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E-COMMERCE AND INVENTORY MODULES

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Abstract: The E-Commerce Integrating with AI, AR/VR, and Chatbot project revolutionizes online shopping by offering an immersive, intelligent, and highly interactive experience. Traditional e-commerce platforms lack personalization and real-time product interaction, leading to uncertainty in purchasing decisions. Our system integrates AR/VR-powered virtual try-ons, allowing customers to visualize products like glasses, rings, and clothing using their device cameras. Additionally, short video advertisements enhance product engagement, making shopping more dynamic and attractive. The AI-driven recommendation engine tracks user preferences to display personalized product suggestions, improving the overall shopping experience. The platform also includes a Buy Now, Pay Later option for greater financial flexibility. Built with React, Node.js, MongoDB, Gemini api this system delivers a seamless and futuristic e-commerce experience, combining AI, AR/VR, and chatbot to enhance both customer satisfaction and inventory efficiency.

Keywords: E-Commerce, AI, AR/VR, Chatbot, Virtual Try-On, Smart Inventory, Personalized Recommendations, React, Node.js, MongoDB.

1. INTRODUCTION:

In the rapidly evolving world of e-commerce, offering a dynamic and personalized shopping experience is becoming essential to meet the demands of today's consumers. This project aims to transform traditional online shopping by integrating advanced technologies such as AI, AR/VR, and short video advertisements to create an interactive, engaging, and user-friendly platform. Short video advertisements provide a more compelling way to showcase products like clothing, accessories, and ornaments, helping customers better understand the product's features, styling options, and benefits.

These videos allow customers to see products in action, making the shopping experience more engaging and informative.

The platform further enhances the user experience through AR/VR-powered virtual try-ons, enabling customers to see how products like glasses, rings, and clothing will look on them in real-time, offering a more immersive shopping experience. In addition, AI-driven recommendations analyze browsing behavior and preferences to suggest personalized products, ensuring a tailored shopping journey for each user. With the integration of Buy Now, Pay Later, customers enjoy financial flexibility, while Chatbot is used for helping customers in the process of searching and buying products.

By combining these modern technologies, this project aims to provide an e-commerce experience that is not only innovative and interactive but also intuitive and convenient, addressing the growing need for smarter, more personalized online shopping solutions.

2. LITERATURE SURVEY:

Several studies and systems have been developed to enhance e-commerce platforms by integrating advanced technologies to improve user experience and inventory management. For instance, [1] explored the use of AR/VR technologies in online retail, enabling virtual try-ons that allow customers to visualize products such as clothing, glasses, and accessories before purchasing. This technology enhances customer confidence and satisfaction, significantly improving the overall shopping experience. Similarly, [2] introduced AI-driven recommendation systems that personalize product suggestions based on customer preferences and browsing behavior, helping users discover products more efficiently. However, these studies often focus on AR/VR or AI in isolation, without incorporating real-time inventory tracking



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or seamless integration between the two technologies.

In the realm of e-commerce, [3] highlighted the effectiveness of short video advertisements as a powerful tool for showcasing products in an engaging and interactive manner. These videos not only capture user attention but also help customers understand product features more dynamically. Additionally, they typically lack flexible payment options like Buy Now, Pay Later (BNPL), which could further enhance the user experience by offering financial flexibility.

[4] proposed a cloud-based e-commerce solution focused on inventory management, utilizing real-time data to track stock levels and automate inventory updates. While effective in managing inventory, this system did not integrate customerfacing technologies such as AR/VR or AI-driven personalized recommendations, which are critical for enhancing the shopping experience. Moreover, the platform lacked advanced features like secure payment gateways and scalable architecture to meet the growing demands of modern e-commerce businesses.

Our proposed system addresses these limitations by integrating multiple advanced technologies, including AR/VR-powered virtual try-ons, AI-driven personalized recommendations, into a unified e-commerce platform.

Unlike the systems described in [1], [2], [3], and [4], our platform ensures dynamic inventory updates as orders are placed, preventing stock discrepancies and improving order fulfillment efficiency. Additionally, it incorporates short video advertisements to engage customers, a Buy Now, Pay Later option for financial flexibility, and a robust, scalable system architecture. By combining these features, our solution bridges the gaps in existing systems, offering a comprehensive and modern e-commerce platform designed to deliver a more personalized, interactive, and efficient shopping experience.

Flow Diagram:

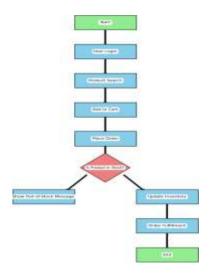


Fig 1-Flow Diagram for application.

3. PROPOSED WORK:

The E-Commerce Integrating with AI and AR/VR system enhances the online shopping experience by combining AI-driven recommendations, AR/VR-powered virtual try-ons, and real-time inventory tracking. The platform features interactive short video ads to engage customers and provide immersive product visualization. With a focus on seamless user experience and secure payment processing, this system aims to optimize both shopping and inventory management for modern e-commerce businesses.

- The Impact of Short Videos in E-Commerce: Short videos have become a crucial tool in e-commerce, offering an engaging and effective way to showcase products, capture consumer attention, and drive sales. Their brief yet dynamic format allows for quick, impactful product demonstrations, helping customers visualize items in action—something static images often fail to convey. These videos enhance consumer trust by providing a clearer understanding of how products look and function, leading to increased confidence in purchasing decisions. Studies have shown that short videos significantly boost engagement and conversion rates, particularly when combined with social media and influencer marketing, where product visibility and authenticity are key. Ultimately, short videos serve as a powerful marketing tool, improving customer interaction, enhancing product appeal, and contributing to higher sales and customer retention in the competitive ecommerce landscape.
- Video marketing has emerged as a powerful tool in ecommerce, transforming how businesses engage with consumers and drive sales. The high recall rate of video ads, even after 30 days, highlights the effectiveness of visual storytelling in creating lasting brand impressions. Consumers are more likely to make informed purchasing decisions after watching product videos, as they provide an immersive and detailed view of the product, reducing uncertainty and increasing confidence. The strong return on investment (ROI) reported by businesses using video marketing underscores its ability to enhance customer engagement, boost conversion rates, and drive revenue growth. Companies continue to invest heavily in video content because it not only attracts more qualified leads but also significantly improves customer retention. The rise in email click-through rates and proposal closing rates for SaaS and eventbased businesses further demonstrates the persuasive impact of video in decision-making processes. As businesses compete in the digital marketplace, video marketing remains an essential strategy for capturing consumer attention, fostering trust, and ultimately increasing sales.

Percentage/Value	Description
1 creentage/ value	Description



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80%	Recall video ads after 30 days.
64%	Buy after watching a brand's
	video.
89%	Report positive ROI from video.
85%	Use video for marketing.
95%	Plan to maintain/increase video
	budget.
66%	Get more qualified leads with
	video.
300%	Higher email click-through rates
	with video.
41%	Higher SaaS proposal closing
	rate with video.
103%	Higher event proposal closing
	rate with video.
46%	Create 51+ videos per year.

3. Integrating AR/VR in E-Commerce: Augmented Reality (AR) and Virtual Reality (VR) technologies are revolutionizing the e-commerce industry by offering immersive and interactive shopping experiences. AR allows customers to visualize products in real-world settings through their devices, enhancing the decision-making process. For example, customers can try on clothes virtually, see how furniture fits in their homes, or test accessories like glasses and jewelry. VR, on the other hand, provides a fully immersive shopping environment, enabling customers to explore a virtual store or try out products in a 360-degree space.

The integration of AR/VR technology in e-commerce is revolutionizing the shopping experience by bridging the gap between online and in-store purchases. Consumers are increasingly drawn to immersive experiences that allow them to visualize products in real-world settings, reducing uncertainty and

Age Group	Interest Level in AR/VR Shopping
18-24	High (Over-indexed)
25-34	High (Over-indexed)
35-54	Moderate
55+	Low

enhancing confidence in their buying decisions. The higher adoption rates in regions like Asia Pacific, Mexico, and the UAE suggest a strong consumer inclination toward digital innovation, possibly driven by tech-savvy demographics and government support for emerging technologies. In contrast, the slower adoption in the US may stem from consumer hesitancy, infrastructure limitations, or differences in shopping behavior. Product categories like clothing, home appliances, and furniture particularly benefit from AR/VR, as these technologies enable users to assess fit, design, and functionality more accurately before purchase. The gaming industry also capitalizes on AR/VR to create interactive and engaging experiences, further demonstrating its versatility. As ecommerce platforms continue to adopt these innovations, businesses that leverage AR/VR effectively will gain a competitive advantage, offering

customers a more personalized and confident shopping journey.

Product Category	Glob al (%)	Asia Pacif ic (%)	Mexi co (%)	UA E (%)	US (%)
Clothing	43%	50%	60%	53 %	27 %
Technolog ies / Home Appliance s	36%	46%	51%	46 %	22 %
Furniture	29%	-	-	-	23 %
Video Games	20%	-	-	-	18 %

The varying adoption of AR/VR shopping across age groups is driven by technological exposure, shopping habits, and comfort with digital innovation. Younger consumers (18-34) embrace AR/VR due to their familiarity with interactive digital experiences, valuing personalization and convenience. The 35-54 group shows moderate interest, adopting new technology primarily for practical benefits. In contrast, consumers 55 and older prefer traditional shopping, often due to unfamiliarity with AR/VR and a preference for physical stores. These differences highlight the need for tailored marketing strategies, emphasizing engagement for younger users and ease of use for older demographics.

The Role of Chatbots in Enhancing E-Commerce Experiences: Chatbots have become an essential tool in e-commerce, enhancing customer engagement, streamlining support, and improving overall shopping experiences. They provide instant assistance, answer queries, recommend products, and guide users through the purchasing process, reducing cart abandonment rates. AI-powered chatbots analyze customer preferences, offering personalized suggestions and support 24/7, ensuring seamless interactions. Additionally, they assist with order tracking, returns, and payment inquiries, minimizing the need for human intervention and improving operational efficiency. By integrating chatbots, ecommerce businesses can boost customer satisfaction, drive sales, and create a more interactive and responsive shopping environment.

Chatbots have become essential in e-commerce due to their ability to provide instant, personalized

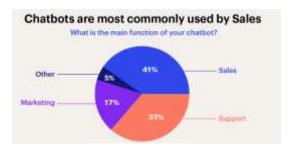


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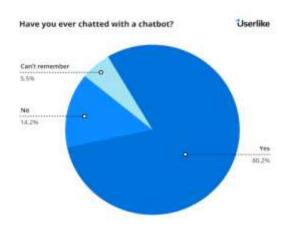
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assistance, improving both customer satisfaction and business efficiency. Their primary role in sales is driven by the need for quick product recommendations and seamless checkout experiences, reducing friction in the buying process. In customer support, chatbots minimize wait times and provide 24/7 assistance, making them a costeffective alternative to human agents. Their role in marketing is growing as businesses leverage AI to engage users through personalized promotions and lead generation. While adoption in other areas remains limited, advancements in AI and natural language processing could expand their applications, making chatbots even more integral to the ecommerce ecosystem.

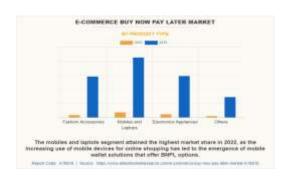


The increasing adoption of chatbots underscores their seamless integration into digital experiences, making automated interactions a standard part of online engagement. Most users have interacted with chatbots, often without even realizing it, due to their natural and intuitive responses. This growing presence is driven by businesses leveraging AI to enhance customer support, streamline sales, and personalize marketing. As industries like e-commerce, banking, and services prioritize efficiency and instant communication, chatbot usage continues to rise, reflecting the shift toward automation and AI-driven customer engagement.



5. Buy now Pay later in E-commerce: Buy Now, Pay Later (BNPL) has emerged as a popular payment option in e-commerce, allowing customers to purchase products immediately and pay in installments over time. This flexible payment model enhances affordability, especially for high-value items, attracting more buyers and increasing conversion rates. BNPL services also reduce cart abandonment by offering interest-free or low-interest payment plans, making online shopping more accessible. As digital transactions continue to rise, BNPL is becoming a key driver of customer retention and sales growth in modern e-commerce platforms.

The rapid growth of the Buy Now, Pay Later (BNPL) market reflects changing consumer spending habits, especially for high-value purchases. The dominance of mobiles and laptops in BNPL transactions is driven by the increasing reliance on online shopping and the convenience of mobile wallet integrations. Electronics and fashion accessories also see high adoption due to their appeal among younger, techsavvy consumers who prefer flexible payment options. Meanwhile, lower adoption in other categories suggests that BNPL is most effective for products where affordability and installment-based payments significantly impact purchasing decisions.



6. Customer service with direct messaging: Customer service with direct messaging enables businesses to engage with customers in real time through instant communication platforms such as chat apps or social media. This method allows customers to ask questions, resolve issues, or seek guidance without waiting for lengthy email replies or calls. Direct messaging creates a more personalized, immediate, and interactive experience, making it easier for customers to get the support they need at any time. By offering quick responses and solving problems on the spot, businesses can increase customer satisfaction, improve trust, and foster loyalty, ultimately enhancing the overall customer experience.

The integration of instant messaging in customer service plays a pivotal role in enhancing the overall customer experience. It enables rapid, real-time communication, leading to higher customer satisfaction due to the quick resolution of queries. Additionally, it reduces operational costs by cutting down on the need for extensive phone or email support. Seamless integration with other business systems streamlines processes, improving workplace efficiency and allowing personalized communication.



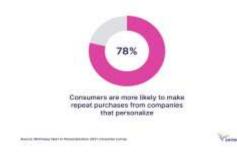
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This technology ensures a more convenient, accessible, and responsive customer service experience, contributing to both customer loyalty and business productivity.



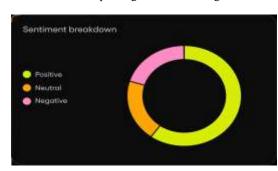
Personalized Product Recommendations Using Customer Interests: Personalized product recommendations, driven by customer interests, play a crucial role in enhancing the e-commerce experience. By analyzing individual preferences, ecommerce platforms can offer tailored suggestions, making the shopping journey more relevant and engaging. This personalization not only increases customer satisfaction but also leads to higher conversion rates, as customers are more likely to purchase products that align with their tastes and needs. Furthermore, it fosters customer loyalty, as shoppers appreciate a more customized experience. Ultimately, this strategy drives sales, encourages repeat business, and accelerates the overall growth of e-commerce businesses in a competitive market.



The high likelihood of repeat purchases from companies offering personalized experiences is driven by the desire for relevance and convenience. Consumers feel more valued and understood when brands tailor their offerings to their preferences, creating a stronger emotional connection. Personalization enhances the shopping experience by providing customers with product recommendations, promotions, and services that match their unique needs and interests. This leads to increased satisfaction, engagement, and trust, which are critical factors in fostering customer loyalty. As a result, businesses that prioritize personalization can differentiate themselves in a crowded market, encouraging customers to return and continue their relationship with the brand.

Enhancing Review Systems with Verified Video Reviews and AI-Driven Sentiment Analysis: Enhancing review systems with verified video reviews and AI-driven sentiment analysis can revolutionize the customer experience. Verified purchase video reviews allow customers to share authentic, visual experiences, building trust and offering a more personal touch compared to traditional text reviews. On the other hand, AI-driven sentiment analysis analyzes the content of reviews to determine the overall mood and highlight key themes, offering potential buyers deeper insights into product quality, delivery, and service. Together, these innovations create a more transparent, interactive, and insightful review system, boosting consumer confidence and improving decision-making.

9.



The sentiment breakdown displayed in the circular chart highlights the general tone of customer feedback, with the majority of responses falling into the positive category. This is significant because it shows that most customers are satisfied with their experiences, which can positively impact a brand's reputation and customer loyalty. The smaller neutral and negative segments suggest that while some customers may have mixed feelings or concerns, the overall sentiment is largely favorable. This positive feedback can be leveraged to reinforce brand messaging, attract new customers, and improve products or services based on the remaining neutral or negative feedback.

4. METHODOLOGY:

The features mentioned are integrated in E-Commerce & Inventory Management System as follows:

 Integrating Short Videos in E-Commerce: To integrate short videos into an e-commerce platform, a combination of tools and services is used to ensure seamless video handling and storage. On the frontend, React Dropzone facilitates easy drag-and-drop video uploads, allowing users to quickly add videos to



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product pages. For smooth video playback, react-player provides a responsive and interactive viewing experience. On the backend, Multer middleware is employed to efficiently handle video uploads, processing multipart/form-data to manage video files. For secure and scalable storage, AWS S3 is used, providing reliable cloud storage for media files. The AWS SDK ensures smooth communication between the backend and S3, making sure videos are stored and retrieved as needed. This integrated approach not only streamlines the video content process but also enhances the user experience by offering dynamic, authentic product demos and reviews, ultimately increasing user engagement and conversion rates.

- Integrating AR/VR in E-Commerce: To integrate AR/VR into an e-commerce platform effectively, a combination of advanced packages and tools is employed to ensure a smooth and immersive user experience, as well as efficient backend management. Three.js plays a central role in rendering high-quality 3D models and enabling interactive AR/VR experiences, allowing customers to explore products in a virtual space or visualize them in their real-world environment using augmented reality. The WebXR API enhances these immersive experiences by enabling AR/VR features directly within the browser, eliminating the need for additional software or plugins, which increases accessibility and user convenience. To manage the backend processes, Multer is used to handle the upload and storage of large media files, such as 3D models and AR assets, ensuring that the platform can efficiently process and serve these complex files. For storage and scalability, AWS S3 provides reliable and secure cloud storage solutions, allowing AR/VR content to be stored, accessed, and delivered quickly to users across the platform. This integration not only enriches the shopping experience by offering virtual try-ons and interactive product visualizations but also significantly enhances user engagement by creating immersive, cutting-edge shopping environments.
- Integration of chatbot in E-commerce: To integrate chatbots into an e-commerce platform, key tools and packages are utilized to provide seamless interaction backend support. React-chatbot-kit botframework-webchat is used for creating an intuitive interface for users to interact with the chatbot, ensuring a smooth and responsive user experience. For managing real-time communication, Axios is employed to handle HTTP requests between the frontend and backend, allowing the chatbot to respond to user queries instantly. On the backend, Gemini is integrated to process natural language, enabling the chatbot to understand and respond to customer queries accurately. Express is used to set up API endpoints, and body-parser ensures that incoming data is properly parsed for processing. Additionally, MongoDB is used to store user interaction data, chatbot responses, and customer

- preferences, which allows for personalized and context-sensitive conversations. This integration enhances user engagement, streamlines customer service, and contributes to higher conversion rates by providing a responsive, intelligent assistant for customers.
- Integration of buy now pay later: To integrate Buy Now, Pay Later (BNPL) options into an ecommerce platform, the use of third-party BNPL services like Klarna, Afterpay, or Affirm is essential. These services provide SDKs and APIs that enable seamless integration of flexible payment options. On the frontend, react-axios can be used to send payment details, including the order and BNPL plan, to the backend for processing. On the backend, Gemini can be leveraged to manage the interaction with the BNPL providers, including payment scheduling and installment handling. To ensure smooth communication with BNPL APIs (like Klarna API or Afterpay API), an API client or RESTful framework can be used to submit order details and retrieve approval or rejection responses. For secure payment processing, Stripe or Razorpay can act as payment gateways, handling installment payments directly. This integration simplifies the payment process for customers, offers flexible payment plans, and ultimately enhances the shopping experience and boosts conversion rates.
- Integration of customer service through direct messaging: To integrate customer service through direct messaging into an e-commerce platform, thirdparty services like Twilio or SendBird can be leveraged for real-time messaging. These services provide robust APIs that allow for seamless integration of live chat functionalities, enabling customers to directly interact with support agents or automated bots. For the frontend, react-chat-widget or botframework-webchat can be used to embed a chat interface, providing customers with an intuitive and responsive communication channel. On the backend, Gemini can handle the logic of routing messages, integrating with Twilio or SendBird APIs to manage the real-time flow of communication. The backend also processes customer queries, enabling agents or bots to provide appropriate responses. By offering instant, real-time communication, this integration enhances customer satisfaction, improves support efficiency, and creates a smoother, more engaging shopping experience.
- 6. Integration of Personalized Product Recommendations Using Customer Interests: To integrate personalized product recommendations based on customer interests into an e-commerce platform, a powerful system can be implemented using advanced technologies like Gemini for processing user data and driving the recommendation engine. By utilizing machine learning-powered recommendation engines, such as AWS Personalize or Google Cloud Recommendations AI, user



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behavior—such as browsing patterns, past purchases, and demographic information—can be thoroughly analyzed to provide tailored, highly relevant product suggestions. These AI-driven engines continuously refine their recommendations over time, learning from the increasing volume of customer data to deliver even more accurate and personalized suggestions. On the backend, cloud-based services like AWS Lambda or Google Cloud Functions can handle the processing of user data and seamlessly integrate with the recommendation engine, ensuring that the platform operates efficiently and at scale. This setup not only ensures that users receive dynamic, interest-driven product recommendations but also significantly enhances the shopping experience by making it more intuitive and relevant. Ultimately, this personalized experience leads to higher conversion rates, increased customer satisfaction, and greater customer loyalty, driving long-term growth for the e-commerce platform.

Integration of enhanced review systems: To integrate verified video reviews and AI-driven sentiment analysis into an e-commerce platform, a seamless and robust system can be implemented using advanced technologies. Gemini can be utilized to process and analyze content, ensuring accurate interpretation of both video and text reviews. On the frontend, reactdropzone makes it easy for customers to upload video reviews, while react-player guarantees smooth playback for an optimal viewing experience. To ensure authenticity, payment systems like Stripe or PayPal can be used to link video reviews to actual purchases, preventing fraudulent content. On the backend, Multer handles video uploads efficiently and securely, storing them for easy access. AI-driven sentiment analysis tools such as Google Cloud Natural Language API or IBM Watson analyze the text content of reviews, categorizing sentiments as positive, neutral, or negative, offering valuable insights for businesses. This integration not only provides customers with authentic and engaging video reviews but also enhances trust through sentimentdriven feedback, helping businesses understand customer opinions, improve products, and drive better purchasing decisions. Ultimately, this system boosts overall customer satisfaction, enhances decisionmaking, and improves conversion rates by offering a more personalized and transparent review experiment

5.SOFTWARE REOUIREMENTS:

5.1 User Authentication & Authorization: Robust system allowing customers to create accounts, log in securely, and manage profiles. Includes email/password authentication and OAuth-based login (Google/Facebook). Implements role-based access control (RBAC) for customers, sellers, and administrators.

- 5.2 Product Catalog Management: System for managing products, categories, and inventory. Supports CRUD operations for products (add, update, remove). Manages product attributes (descriptions, images, prices, stock, discounts).
- 5.3 **Shopping Cart & Checkout System:** Enables users to add, remove, and modify products in their cart. Calculates total price, applies discounts, and handles taxes/shipping dynamically. Optimized checkout process with guest checkout option.
- 5.4 Payment Gateway & Buy Now Pay Later (BNPL): Integration with multiple payment gateways (Stripe, PayPal) and BNPL services. BNPL supports installment payments and credit-based purchasing, compliant with regulations.
- 5.5 Order Management & Tracking: Real-time order tracking, allowing users to check status and receive updates (email/SMS). Automated invoice generation and support for cancellations, refunds, and returns. Admin panel for managing orders, disputes, and analyzing sales data.
- 5.6 **AI-Based Recommendation System:** AI-powered system analyzing user behavior, purchases, and browsing history to generate personalized product recommendations. Uses machine learning (collaborative filtering, content-based recommendations).
- 5.7 AR/VR Integration for Interactive Shopping:
 AR/VR capabilities for visualizing products interactively. AR allows users to see products in their environment (furniture, clothing). VR for virtual showrooms. Requires WebXR compatibility and AR device support.
- 5.8 Chatbot with Gemini API for AI-Powered Support:
 AI-driven chatbot powered by Gemini API for customer support. Answers FAQs, assists with product finding, handles order inquiries, and offers personalized assistance. Supports NLP and integrates with customer service system for human agent takeover.

6. CONCLUSION:

The integration of AI, AR/VR, chatbots, and advanced recommendation systems in e-commerce is revolutionizing the way consumers interact with online shopping platforms. This project successfully combines these technologies to enhance user experience, improve customer engagement, and optimize inventory management. By incorporating AR/VR-powered virtual try-ons, customers can visualize products in real-time, leading to more informed purchasing decisions. AI-driven recommendations personalize the shopping experience, increasing customer satisfaction and retention.

The implementation of short video advertisements has proven to be an effective marketing strategy, capturing user attention and



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providing an interactive way to showcase products. Additionally, the inclusion of a chatbot powered by the Gemini API ensures seamless customer support, reducing response times and improving overall service efficiency. The Buy Now, Pay Later (BNPL) feature adds financial flexibility, allowing users to make purchases without immediate payment constraints.

From an inventory management perspective, real-time tracking and automation help prevent stock discrepancies, ensuring efficient order fulfillment. The combination of these technologies creates a scalable, innovative, and customer-centric e-commerce platform that enhances both shopping convenience and business efficiency.

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