumer feedback when making business decisions also increases.

Table 17

Correlation between the perception that companies' responses influence brand perception and the belief that companies should consider consumer feedback when making business decisions - Rô Spearman

			Responses	Feedback
Rô Spearman	Feedback	Coeficiente de Correlação	,313[14]	1,000
		Sig. (2 extremidades)	<,001	
		N	129	154
	Responses	Coeficiente de Correlação	1,000	-,313[15]
		Sig. (2 extremidades)		<,001
		N	136	129

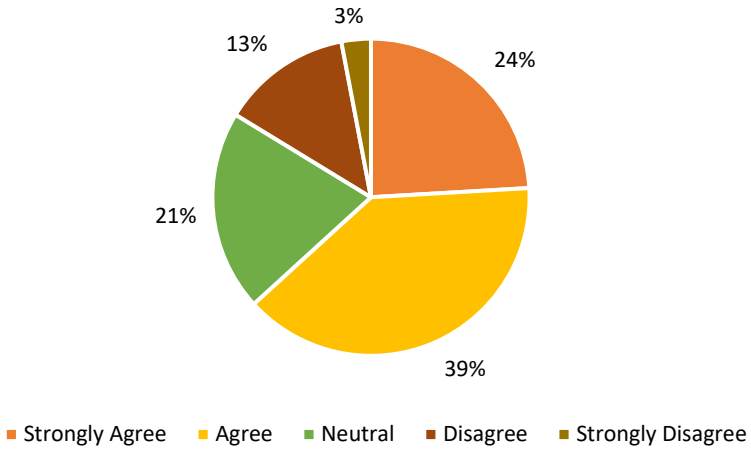
The pie chart below illustrates respondents' perceptions of the positive impact of AI-based sentiment analysis on customer satisfaction and brand reputation. A combined total of 63,30% of respondents view AI-based sentiment analysis positively, with 39,20% agreeing and 24,10% strongly agreeing. Conversely, 16,30% do not perceive the impact as positive, with 13,30% disagreeing and 3% strongly disagreeing. Additionally, 20,50% are neutral. The data suggests that a significant majority of respondents believe AI-based sentiment analysis

[14] The correlation is significant at the 0.01 level (2-tailed)
[15] The correlation is significant at the 0.01 level (2-tailed)

positively affects customer satisfaction and brand reputation, though a notable portion remains skeptical or undecided.

Figure 14

Perception of AI-Powered Sentiment Analysis on Customer Satisfaction and Brand Reputation



The analyses conducted on the perception of AI-based sentiment analysis reveal significant insights into consumer attitudes. Most respondents, approximately 63,3%, perceive AI-based sentiment analysis positively, believing it enhances customer satisfaction and brand reputation. This indicates a general acceptance and recognition of the benefits of AI in understanding and addressing consumer sentiments. However, about 16,3% of respondents do not share this positive view, indicating some skepticism or concern about the effectiveness or implications of AI-driven sentiment analysis. Additionally, a notable portion of respondents, around 20,5%, remain neutral, suggesting that there is still a need for further education and communication about the benefits and functionalities of AI in sentiment analysis.

Overall, while the sentiment towards AI-based sentiment analysis is largely positive, businesses should address the concerns and uncertainties expressed by a minority of consumers to fully leverage the potential of AI in enhancing customer satisfaction and brand reputation.

5. RESULTS AND DISCUSSION

This research investigates the impact of AI technologies such as machine learning, conversational AI, generative AI, and data mining on consumer behavior in the apparel e-commerce sector. These technologies enhance customer service, personalize shopping experiences, and improve operational efficiency. The results show that AI significantly improves the overall shopping experience by offering personalized recommendations, better customer service through chatbots, and optimized inventory management. This leads to higher consumer satisfaction and operational efficiency, validating the hypothesis that AI positively influences e-commerce in the apparel industry.

The study also explores the impact of AI-driven personalized advertisements on consumer behavior. Personalized ads significantly affect consumer perceptions and behaviors, leading to higher satisfaction and increased likelihood of purchasing products. However, privacy concerns are a critical issue, with some consumers feeling uneasy about data collection and usage for personalization. Despite these concerns, personalized advertisements are effective in enhancing consumer engagement and driving sales. Transparency in data usage and robust privacy measures are essential to address these concerns.

Analysis of AI-powered chatbots reveals that they are well-received by consumers for handling routine inquiries and providing quick responses. However, human interaction is still preferred for complex scenarios. Chatbots improve user experience and satisfaction by providing efficient and timely assistance, but a hybrid approach combining AI and human agents is necessary to address more nuanced customer needs. Businesses can maximize the benefits of chatbots by integrating them with human support channels.

The study examines the influence of AI-enabled customization services on consumer attitudes. Customization services, such as personalized product recommendations and tailored shopping experiences, significantly enhance consumer satisfaction. Consumers appreciate personalized shopping experiences, leading to higher engagement and repeat purchases. AI-driven personalization positively impacts consumer attitudes and increases overall satisfaction with online shopping.

Lastly, the study explores the role of AI-powered sentiment analysis in shaping consumer perceptions and brand reputation. Sentiment analysis is highly effective in gauging consumer sentiments and improving business decision-making. By analyzing feedback and comments on social media, companies can respond to consumer concerns promptly and enhance their brand reputation. Sentiment analysis significantly impacts consumer perceptions and brand reputation, supporting the hypothesis that AI-driven sentiment analysis is a valuable tool for businesses.

The empirical study provides substantial evidence supporting the positive impact of AI technologies in the e-commerce and apparel industry. The hypotheses were largely validated, demonstrating that AI enhances operational efficiency, improves consumer experience, and significantly influences consumer attitudes and perceptions. However, privacy concerns and the need for human interaction in complex scenarios highlight areas for further improvement. The findings offer valuable insights for businesses aiming to leverage AI to optimize consumer engagement, satisfaction, and overall effectiveness in e-commerce.

The hypotheses Table presented earlier in the literature review outlines the key assumptions tested in this study regarding the impact of AI technologies in the e-commerce and apparel industry. Each hypothesis explores different aspects of AI's influence on consumer behavior, satisfaction, and operational efficiency. In the following section, a new column has been added to this Table to display the results obtained from the empirical analysis, providing a clear evaluation of each hypothesis based on the study's findings.

Table 18

Hypothesis and Conclusions

Segments		Hypotheses	Conclusions
Segments	Segment 1 – AI in E-commerce	The extensive presence of artificial intelligence **(AI) in e-commerce** and the apparel industry positively influences operational efficiency and consumer experience.	The study supports this hypothesis showing that **AI enhances operational efficiency and improves consumer experience** through better inventory management, customer service, and personalized recommendations.

Table 18

Hypothesis and Conclusions (continuation)

	Segments	Hypotheses	Conclusions
Segments	Segment 2 – Personalized Ads	The impact of **personalized advertisements** for clothing items, driven by AI algorithms, on consumer behavior and perception varies.	This hypothesis is confirmed by the fact that AI-driven personalized ads positively affect consumer behavior and perceptions, increasing satisfaction and purchase likelihood despite some privacy concerns.
	Segment 3 – Chatbots	Utilizing AI-powered **chatbots** and virtual assistants positively impacts user satisfaction and experience.	The data supports this hypothesis showing that **AI-powered chatbots improve user satisfaction and experience** though consumers still prefer human interaction for complex issues suggesting a need for a hybrid approach.
	Segment 4 - AI-enabled Customization	The utilization of **AI-enabled customization** services in online shopping significantly influences consumer attitudes.	The hypothesis is validated showing that **AI-driven personalization greatly enhances consumer satisfaction**, leading to higher engagement and repeat purchases, and fostering customer loyalty and satisfaction.
	Segment 5 - AI-powered sentiment analysis	Using **AI-powered sentiment analysis** on social media significantly impacts consumer perceptions, brand reputation, and business decision-making.	This hypothesis is confirmed showing that **AI-powered sentiment analysis significantly influences consumer perceptions**, strengthens brand reputation, and aids in business decision-making.

6. CONCLUSIONS AND FUTURE RESEARCH

This conclusion aims to synthesize the main findings of the study, discuss their practical and theoretical implications, and highlight the limitations while suggesting directions for future research. This study investigated the impact of Artificial Intelligence (AI) on consumer behavior, particularly in the context of e-commerce, utilizing advanced techniques such as automated personalization and sentiment analysis.

6.1. IMPLICATIONS

The findings of this study have several significant practical and theoretical implications. Theoretically, the research contributes to the existing literature by confirming that AI-based personalization can significantly enhance consumer satisfaction and, consequently, increase customer loyalty. This corroborates previous studies by Areiqat et al. (2021) and Balakrishnan & Dwivedi (2021), which highlight the transformative role of AI in online consumer experiences. Specifically, the data demonstrate that the use of AI-driven personalized services improves consumer attitudes and elevates overall satisfaction with online shopping (Blanckenberg, 2023).

Practically, e-commerce businesses can leverage these insights to optimize their marketing strategies and customer engagement efforts. Implementing personalized recommendation systems and real-time sentiment analysis can not only enhance the user experience but also strengthen brand reputation. Businesses must invest in AI technologies that not only automate processes but also provide personalized and intuitive experiences for consumers. This approach can significantly differentiate a brand in today's competitive market, boosting customer loyalty and promoting sustainable growth. (Bughin et al., 2018) (Delipetrev et al., 2020)

For instance, companies can utilize AI to analyze customer data and provide tailored product recommendations, thereby increasing the likelihood of purchases and repeat business. Furthermore, AI can be used to monitor and analyze customer feedback in real-time, allowing businesses to promptly address any issues and improve customer satisfaction. This aligns with the findings of Bughin et al. (2018), who emphasize the importance of real-time data analysis in enhancing customer experiences and building long-term loyalty.

Additionally, AI's ability to streamline operations and reduce costs can lead to more efficient business processes, ultimately providing better value to customers. This efficiency can be particularly beneficial in handling large volumes of transactions and customer interactions, which are common in the e-commerce sector. As noted by Delipetrev et al. (2020), the integration of AI into business operations can lead to significant improvements in service delivery and customer satisfaction.

6.2. LIMITATIONS

Despite the significant contributions, this study is not without limitations. One major limitation is the cross-sectional nature of the data collected, which does not allow for a longitudinal analysis of changes in consumer behavior over time. Future studies should consider using longitudinal designs to examine how consumer perceptions and behaviors evolve with continuous exposure to AI technologies.

Additionally, the sample used in the study was a convenient and random sample, and as such, the results presented below are not representative of the entire population. Future research should aim to include a more diverse sample to increase the generalizability of the results. Another point to consider is the variability in AI implementations across different companies. The effectiveness of personalization and sentiment analysis strategies can vary significantly depending on the sophistication of the AI tools used and how they are integrated into e-commerce systems.

Furthermore, the e-commerce industry must take a stand on ethical and privacy concerns associated with the use of AI. Particularly, the use of personal data for personalization and analysis must be addressed. Companies and researchers must ensure that AI practices are transparent, and that consumer data is adequately protected following regulatory guidelines. This not only protects consumers but also builds trust, which is crucial for long-term loyalty (Fedorko et al., 2022).

Moreover, future research should explore the impact of cultural differences on the acceptance and effectiveness of AI in e-commerce. Different cultural contexts can influence how consumers perceive and interact with AI technologies, and understanding these nuances can help businesses tailor their strategies to different markets more effectively.

Lastly, the rapid pace of technological advancements means that the AI tools and techniques studied today may become outdated quickly. Therefore, continuous research and adaptation are necessary to keep up with the evolving landscape of AI in e-commerce.

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APPENDIX A – QUESTIONNAIRE

Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 1

UNDERSTANDING CONSUMER BEHAVIOR IN THE CONTEXT OF ONLINE CLOTHING SHOPPING AND THE USE OF AI

Introduction

Introduction [EN]
This survey is being conducted as part of an academic research project at the NOVA Information Management School.

Objective: Understanding How AI Alters Consumer Behavior in Online Apparel Shopping.

The survey takes an average of 5 min, and your responses will remain confidential. By proceeding, you confirm that:
- Your participation is voluntary;
- You are 18 years of age or older;
- You are aware that you can choose to end your participation at any time.

Regards,
Mafalda Simões

End: Introduction

Shopping Habits (Filter Question)

How frequently do you shop for clothing online?

- ○ More than once a week
- ○ Once a week
- ○ 2-3 times a month
- ○ Once a month
- ○ Rarely
- ○ Never

End: Shopping Habits (Filter Question)
Shopping Habits Analysis

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 2

Welcome to the Shopping Habits Analysis section of our research study! Your responses will help us understand online shopping habits and their implications for consumers and retailers.

How do you prefer to discover new products when shopping for clothing online?

- ○ Browsing through categories
- ○ Searching for specific items
- ○ Recommendations from the website
- ○ Recommendations from friends or family
- ○ Social media advertisements
- ○ Other (please specify):

What factors influence your decision to purchase clothing online?

- ○ Price
- ○ Product quality
- ○ Brand reputation
- ○ Product reviews
- ○ Shipping options
- ○ Return policy
- ○ Availability of discounts or promotions
- ○ Personalized recommendations
- ○ Other (please specify):

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 3

How do you typically pay for your online clothing purchases?

- ○ Credit/debit card
- ○ A Disposable Online Card
- ○ PayPal
- ○ Online banking transfer
- ○ Cash on delivery
- ○ Apple Pay/Google Pay
- ○ Mbway
- ○ Other (please specify):

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 4

How important it is to you to have a seamless and user-friendly online shopping experience?

- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7
- ○ 8
- ○ 9
- ○ 10

On average, how much time do you spend browsing for clothing online per session?

- ○ Less than 15 minutes
- ○ 15-30 minutes
- ○ 30 minutes to 1 hour
- ○ 1-2 hour
- ○ More than 2 hours

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 5

Motivation What motivates you to return clothing items purchased online?

- ○ Wrong size or fit
- ○ Color or style not as expected
- ○ Product quality issues
- ○ Changed mind
- ○ The item didn't match the description
- ○ Other (please specify):

End: Shopping Habits Analysis

Perceptions of Personalized Advertising

Welcome to the Perceptions of Personalized Advertising section of our research study. In this section, we aim to explore individuals' perceptions and attitudes towards personalized advertising in the online clothing shopping context.
You will be presented with several statements regarding personalized advertising, and we kindly ask you to rate your agreement with each statement on a scale from 1 to 5.
Scale:
1: Strongly Disagree;
2: Disagree;
3: Neutral;
4: Agree;
5: Strongly Agree.

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 6

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I have noticed personalized advertisements in social media for clothing items that I recently searched for on websites.	○	○	○	○	○
The personalized clothing advertisement based on my previous online browsing behavior enhanced my shopping experience.	○	○	○	○	○
I feel comfortable with websites using AI to personalize my shopping experience.	○	○	○	○	○
I feel personalized advertisements in social media for clothing items are intrusive.	○	○	○	○	○
I feel that my privacy is compromised when companies use AI to track my browsing behavior for personalized ads.	○	○	○	○	○
I'm likely to click on personalized advertisements on social media for clothing items.	○	○	○	○	○

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 7

I have never purchased due to clicking on a personalized advertisement for a clothing item.	○	○	○	○	○
I like the variety of personalized advertisements for clothing items presented to me while browsing online.	○	○	○	○	○
I trust recommendations made by an AI system on a clothing website.	○	○	○	○	○

End: Perceptions of Personalized Advertising

Perceptions of Chatbots

Welcome to the Perceptions of Chatbots section of our research study. This segment explores individuals' perceptions and attitudes toward using chatbots in online clothing shopping experiences.
As in the previous section, you will encounter a series of statements regarding chatbots. Please rate your agreement with each statement on a scale of 1 to 5.
Scale:
1: Strongly Disagree;
2: Disagree;
3: Neutral;
4: Agree;
5: Strongly Agree.
Thank you for your participation!

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 8

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I use the chatbot available on the website to seek assistance with product recommendations.	○	○	○	○	○
I use the chatbot available on the website to inquire about order status or shipping information.	○	○	○	○	○
I use the chatbot available on the website to ask questions about product availability or sizes.	○	○	○	○	○
I use the chatbot available on the website to seek assistance with returns or exchanges.	○	○	○	○	○
I use the chatbot to get help with payment-related issues.	○	○	○	○	○
I use the chatbot to seek general information about the company or its policies.	○	○	○	○	○
I use the chatbot to explore promotional offers or discounts.	○	○	○	○	○

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 9

I'm delighted with chatbots' effectiveness in addressing my inquiries or issues while shopping for clothes online.	○	○	○	○	○
I prefer interacting with a customer service employee over a chatbot when shopping online for clothing or to ask questions.	○	○	○	○	○
I consider it essential for a clothing website to have a chatbot nowadays.	○	○	○	○	○
I feel comfortable with websites using chatbots.	○	○	○	○	○
I have encountered challenges or frustrations while interacting with chatbots on clothing websites.	○	○	○	○	○
I don't use the chatbot.	○	○	○	○	○

End: Perceptions of Chatbots

Perceptions of AI-Driven Personalization

Welcome to the Perceptions of AI-Driven Personalization section of our research study. This section explores individuals' perceptions and attitudes toward using AI-driven personalization in online clothing shopping experiences.
Like the previous segments, this segment includes several statements related to AI-driven personalization. We kindly request your feedback by rating your agreement with each statement on a scale from 1 to 5.

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 10

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I'm very familiar with the concept of AI-enabled customization services in online shopping.	○	○	○	○	○
I have never used AI-powered customization services on clothing websites to personalize my shopping experience.	○	○	○	○	○
I value the option to customize products according to my shopping preferences.	○	○	○	○	○
I believe that AI-enabled customization services enhance my overall satisfaction with the online shopping experience.	○	○	○	○	○
It's very likely for me to purchase customized products compared to standard, non-customized products.	○	○	○	○	○
I trust AI algorithms to understand and fulfill my customization preferences accurately.	○	○	○	○	○

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 11

I have never encountered challenges or limitations while using AI-powered customization services on clothing websites.	○	○	○	○	○
I perceive the value proposition of AI-enabled customization services as much better than traditional online shopping experiences.	○	○	○	○	○
I feel that my privacy is compromised when websites use AI to track my browsing behavior for personalized recommendations.	○	○	○	○	○

End: Perceptions of AI-Driven Personalization

Perceptions of Sentiment Analysis

Welcome to the last section regarding this thesis, Perceptions of Sentiment Analysis!
As in the previous sections, you will be presented with various statements related to sentiment analysis. We kindly ask for your feedback by rating your agreement with each statement on a scale from 1 to 5.
Scale:
1: Strongly Disagree;
2: Disagree;
3: Neutral;
4: Agree;
5: Strongly Agree.
Thank you for your participation!

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 12

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I'm aware of the concept of sentiment analysis, which companies use to gauge consumer perceptions on social media platforms.	○	○	○	○	○
I have never noticed companies responding to comments or feedback on social media platforms.	○	○	○	○	○
I believe that companies' responses to comments or feedback on social media platforms influence my perception of the brand.	○	○	○	○	○
I consider using AI-powered sentiment analysis very effective in accurately assessing consumer sentiments expressed on social media.	○	○	○	○	○

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 13

Companies should consider consumer feedback and comments on social media when making business decisions.	○	○	○	○	○
Companies should respond to positive and negative comments or feedback on social media platforms.	○	○	○	○	○
I perceive the overall impact of AI-powered sentiment analysis on improving customer satisfaction and brand reputation as very positive.	○	○	○	○	○

In your opinion, what factors influence the accuracy of AI-powered sentiment analysis in assessing consumer perceptions on social media?

- ○ Use of advanced natural language processing (NLP) techniques
- ○ Volume and diversity of data collected
- ○ Contextual understanding of comments and feedback
- ○ Ability to distinguish sarcasm and irony
- ○ Other (please specify):

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 14

End: Perceptions of Sentiment Analysis

Demographics

Welcome to the Demographics section of our research study! Please take a moment to provide us with some basic demographic information. Your responses will be kept confidential and used solely for research purposes.

Thank you!

What is your Age?

- ○ 18 - 24
- ○ 25 - 34
- ○ 35 – 44
- ○ 45 – 54
- ○ 55 – 64
- ○ 65 or older

What is your Gender?

- ○ Male
- ○ Female
- ○ Non-binary/Third gender
- ○ Prefer not to say

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 15

What is the highest level of education you have completed?

- ○ High School or equivalent
- ○ Bachelor's Degree
- ○ Master's Degree
- ○ Doctorate or higher

What is your current employment status?

- ○ Student
- ○ Employed full-time
- ○ Employed part-time
- ○ Self-employed
- ○ Unemployed
- ○ Retired
- ○ Other (please specify):

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 16

What is your Monthly Income? (Net Income)

- ○ Less than 700€
- ○ 700€ - 1.000€
- ○ 1.000€ - 1.500€
- ○ 1.500€ - 2.000€
- ○ 2.000€ - 3.000€
- ○ 3.000€ - 4.000€
- ○ 4.000€ - 5.000€
- ○ > 5.000€
- ○ Prefer not to say/N.A

Q31 In which country do you currently reside?

▼ Afghanistan (1) ... Zimbabwe (1357)

End: Demographics

End

Thank you for participating in our survey and sharing your valuable insights on Understanding How AI Alters Consumer Behavior in Online Apparel Shopping. Your contribution is instrumental in advancing research at NOVA IMS.
Your thoughtful responses have provided invaluable data to enhance our understanding of how AI influences consumer behavior in online apparel shopping. If you have any further questions about the study or want to learn more about our research at NOVA IMS, please get in touch with me.
Once again, we sincerely appreciate your time and effort in participating in this study and feel free to share with your colleagues and friends.
Your input will contribute to meaningful advancements in our field and if this is a topic that interests you, I will gladly send a brief summary to your email of the results obtained in this questionnaire.

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Questionnaire - Understanding Consumer Behavior in The Context of Online Clothing Shopping and The Use Of AI – Page 17

Q30 What is your email? (In case you want to see a brief summary of the results of this questionnaire)

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