

How AI is Changing Customer Service: A Review of Chatbots and Virtual Assistants

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Abstract: *As customer expectations continue to evolve, businesses are increasingly turning to artificial intelligence (AI) to reshape how they deliver service and support. This review explores how AI technologies such as chatbots and virtual assistants are playing a central role in streamlining customer interactions and offering faster, more personalized experiences. This review paper gives an insight of the evolution of the chatbots and virtual assistants, along with comparison between different chatbots available in market. This paper also explores the Indian market size which is being controlled by these tools and their future trend. These tools rely on advances in natural language processing (NLP), machine learning (ML), and speech recognition so as to mimic human conversation and enhance user satisfaction. The paper outlines the advantages of using AI in customer service, including round-the-clock availability, improved efficiency, and scalable service delivery. It also critically examines limitations, such as the absence of emotional intelligence, difficulty with complex queries, and the potential risks of over-reliance on automation. Emerging developments like multilingual and emotion-aware bots, AR integration, and the future influence of quantum computing are explored. The review concludes by suggesting that AI should be adopted responsibly, with a balanced approach that combines human judgment with the speed and efficiency of technology.*

Keywords: *Artificial Intelligence, Customer Service, Chatbots, Virtual Assistants, NLP, Automation*

I. INTRODUCTION

With technology advancing each passing day, customer expectations are also gaining an exponential trend. Customer service has become a key factor that sets businesses apart. Customers has the tendency to gravitate towards companies which give them better and instant response. Customers now expect quick, personalized, and consistent help across different platforms. But traditional systems—like call centers with human agents or IVRs—often fall short of these expectations. That’s where AI comes in.

Artificial Intelligence (AI) is changing the way customer service works. It helps by handling simple questions, offering personalized support, and being

available 24/7. AI tools like chatbots and virtual assistants are now widely used. Thanks to improvements in natural language processing (NLP), machine learning (ML), and deep learning, these tools can manage millions of customer conversations every day in every field and answering questions, setting up appointments, or suggesting products which one can buy.

Not only are these AI tools reducing operational costs—by as much as 30%—they’re also improving efficiency, handling up to 80% of first-level support issues without human involvement [1]. The global market for intelligent virtual assistants was valued at approximately USD 2.48 billion in 2022, and it is expected to grow significantly—reaching around USD 14.10 billion by 2030. This reflects a compound annual growth rate (CAGR) of 24.3% during the period from 2023 to 2030. Real-world cases highlight the scale of change. For example, British Telecom’s virtual assistant Aimee handles 60, 000+ queries weekly, helping to streamline services and reduce headcount [3]. Similarly, Zurich Insurance leverages AI for customer engagement while stressing the importance of ethical, human-centered oversight [4].

However, while efficiency is increasing, emotional intelligence and trust remain critical concerns. Studies show that customers are more satisfied when AI systems express empathy, even if resolution rates stay the same [5]. Consequently, many firms are adopting hybrid models that combine automated systems with human agents—balancing speed with sensitivity.

This review explores how AI is reshaping customer service, with a particular focus on the rise of conversational agents. The review also includes technical foundations, applications across industries, user perceptions, ethical challenges, and future trends.

1.1 Research Questions

This review seeks to explore several important questions that shape the growing role of AI in customer service:

- In what ways has AI changed the way customer service is delivered across different industries?
- What are the core technologies driving the development of chatbots and virtual assistants?
- What benefits have businesses and customers experienced from using AI in customer service—and what limitations or ethical concerns still remain?
- Finally, what emerging trends are likely to influence the future of AI-powered customer service?

II. BACKGROUND AND EVOLUTION

2.1 Historical Perspective of Customer Service

Initially customer support was more labor intensive as it was based on face to face interactions or could be done through telephonic support. Customer service was very restrictive as it was dependent on availability of staff or their working hours. But with technological advancement customer service has evolved significantly over the past 40 yrs. Things started to change with the rise of the internet in the late 1900s. Email and website-based support made it easier for companies to help more customers, more

quickly. Still, these methods often needed a lot of human effort and customers sometimes had to wait a long time to get help.

2.2 Evolution of Chatbots and Virtual Assistants

The first chatbots, like ELIZA (1966) and ALICE (1995), showed that machines could have basic conversations, but they didn't really understand context or meaning. Things started to improve in the 2010s with the rise of machine learning and natural language processing (NLP), which made chatbots smarter and better at handling complex questions. Around the same time, virtual assistants like Siri, Alexa, and Google Assistant became popular by combining voice recognition with helpful everyday features.

By the early 2020s, new technologies like deep learning, transformers, and large language models (LLMs)—including OpenAI's GPT and Google's Gemini—took conversational AI to a whole new level. These advanced systems can now understand what users mean, follow longer conversations, and give more personalized answers. As a result, they're being used more and more in many different industries.

2.3 Key Technological Milestones

This table summarizes key milestones in the development of chatbot and virtual assistant technology, with relevant references [6]-[16].

Table1: Key Technological Milestones in Chatbots and Virtual Assistants

Year	Milestone / System	Description
1966	ELIZA	First chatbot simulating a therapist using pattern matching.
1995	ALICE	Used AIML for realistic rule-based responses.
2001	SmarterChild	Consumer bot on AOL/MSN offering info like weather and sports.
2006	IBM Watson	Showed advanced NLP by winning Jeopardy! and enabling enterprise use.
2011	Apple Siri	Mobile voice assistant with task execution capabilities.
2014	Facebook Messenger Bots	Enabled businesses to use chatbots for commerce and service.
2016	Google Assistant & Alexa	Introduced voice-first, context-aware smart assistants.
2018	OpenAI GPT-2	Generated coherent multi-turn responses using deep learning.
2020	GPT-3	Enabled advanced reasoning with 175B parameters.
2023–24	GPT-4, Claude, Gemini, Krutrim AI	Multimodal, emotion-aware models with regional language support.

2.4 Methodology of Literature Selection

To maintain the relevance and depth of this review, a structured and methodical approach was followed

while selecting the literature. The process consisted of the following steps:

1. Databases Explored:
Literature was sourced from reputable academic platforms including IEEE Xplore, Scopus, SpringerLink, ACM Digital Library, and Google Scholar. For industry perspectives, insights from Gartner, McKinsey reports, and selected company white papers were also reviewed.
2. Search Keywords:
Searches were conducted using terms such as: “chatbots,” “virtual assistants,” “conversational AI,” “AI in customer service,” “NLP in customer support,” and “AI-driven customer engagement.”
3. Inclusion Parameters:
 - Peer-reviewed articles and conference papers published between 2016 and 2024.
 - Research focused on AI-based customer service technologies.
 - Case studies of chatbot or virtual assistant implementation.
 - Publications available in English.
4. Exclusion Conditions:
 - Non-technical opinion pieces or blog content without data support.
 - Studies unrelated to customer service environments.
 - Papers with vague methodology or lacking specific use cases.
5. Review and Classification:
From a pool of over 130 identified works, around 60 were selected based on their citation count, thematic relevance, and analytical depth. These were grouped under the following themes:
 - Technological Foundations.
 - Trends in Adoption.
 - Ethical and Practical Challenges.
 - Sector-wise Use Cases.
 - Strengths and Limitations.

This framework helped ensure that the literature considered was both academically robust and practically meaningful.

III. LITERATURE REVIEW

3.1 Growth and Adoption of AI in Customer Service

AI has reshaped how the business work and so companies focus on how AI can be used to cater customer needs and gain their trust and thus enhance a customer experience. This shift has been fueled by improvements in technologies like natural language processing (NLP), conversational AI, and large language models (LLMs). According to [17], over 80% of customer interactions in industries such as telecom, finance, and e-commerce are now handled by AI-based systems. It is even predicts that by 2025, about 95% of customer service conversations will involve AI—whether through chatbots, voice assistants, or smart routing tools[1].

In India, the adoption of conversational AI is rapidly accelerating. As of 2022, the Indian conversational AI market was valued at approximately USD 274.5 million, with forecasts estimating it will grow to over USD 1 billion by 2029—reflecting an annual growth rate near 24.6% [18]. Additionally, the Indian call center industry, estimated at USD 33 billion in 2024, expects AI-powered systems to handle more than half of customer interactions by 2028—resulting in potential savings of over USD 400 million annually [19].

Businesses are turning to AI mainly because it is not only helping them to work faster and giving an edge in substantial cost reduction.

3.2. Performance and User Perception

AI-powered systems are now capable of handling 80–90% of routine queries without human intervention [20]. Customer satisfaction with chatbot experiences is also rising: a recent survey by Salesforce [21] found that 69% of users reported faster resolution and 87% found chatbots helpful, particularly for basic support.

Interestingly, research shows that perceived emotional intelligence in AI responses boosts user trust. The authors of [22] demonstrated that AI assistants that acknowledged emotions or apologized for delays were rated significantly higher in satisfaction—even when issue resolution was identical to generic bots.

3.3. Enterprise Use Cases and Real-World Applications

Major companies are already leveraging AI at scale:

BT Group, the UK telecom provider, uses an AI virtual assistant named Aimee that handles 60,000+ weekly customer interactions, contributing to strategic workforce reductions [3]. Verizon reported a 40% increase in sales conversions after integrating Google’s Gemini-powered AI agent-assist system into its customer operations [23]. Zurich Insurance uses AI to automate claims support and customer communication, while emphasizing human oversight and ethical AI principles [4]. These implementations underscore AI’s growing strategic value not just in automation but in customer engagement and personalization.

3.4. Human-AI Collaboration and Hybrid Models
 Despite AI’s efficiency, there are limits to its emotional range, especially in complex or sensitive situations. This has led to a shift toward hybrid

customer service models, combining automation with human empathy.

Studies such as Comcast’s LLM integration trials showed that human agents using real-time LLM assistance resolved queries 10% faster, and received higher internal satisfaction ratings [24]. The “agentic AI” concept—where AI systems perform autonomous tasks end-to-end—is emerging, but adoption remains cautious due to transparency and accountability concerns [25].

3.5 Comparison of Major AI Chatbots in Customer Service

This table highlights the capabilities, language support, and deployment channels of leading AI chatbots, including several from India [26]-[32].

Table2: Comparison of Major AI Chatbots in Customer Service

Chatbot Name	Organization	Features	Languages Supported	Deployment Type
Erica	Bank of America	Finance queries, spending advice	English	Mobile App
Haptik Bot	Reliance Jio (India)	Multi-brand support via WhatsApp	English, Hindi, others	WhatsApp, Web
SnehAI	Population Council	Reproductive health info	Hinglish	WhatsApp, Facebook
Krutrim AI	Ola Group (India)	Vernacular assistant, task execution	13+ Indian languages	App + Voice
ASHABot	Public Health Pilot	Health queries for field workers	Hindi, Marathi, others	WhatsApp
Dialogflow CX	Google	Enterprise-level LLM chatbot	30+ languages	Omnichannel cloud

IV. TECHNOLOGICAL FOUNDATIONS

4.1 AI, NLP, and Machine Learning

AI-based customer service systems such as chatbots and virtual assistants are powered by several key subfields of artificial intelligence, most notably Natural Language Processing (NLP), machine learning (ML), and deep learning (DL). These technologies collectively enable systems to understand, interpret, and respond to human language in real time.

4.1.2 Intent Recognition

The very first step in customer support is to find out what a customer want and this is done by intent recognition. It refers to the process of understanding what a user wants to do based on their query—such

as checking a bank balance, booking an appointment, or asking about a product. In the early stages, simple machine learning models like Support Vector Machines (SVM) and Naïve Bayes were used for this task, relying on basic text features for classification.

Technological advancement particularly in the field of AI, intent detection has improved significantly with the use of deep learning models, especially BERT (Bidirectional Encoder Representations from Transformers) and LSTMs (Long Short-Term Memory networks). BERT, developed by Google, is particularly powerful because it can understand the context of a word by considering the words that come both before and after it, which greatly improves the model’s ability to detect user intent [33].

These models are usually trained on labeled datasets from specific domains to recognize the differences between similar user queries—for example, distinguishing between “book a ticket” and “cancel a reservation.” In practice, a telecom chatbot uses such intent recognition models to decide if a user wants to recharge, check their balance, or speak with a customer service agent.

4.1.2 Entity Extraction

Once intent is identified, the system needs to extract key information—called entities—from the query. These include names, dates, locations, amounts, product types, etc. Traditional NLP techniques used Named Entity Recognition (NER) with CRFs (Conditional Random Fields).

Now, transformer-based models like RoBERTa and spaCy with transformer pipelines achieve higher accuracy in multilingual and domain-specific entity extraction [34]. Entity extraction enables bots to fill in “slots” in a conversation. For example, in “Book a flight to Mumbai on Monday,” the city and date are extracted as entities. Example: In a hospital chatbot, extracting “fever”, “today”, and “Dr. Mehta” helps route the patient request accurately.

4.1.3 Dialogue Management

Dialogue management governs the flow of conversation. It decides how the system should respond next based on the user’s current and previous inputs. Rule-based systems use finite-state machines or decision trees. These are easier to control but lack scalability. Reinforcement Learning (RL) models learn optimal dialogue policies by maximizing long-term user satisfaction or efficiency. For instance, the Deep Dyna-Q architecture combines planning and learning for dynamic conversation management [35].

Some systems adopt hybrid approaches, mixing scripted flows with AI-based responses depending on confidence levels. Example: In an e-commerce chatbot, if the user says “I want to return this,” the system initiates a return flow but switches to human support if confidence drops.

4.1.4 Response Generation

Once the chatbot knows what to say, it generates a response either by:

Templated generation – Selecting pre-written responses using slot-filling (e.g., “Your order #[order_id] will arrive on [date]”).
Generative models – Creating responses dynamically using large

language models (LLMs) such as GPT-3/4 and T5, trained on massive corpora. These models ensure contextual, coherent, and even empathetic replies [36]. The shift to generative models improves personalization, sentiment alignment, and the ability to answer open-ended queries. However, response filtering and guardrails are essential to avoid hallucinations and bias.

Example: A customer types, “I’m not happy with the service.” A templated bot may reply, “Sorry for the inconvenience,” while a generative bot may respond, “I truly regret the experience you had. Let’s see how I can make it better for you.”

4.2 Types of Chatbots

4.2.1 Rule-based Chatbots

These chatbots operate using a set of predefined rules, often structured in the form of decision trees. They are well-suited for handling simple, repetitive tasks like answering frequently asked questions or guiding users through a fixed process. However, they are limited in their ability to interpret free-form input and cannot adapt to unexpected user queries [37].

4.2.2 AI-based Chatbots

AI-powered chatbots make use of machine learning (ML) and natural language processing (NLP) to understand user intent and context. Unlike rule-based bots, they can manage open-ended conversations, adapt to user behavior, and improve over time through continuous learning [38].

4.2.3 Hybrid Chatbots

Hybrid models combine the structured logic of rule-based bots with the flexibility of AI-based systems. This allows them to handle both predictable and complex queries efficiently. They are commonly used in enterprise settings where both high accuracy and scalability are required [37], [38].

4.3 Virtual Assistant Architecture

Modern virtual assistants are designed using several key components that work together to enable intelligent communication. One core element is Natural Language Understanding (NLU), which helps the system interpret the user’s intent. A dialogue manager oversees the flow of the conversation, ensuring it remains coherent and context-aware. Meanwhile, Natural Language Generation (NLG) is used to produce responses that sound natural and human-like.

These assistants are often integrated with backend systems, such as customer relationship management (CRM) platforms or knowledge bases, allowing them to provide relevant and real-time support. Many also feature multimodal interfaces, enabling users to interact through text, voice, or even images. This combination of technologies allows virtual assistants to deliver smooth, context-sensitive experiences across different communication channels [38], [39].

V. APPLICATIONS IN CUSTOMER SERVICE

AI-powered chatbots and virtual assistants are revolutionizing the way businesses manage and deliver customer support. Their ability to automate repetitive tasks, scale responses, and deliver consistent service across channels makes them invaluable in enhancing customer satisfaction and operational efficiency.

5.1 Common Use-Cases

AI chatbots are now integral to various facets of customer interaction. Here are key areas where they are frequently deployed:

5.1.1 FAQs and Policy Explanations

One of the most common applications is automating frequently asked questions (FAQs). Chatbots are trained on predefined queries related to product features, service terms, refund policies, and warranty conditions. They reduce the load on live agents and ensure round-the-clock information delivery. Studies indicate that over 70% of initial customer queries can be resolved by bots through FAQ support alone [40].

5.1.2 Product Recommendations

Intelligent chatbots use machine learning algorithms to analyze customer preferences, browsing behavior, and purchase history to offer personalized product suggestions. In e-commerce, platforms like Flipkart and Amazon use AI chat interfaces to improve product discovery and cross-selling. This not only enhances the user experience but also increases conversion rates [41].

5.1.3 Order Tracking and Returns

Bots can instantly retrieve order status and tracking details from backend systems using API integration. Customers receive real-time updates without waiting in call center queues. In case of returns, chatbots

guide users through eligibility checks, return requests, and refund initiation, thereby simplifying post-purchase processes.

5.1.4 Appointment Scheduling

In sectors like healthcare, beauty, and education, AI assistants manage appointment booking by checking availability, syncing calendars, and sending automated reminders. For instance, Practo and Apollo hospitals in India utilize bots for scheduling consultations, reducing no-shows and administrative overhead [42].

5.1.5 Feedback and Surveys

Through Feedback and surveys a company can figure out how much a customer is satisfied with company service. These Chatbots collect feedback on real time after interactions, thus enabling companies to measure customer satisfaction (CSAT) scores effectively. Using sentiment analysis, bots also interpret open-ended responses to derive deeper insights into customer experience. Feedback bots integrated into WhatsApp are increasingly used in India due to their mobile-first design [43].

5.2 Industry Implementations

Various sectors have embraced chatbots and virtual assistants tailored to their specific needs:

5.2.1 Banking

India's HDFC Bank uses "Eva," a conversational AI that has answered over 5 million customer queries in a year across 20+ banking domains. Similarly, SBI's "SIA" provides account information, branch locator services, and card-related support, functioning 24/7. These bots reduce queue times and improve customer retention.

5.2.2 Retail

Retailers such as Reliance use Haptik, an AI assistant capable of handling over 3 million conversations monthly. Amazon's Lexis used to build bots that guide customers through purchase decisions, returns, and delivery updates.

5.2.3 Healthcare

Apollo Hospitals uses an AI-powered chatbot to guide patients through symptoms and recommend doctor appointments. Another notable initiative is Snehai, a chatbot launched in India to provide young adults with information about sexual and reproductive health using conversational AI in Hindi [44].

5.2.4 Telecom

Airtel's voice assistant helps users with balance inquiries, plan upgrades, and service complaints using both voice and text. Jio's Krutrim, developed in partnership with AI startup Krutrim, supports regional language commands and natural voice queries, targeting India's non-English speaking users.

5.3 Integration with Platforms

To enhance accessibility and functionality, chatbots are embedded into various digital ecosystems:

5.3.1 CRM Systems (Salesforce, Zoho CRM)

Chatbots integrated with CRM platforms access customer data in real-time, enabling them to personalize interactions. For example, when a returning customer initiates a chat, the bot can retrieve their purchase history and service issues, ensuring context-aware assistance.

5.3.4 Indian Chatbox market Size and Outlook

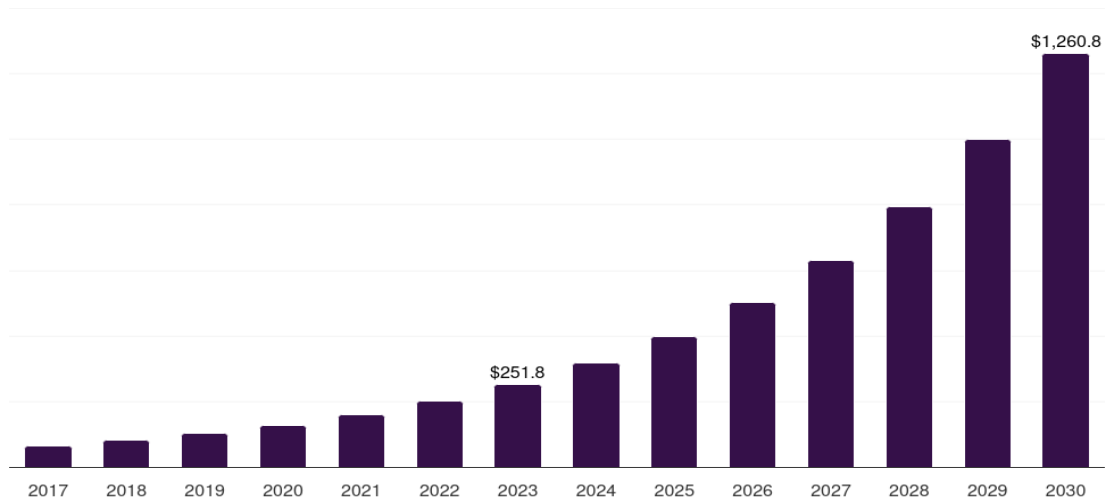


Figure 1: Indian Chatbox market Size and Outlook [46]

India chatbot market highlights

- The India chatbot market generated a revenue of USD 251.8 million in 2023 and is expected to reach USD 1,260.8 million by 2030.
- The India market is expected to grow at a CAGR of 25.9% from 2024 to 2030.
- In terms of segment, solution was the largest revenue generating offering in 2023.
- Services is the most lucrative offering segment registering the fastest growth during the forecast period.

5.3.2 Messaging Apps (WhatsApp, Facebook Messenger)

Messaging platforms are the most popular channels for customer support in India, with over 500 million WhatsApp users. Companies like MakeMyTrip and Swiggy use WhatsApp bots for order confirmations, FAQs, and real-time tracking, supported by multilingual NLP[45].

5.3.3 Company Websites and Mobile Apps

Embedding chatbots on websites helps capture leads, answer product-related queries, and drive sales. On mobile apps, in-app bots improve onboarding, troubleshoot errors, and offer personalized user support. For example, Myntra's bot handles sizing queries and returns via its mobile interface.

6.1 24/7 Availability

AI bots operate round-the-clock, reducing response time and customer frustration. A survey by Deloitte [40] reported 78% of users prefer self-service options available anytime.

6.2 Cost Efficiency and Scalability

Gartner estimates AI can reduce customer service costs by up to 30%. Chatbots can scale to handle thousands of concurrent users, especially during seasonal peaks.

6.3 Personalization

VI. BENEFITS AND OPPORTUNITIES

AI assistants can access user history, preferences, and behavior to personalize experiences. Indian e-commerce firms like Flipkart and BigBasket have integrated recommendation engines with chatbots.

6.4 Analytics and Insights

Conversational AI logs provide insights into customer behavior, popular queries, sentiment trends, and product feedback.

VII. LIMITATIONS AND CHALLENGES

7.1 Language and Contextual Understanding

Bots may misinterpret intent, especially with idioms, regional expressions, or code-mixing (e.g., Hinglish). Emotion and sarcasm remain difficult to detect.

7.2 Complex and Sensitive Queries

Customers dealing with complaints or health issues often prefer human empathy over scripted responses. Chatbots can escalate queries, but delays can frustrate users.

7.3 Trust and Acceptance

Studies (Saklani & Kala, 2024) show that while Gen Z prefers speed, many still mistrust bots in high-stakes situations. Voice-based bots raise additional concerns about privacy.

7.4 Maintenance and Updates

AI systems require continuous training, data updates, and bug fixing. Integration with legacy CRMs can be challenging.

VIII. USER PERCEPTIONS AND EXPERIENCE

8.1 Satisfaction Studies

A McKinsey survey [47] found 72% of users were satisfied with AI support for simple queries, but only 41% for complex problems.

8.2 Influencing Factors

Key factors include:

- Response speed and relevance
- Human fallback options
- Empathy in tone
- Multilingual support

8.3 Human vs. AI Agent Preference

Hybrid systems are gaining popularity, combining automated assistance with seamless handover to live

agents. This “human-in-the-loop” approach balances efficiency with emotional support.

IX. ETHICAL CONSIDERATIONS

As artificial intelligence becomes more deeply integrated into customer service, ethical considerations are gaining critical importance in how these technologies are designed and deployed. It is no longer just about efficiency or automation—there is a growing need to ensure that AI systems reflect and protect human values. Key principles such as fairness, user privacy, and transparency must be embedded into AI solutions to build customer trust and ensure their long-term acceptance and reliability.

9.1 Data Privacy and Security

Every AI-driven customer service platform operates on customer data which is quite sensitive and imposes serious concern to user data privacy and security also. These virtual assistants often rely on large volumes of personal data, including user names, transaction history, preferences, and contact details. This data enables systems to offer personalized and efficient responses but also introduces serious concerns related to data privacy, security, and consent.

Weak data protection measures—such as unauthorized access, insufficient encryption, or improper handling of stored information—can seriously undermine user trust. For instance, if a chatbot stores sensitive details like payment information without adequate security or collects personal data without clear user consent, it can lead to serious privacy violations. Such actions may also breach important data protection laws, including India’s Digital Personal Data Protection Act (2023) and the European Union’s General Data Protection Regulation (GDPR) [48], [49]

Furthermore, businesses must ensure that AI systems comply with evolving regional policies such as the Reserve Bank of India’s (RBI) cybersecurity norms for financial services, especially when dealing with sensitive financial data [50].

9.2 Bias and Fairness

AI systems learn from past data, which can often include hidden biases related to race, gender, language, or region. In customer service, these biases can lead to unfair treatment—for example,

responding less accurately to people who speak a regional language or have a different accent. A chatbot trained mostly on English might not understand users speaking in Hindi or other Indian languages, which is a serious issue in a multilingual country like India.

To make AI systems more fair, developers need to train them using diverse and inclusive data, regularly check for bias through audits, and use machine learning techniques that help reduce bias—like reweighting data or applying special fairness algorithms. It's also important to involve experts from different fields, such as language specialists, ethicists, and social scientists, during the design process. Bias in AI isn't just a technical problem—it can affect real people, especially in systems that don't have much human supervision.

9.3 Transparency and Accountability

Transparency is one of the most important aspects of using AI ethically. People should always know when they're talking to a machine and how their personal data is being used. If this isn't made clear, it can lead to confusion, frustration, and a lack of trust—especially when chatbots don't solve problems effectively.

Important practices to improve transparency include:

- Show clear disclosures at the start of the chat (e.g., "You are chatting with a virtual assistant") so users know they are interacting with AI.
- Provide easy options to escalate the conversation to a human agent when needed.
- Use Explainable AI (XAI) techniques to give users simple explanations for how the AI made a decision.
- Maintain audit trails of conversations—especially in sensitive areas like healthcare and finance—to ensure accountability and compliance.

Additionally, organizations should establish accountability frameworks, assigning responsibility for how AI systems behave and how failures or miscommunications are handled. This aligns with the Responsible AI principles outlined by organizations like NITI Aayog (India's public policy think tank) and the OECD AI framework[[51][52]

X. RECENT ADVANCES AND TRENDS (2022–2025)

The field of AI-powered customer service has seen significant innovation between 2022 and 2025. These advances have made virtual assistants smarter, more inclusive, and capable of understanding users more naturally. Below are some of the most impactful trends shaping the future of conversational AI.

10.1 Large Language Models (LLMs)

Recent years have witnessed the rapid growth of Large Language Models (LLMs) such as GPT-4o (OpenAI), Claude (Anthropic), Gemini (Google DeepMind), and India's own Krutrim. These models can hold natural, fluent, and multi-turn conversations with users. They are capable of not just answering queries, but also performing tasks like content summarization, decision support, and contextual reasoning—improving customer experience significantly. Their ability to learn from few examples makes them highly adaptable across domains and industries [53].

10.2 Multilingual and Vernacular AI

India has been at the forefront of vernacular AI development, with startups like Sarvam AI and AI4Bharat creating LLMs that understand and generate content in languages like Hindi, Tamil, Bengali, Marathi, and more. These models are tailored to India's diverse linguistic landscape, allowing companies to engage a wider audience and provide support in users' preferred languages. Tools like IndicBERT and Bhashini (India's national language translation mission) also contribute to inclusive AI development.

10.3 Emotionally Intelligent Bots

Most companies today focus on the emotional aspect of a customer with the help of AI. This is being done through the emotional intelligence an emerging area in AI customer support. These AI systems are capable of detecting different emotional and sentimental tone cues in user messages and adjust their responses accordingly. For instance, if a user appears frustrated, an emotionally aware chatbot can respond with empathy or quickly transfer the conversation to a human agent. Research suggests that such emotionally intelligent bots can boost customer satisfaction and increase customer loyalty, and better trust in AI interactions [54]. These systems are

especially useful in sensitive areas such as healthcare and customer complaint resolution, where empathy and accuracy are crucial.

10.4 Voice-First and Multimodal Interfaces

Voice interfaces are becoming more popular with the rise of smart speakers, IVR systems, and mobile voice assistants. They offer an easy and accessible way to use technology, especially for people who are visually impaired, elderly, or have limited reading skills. Tools like Google Assistant, Alexa, and Airtel's voice AI now support commands in Indian languages, making them more user-friendly for diverse populations. In addition, many startups are developing multimodal interfaces that blend voice, touch, and visual elements to create a richer and more intuitive user experience (Sharma & Rao, 2024).

XI. CONCLUSION AND FUTURE DIRECTIONS

This paper underscores the transformative role of artificial intelligence (AI), particularly through chatbots and virtual assistants, in redefining customer service across diverse industries. Through a comprehensive synthesis of existing literature and applied case studies, we identified key technological enablers, adoption patterns, and the operational impact of AI-powered conversational systems.

Our findings suggest a steady evolution towards emotionally aware, multilingual, and hybrid human-AI models, especially in contexts requiring personalization at scale. While these systems offer measurable gains in efficiency, scalability, and user satisfaction, challenges related to empathy, bias, and data privacy remain critical.

Emerging advancements, including large language models, vernacular AI, and multimodal interfaces, are poised to enhance customer engagement in increasingly complex and culturally diverse environments. To ensure responsible adoption, organizations must design AI tools that are transparent, fair, and ethically aligned. Key recommendations include combining automated agents with human support in high-stakes scenarios, investing in multilingual capabilities, and building AI systems that reflect diverse user needs.

Future research could focus on measuring the long-term impact of AI on customer trust and loyalty, evaluating real-time hybrid service models, and exploring the integration of AI with augmented

reality and on-device privacy-preserving technologies.

Overall, AI holds great promise in enhancing customer service, but its success will depend on how well it is aligned with human values, emotional intelligence, and ethical design principles.

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