A Study on Impact of Artificial Intelligence and Its Sustainability in E-Commerce

Dr. Amuthavalli P, Dr. Aravindan S

Assistant professor, Department of Business Administration

Vice Principal, Christ Arts and Science College, Kilachery, Thiruvallur district – 631402

Abstract- The aim of this position paper is to identify a specific focus and the major challenges related to the Artificial Intelligence and Sustainable in E-Commerce. The first step buying and selling of online goods and services in E-commerce, which helps in delivering more intuitive, responsive, and more personalized shopping experiences. AI-powered customer segmentation increases brand awareness as well as customer engagement, improves nurturing campaigns and, consequently, conversion rates, improves customer experience, and reduces customer churn. Furthermore, it investigates how the Artificial intelligence in E-Commerce in Market overview, the Benefits of using artificial intelligence in E-Commerce, find out the Real-life In nowise case studies of AI in E-Commerce, the future of AI in E-Commerce: trends to watch and find out the solutions to the problems of AI. It solves one of the biggest problems in E-commerce by ensuring that your customers, no matter who or where they are, find your brand relevant to their preferences and appreciate the buying experience you provide them so that they keep buying from you. Overall, it presents AI at the heart of it all. From custom-tailored marketing to smarter customer support, save our time and money.

Index - Terms: AI, E-commerce, Natural Language Processing (NLP)

INTRODUCTION

Electronic commerce, or E-commerce, is the buying and selling of goods and services over the internet. E-commerce can be conducted on computers, tablets, smartphones, and other smart devices. Nearly every imaginable product and service is now available through e-commerce, and it has upended how many companies and entire industries do business.

As noted above, e-commerce is the process of buying and selling products and services online. But it involves more than simply a buyer and a seller, relying on a vast, often invisible, infrastructure to keep it running.

E-commerce has helped companies (especially those with a narrow reach, like small, local businesses) gain access to a wider market by providing cheaper and more efficient sales and distribution channels for their products or services.

While some businesses exist entirely online, others straddle the real and virtual worlds. Target (TGT), for example, is one of many giant retailers that has supplemented its brick-and-mortar presence with an online store that allows customers to purchase everything from clothes and coffeemakers to toothpaste and action figures without leaving their homes.

At the other end of the scale spectrum, individual sellers increasingly engage in e-commerce transactions via their own personal websites. And digital marketplaces like eBay and Etsy serve as exchanges where multitudes of buyers and sellers can come together and do business.

Most of us have shopped online for something at some point, which means we've taken part in e-commerce. So it goes without saying that e-commerce is everywhere. But very few people may know that e-commerce has a history that predates the internet.

E-commerce actually goes back to the 1960s, when companies used an electronic system called the Electronic Data Interchange to facilitate the transfer of documents. It wasn't until 1994 that the very first transaction took place. This involved the sale of a CD between friends through an online retail website called NetMarket.1

The industry has evolved rapidly since then, with companies like Alibaba and Amazon becoming household names around the world. The introduction of free shipping, which, at least on the surface, reduces

costs for consumers, has also helped increase the popularity of the E-commerce industry.

OBJECTIVES OF THE STUDY

As a guiding framework for our study, we set the following objectives of the study:
What does the Artificial intelligence in E-Commerce: market overview?
What are the Benefits of using artificial intelligence in E-Commerce?
Find out the Real-life In nowise case studies of AI in E-Commerce
What is the future of AI in E-Commerce: trends to watch?
What are the solutions to the problems of AI?

1. Artificial intelligence in E-Commerce: market overview
Artificial intelligence in E-Commerce uses tech like computer vision, natural language processing, and machine learning to make online shopping smarter. The big benefit? AI can handle a lot of data and learn from it, which helps in delivering more intuitive, responsive, and more personalized shopping experiences.

Top AI use cases in E-Commerce
AI-powered chatbots and virtual assistants
Walmart's chatbot is an excellent example of AI in action — it helps you find products, check store hours, and place orders all in one go. Virtual assistants go even further. They use advanced natural language processing (NLP) to understand and respond to more complex questions, simulate human-like conversations, and provide round-the-clock tailored support. These assistants learn from every interaction, getting smarter and more helpful over time.

AI in E-Commerce: examples of successful implementation
eBay's AI-powered platform
eBay uses artificial intelligence throughout its platform to improve the buying experience and further enable sellers. AI-powered features range from search optimization and personalized shopping journeys to simplifying the guest checkout process. eBay offers AI-powered tools that help sellers improve their product listings, refine ad targeting, and enable global transactions.

2. Benefits of using artificial intelligence in E-Commerce
Just like how Netflix knows what show you're likely to watch next or AI-powered virtual assistants can even act as fashion consultants, AI in E-Commerce is fundamentally reshaping how businesses interact with customers. This level of personalization goes beyond targeted recommendations and enables retailers to anticipate customers' needs and expectations. Further, AI helps manage inventory through the analysis of trends and forecast demand — leading to minimal waste and availability of stock.
•   Personalized shopping experience
•   Round-the-clock customer support
•   Optimized pricing strategies
•   Efficient supply chain management
•   Strengthened fraud detection and prevention
•   Automation of repetitive tasks
•   Tailored marketing campaigns
•   Churn prediction and customer retention

3. Real-life in nowise case studies of AI in E-Commerce
IN nowise delivers solutions for smarter interactions and efficiency, using predictive analytics, NLP chatbots, visual search, and personalized recommendations. Discover how our technologies foster innovation and deliver measurable outcomes through these use cases. In nowise built a system that automatically collected and analyzed shopper activity, offering customers personalized recommendations and giving the client all the insights in one spot.

Traffic filtering system
60% reduction in response time to threats
We developed a solution that filters traffic, assesses threats, and blocks suspicious activity. It detects real-time attacks like DOS and IP spoofing, alerting clients with risk mitigation steps.

Agricultural cost forecasting service
70% reduction in forecasting time
Using data from time series, texts, images, and more, the system by in nowise relies on a unique AI

algorithm that processes data points to provide highly accurate trend predictions.

Intelligent system to match customers with consultants 20% increase in user retention in the first three months We developed an app to help customers connect with the ideal consultant. The platform matches users with consultants based on availability, preferred language, region, and more.

4. The future of AI in E-Commerce: trends to watch Retailers need to be in tune with the latest trends and innovations to keep their edge. If they fail to adapt and meet customer expectations, shoppers won't hesitate to explore other options, making it vital to continually evolve to stay relevant and profitable. Let's see what should be their focus now.

• AI-powered augmented reality (AR)
The huge success of Pokémon Go in 2016 brought AR into the spotlight, showing how it can engage people on a massive scale. Now, AI-powered AR is taking things further. IKEA Creative is a fantastic example of how AR and AI can come together to transform home design. With just a photo of your space, the app suggests everything from furniture arrangements to colour schemes and room layouts. It's like having a personal designer in your pocket!

• Hyper-personalization
Ever notice how Amazon seems to know exactly what you're looking for and suggests it right when you need it? That's all thanks to hyper-personalization, which makes every part of the shopping experience feel tailored just for you. Amazon uses smart algorithms to check out your browsing history, past purchases, and search habits. They keep this info up-to-date to offer you spot-on product recommendations.

• Advanced predictive analytics
AI-powered predictive analytics works by digging into tons of historical data to figure out what customers want and how they behave. This lets businesses create super personalized marketing strategies. So, retailers can tailor their product recommendations, manage inventory more effectively, and really engage with customers. This means such a business will have higher conversion rates and happier shoppers. And as

AI continues to be smarter, the effect it will have on eCommerce sales is only going to increase, making it a must-have in anyone's arsenal looking to stay competitive.

• AI-enhanced marketing automation
Since 2022, ASOS has been utilizing Microsoft's Azure software and AI capabilities. In 2024, ASOS announced a three-year collaboration with Microsoft to enhance its use of AI tools for data-driven decision-making and efficiency. With the new agreement, ASOS aims to eliminate repetitive tasks, allowing employees to focus on creative projects. This fits with the growing trend of AI-enhanced marketing automation, allowing teams to concentrate on data analysis and targeted campaigns for more personalized marketing. As this trend evolves, it will further boost customer engagement and strengthen E-Commerce success.

• Ethical AI and data privacy
As AI plays a bigger role in E-Commerce, ethical AI and data privacy are big concerns. Companies gather tons of data to personalize shopping, but there are growing worries about how that data is used and kept safe. Looking ahead, the focus will be on building AI systems that are transparent, respect user privacy, follow the rules, and stay free from bias to address these concerns.

• AI-powered sustainability initiatives
Walmart's about to roll out this cool AI tool for waste management. Imagine AI digging through tons of data to figure out which products might create the most waste — like taking into account daily inventory changes and seasonal trends. It's going to help them decide what to stock and when so they can avoid wasting stuff in the first place. This is a huge part of how AI is shaking up sustainability in E-Commerce.

• Seamless omnichannel experiences
If you're a huge Starbucks fan, you've probably already noticed how awesome it is to use their app, order your drink, and stroll in to pick it up without waiting. That's what omnichannel is all about! And AI is a big part of it. It personalizes your orders by remembering your favourite drinks and predicts busy times so your drink is ready when you arrive. So,

whether browsing on your phone, checking stuff out in-store, or finishing up your purchase online, it all works together perfectly to give you the best experience.

- AI and blockchain integration

The mix of AI and blockchain is really benefiting E-Commerce by creating personalized, secure experiences. AI helps tailor recommendations to each shopper, while blockchain ensures data integrity and privacy, building trust along the way. A great example of this is IBM Food Trust®. It applies blockchain to the food supply chain, connecting growers, distributors, and retailers through a secure, transparent system.

- AI agents for E-Commerce

AI agents in E-Commerce are the behind-the-scenes powerhouses automating customer service, personalizing shopping, and optimizing decisions in real-time. They chat with customers, solve problems instantly, and suggest products based on past behaviour — all while learning and adapting. The coolest thing here is that they work 24/7, making shopping faster, smarter, and more personal for both businesses and customers.

5. 8 Problems with E-commerce that artificial intelligence solves: AI use cases in E-commerce
If you are an online retailer or are running an E-commerce company, here are the eight biggest problems with E-commerce that you can solve with the power of AI.

1) AI Personalization
Personalization, powered by artificial intelligence, is one of the most common use cases to prove that AI can be a game-changer for E-commerce brands. It can support multiple aspects of your E-commerce business ranging from marketing, sales, and customer service, to post-purchase communication and more.
For starters, AI can create targeted marketing ads and campaigns for individual customers and audience segments. 40% of consumers prefer targeted ads aligned with their needs and preferences for the product they want. AI personalization in E-commerce makes the buyer's journey much easier and helps

marketers reduce ad spend and generate higher returns.
Personalized product recommendations have been found to increase the average order value (AOV). By analysing a customer purchasing habits, previous transactions, interests, and demographics, the AI software presents them with relevant and distinctive suggestions, boosting their chances of purchasing more than what they came for.
Let's look at the power of AI personalization in Ecommerce: One shoe brand from London, Office.co.uk, achieved an 8.6% increase in add-to-cart rates by offering complimentary personalized product recommendations.
It sold 3000%+ more shoe products than the previous year. They employed nifty templates like "Purchased Together" pop-ups to nudge customers to buy more of their stuff.
Another common AI use case in E-commerce is chatbots that efficiently take care of customer service by providing customized responses to customer queries and helping them resolve their concerns around the clock.
With artificial intelligence, brands can even deploy optimized searches. What's that? Your website can identify keywords and learn from previous search queries to display more accurate results to what customers are looking for, elevating the customer experience.
You can use E-commerce AI tools like Dynamic Yield (used by brands like Sephora and IKEA) and Salesforce Commerce Cloud for personalization strategies for your brand.

2) Customer segmentation
Customer segmentation, with artificial intelligence, is another invaluable element used by E-commerce businesses to take their marketing efforts to the next level and supercharge sales.
An analysis conducted by Appboy of 10 billion marketing messages found that the campaigns sent to well-defined audience segments converted 200% more customers than non-targeted campaigns.
As an E-commerce business owner, you would know how important it is to target the right prospects at the right time with the right offer to convert. This is where AI makes a huge difference. AI-powered customer segmentation is based on shared attributes like age, gender, geography, interests, occupation, language,

browser searches, and more. These criteria combine to create a hyper-personalized brand experience for individual customers and audience micro-segments.

AI-powered customer segmentation increases brand awareness as well as customer engagement, improves nurturing campaigns and, consequently, conversion rates, improves customer experience, and reduces customer churn.

It solves one of the biggest problems in Ecommerce by ensuring that your customers, no matter who or where they are, find your brand relevant to their preferences and appreciate the buying experience you provide them so that they keep buying from you.

The case in point is the AI in Ecommerce example of the American athleisure apparel brand, Lululemon, which has been killing it in the DTC space and witnessed the fastest growth (40%) in retail in 2020 worldwide.

The brand partnered with Agi lone, an AI-powered customer data platform (CDP), to employ artificial intelligence to develop consumer profiles, segregate their audiences based on demographic, psychographic, geographic, and behavioural patterns, predict purchasing habits, and provide early warning about potential concerns. It significantly contributed to their brand growth and made them popular worldwide.

Life sight's segmentation feature allows DTC and E-commerce brands to build granular segments from real-time data such as shopping behaviour to send personalized messages.

3) Inventory management and demand forecasting

Inventory management and demand forecasting are some of the major problems large E-commerce companies face. Research indicates that over 30% of all fashion items manufactured by a brand are thrown away within the first year—that's 92 million tonnes of wasted cloth. AI technology, particularly machine learning, helps reduce stock discrepancies.

Correlating inventory data and consumer demand, AI can help your brand maintain stock control through efficient processes and notify staff when items are understocked or overstocked based on market trends, seasonal demands, and customer preferences. Also, the use of AI in E-commerce fulfilment procedures helps expedite scheduling, shipping, re-ordering, and catering to customer needs.

With AI demand forecasting, online stores can increase accuracy in predicting product demand,

personalize special offers for customers, forecast marketing impact on a product's sales, and optimize strategies to maximize it.

Amazon employs AI-driven robots for inventory management and warehouse automation. There are two of them—Pegasus (for item categorization) and Xanthus (for carrying cargo and automating warehousing tasks).

Google has also launched an inventory scanning system that lets retailers automate the task of monitoring their products on the shelf with an image-recognition system.

4) Chatbots and customer service

More than 60% of consumers agree that long wait times are the most frustrating part of seeking customer support. AI chatbots solve this business problem.

One of the most common AI use cases in E-commerce, chatbots are programmed to provide instant answers to typical concerns ranging from product care and return policies to the warranty information and troubleshooting, 24/7, no matter where the customer is based. This elevates the customer experience and may inspire brand loyalty. Moreover, these chatbots learn quickly from previous customer interactions using natural language processing.

Some examples of AI-powered customer service chatbots include Netomi (which answers queries in a human and conversational manner) and Zowie (which provides personalized customer care for digital retailers in 56 languages).

One brand that utilizes chatbots liberally is Sephora. One of the most popular AI in E-commerce examples, Sephora's Beauty Specialist chatbot was deployed to arrange virtual makeovers for customers using the app. Besides helping you provide stellar customer care, chatbots also aid in boosting lead generation, supplementing omnichannel strategies by integrating with multiple online platforms, improving marketing initiatives, and increasing conversion rates.

5) Fraud detection and prevention

In the old days, E-commerce merchants required an army of personnel to verify transactions. But now, with AI algorithms in the picture, online store owners can analyse millions of data points to detect abnormalities and fraudulent behaviour, that in turn, can help them protect themselves from financial penalties, reputational damage, and customer churn

Research shows that if the checkout process is longer than 30 seconds, more than 50% of customers abandon their purchase completely. Thus, the need for advanced technology to detect fraud accurately without extending time on the checkout process is necessary for a fast-growing industry like Ecommerce—AI fulfils that need.

AI-powered fraud detection systems generally work on finding behavioural patterns while analysing data and spotting suspicious payments and anomalies without pre-established rules. These systems are also adaptable to trends, like expedited shipping (generally considered a red flag in fraudulence, but with thousands of customers using it during the pandemic—it had to be normalized), friendly fraud (conducted by historically legitimate customers), or policy abuse.

AI in E-commerce example: Shopify's E-commerce platform uses AI-powered fraud detection systems to protect its merchants from fraudulent orders.

By examining various factors such as IP addresses, order histories, and customer behaviour, Shopify's algorithms can accurately identify high-risk transactions and alert merchants. This helps shop owners prevent double billing, billing for incorrect amounts, unrecognized purchases, malicious fraud, and customer discontent.

Some E-commerce AI tools that support fraud detection and prevention within Shopify are:

- No-Fraud Fraud Protection (a fully-automated fraud detection app that delivers real-time analysis on every individual transaction and requires no input from merchants) and
- SEON Fraud Prevention (a fraud detection and prevention app that assists merchants in fortifying their operations with a powerful scoring system that detects fraud trends and flags potential problematic orders).

6) Price optimization and dynamic pricing

The process of offering products at different prices based on market conditions is known as dynamic pricing optimization. Product and service prices are dynamically adjusted based on competitive pricing, supply and demand, inventory level, sales requirements, consumer expectations, and conversion rates.

Dynamic pricing is one of the biggest problems faced by E-commerce businesses selling their products worldwide—however, AI in Ecommerce has made it easier for such brands to maximize their profit margins. By employing machine learning algorithms, adjusting pricing is efficiently automated.

AI algorithms locate and maximize price points by leveraging a market's accessible private and public data. This makes it easy for merchants to sell their products at comparably right prices in different locations.

Online retailers currently use two basic strategies for dynamic pricing:

- Forecasting and adjusting the price for each product: This means pricing particular items differently based on how likely consumers are to buy products they see at specific price points (as well as the highest price point they're willing to pay). This strategy examines customer interactions at a macro level and determines the worldwide price for that product in order to maximize profit or revenue.

- Forecasting and adjusting the price for each customer: This means changing the price of an item based on what products a consumer clicks on, adds to their basket, and purchases. The result is an increased likelihood of conversion for that specific customer. Reduced prices can entice first-time buyers, while slightly reduced rates can entice more price-sensitive customers.

Amazon has nailed its dynamic pricing strategy. It is said the marketplace giant changes their pricing for products an astounding 2.5 million times per day, using AI, particularly machine learning technology and big-data analytics.

The dynamic pricing tool at Amazon functions under two rules:

- The Competitive Price Rule (assures competitive pricing by mirroring the Buy Box price for a specific ASIN, analyzing prices from external sources, and revising prices when competitors of the same ASIN alter their prices), and

- The Create a Customized Pricing Rule (permits sellers to set their own repricing thresholds based on four basic pricing guidelines: Lowest Price, External Price, Buy Box, and Sales Units).

You can use AI Ecommerce tools like Supplier Database by Jungle Scout and Feed visor for your DTC/E-commerce store.

7) Visual and product recommendations

Research indicates that 80% of online shoppers prefer buying from stores where personalized product discovery journeys are available. Ecommerce stores can achieve this with visual AI and recommendations. Use of AI in E-commerce now also includes implementing visual AI technology to help customers search for what they want with image search. It works similarly to finding something in a catalogue. Visitors can input images from their camera rolls or even upload a picture taken in real-life, and AI algorithms are tasked with finding similar products and recommending them.

This can instantly elevate the user experience, as consumers often can't find the exact words to describe what they want, and a picture is worth a thousand words in that case. Visual AI can save consumers from wasting time on their keyboards.

Combining visual AI with Computer Vision technology, you can display to consumers personalized product recommendations that are visually similar. For example, if you are uploading a picture of a "white L-shaped leather 6 -seater sofa", artificial intelligence technologies can invite you to buy a complementary "minimalistic white base center table with a glass top". A visual recommendation approach effectively discovers and organizes consumer data at scale. It lets retailers gain reliable insights into customers' preferences through click history and cart activity.

Argos embraced mobile marketing with visual AI search in 2019. Digital Director of Argos, Mark Steel, said at the time, *"Customers seeking a product or even an entire room set they've discovered online, or seen in a friend's home, can now browse our vast range of homewares and furniture to find great value similar items in an instant, simply using a picture."* It is one of the best AI use cases in ecommerce.

8) Language translation and localization

One of the reasons why E-commerce has grown so aggressively over the years is because you can sell your products to anyone, anywhere, with an online store.

If your E-commerce business has a global audience, your online store must support language translation and localization for different customers in your targeted countries. Did you know that according to Unbabel's Global Multilingual CX Report 2021, 68% of customers like to communicate with a brand in their mother tongue?

With AI in E-commerce, you do not need legions of sales or customer service reps who know a certain language to cater to an audience segment speaking the same language. You can simply implement AI multilingual software for language translation and localization.

Flying Tiger has different product recommendations on their French site than on their Dutch site. They use the AI tool, Klevu, to process search queries in 21 different languages and show the relevant results. Klevu's Site Search works by understanding the word-level category when breaking down these inquiries.

CONCLUSION

The future of E-Commerce is smart, efficient, and deeply personalized, with AI at the heart of it all. From custom-tailored marketing to smarter customer support, AI is turning stores into innovative powerhouses. Ready to future-proof your store? Let's partner, so we can help you tap into the limitless potential of AI.