World Journal of Advanced Engineering Technology and Sciences
eISSN: 2582-8266
Cross Ref DOI: 10.30574/wjaets
Journal homepage: https://wjaets.com/

(REVIEW ARTICLE)

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From scripted replies to intelligent assistance: A study on artificial intelligence chatbots in user support

Alexandre Davitaia *

Independent Researcher, Germany.

World Journal of Advanced Engineering Technology and Sciences, 2025, 15(03), 1160-1164

Publication history: Received on 28 April 2025; revised on 08 June 2025; accepted on 10 June 2025

Article DOI: https://doi.org/10.30574/wjaets.2025.15.3.1036

Abstract

From early rule-based systems to modern intelligent assistants, this paper explores the development and effects of AI-driven chatbots in user support. We examine how conversational agents have developed historically, look at their current uses in the fintech (banking and financial services), e-commerce (online retail), and healthcare industries, and talk about potential future developments. Zalando's ChatGPT fashion assistant (Europe) in e-commerce, Bank of America's Erica (USA) and Swedbank's Nina (Sweden) in fintech, and new AI symptom-checkers in healthcare are real-world examples that demonstrate these trends.We analyze how modern chatbots employ machine learning and natural language processing to provide 24/7 customer support, reduce costs, and personalize experiences. Finally, we address anticipated advances (e.g. integration with generative AI and IoT health monitoring) and challenges such as trust, privacy, and regulatory compliance. Our study draws on industry reports and academic sources to present a comprehensive overview.

Keywords: Artificial Intelligence; Chatbots; User Support chats; Software agents

1. Introduction

In online customer service, chatbots—software agents that mimic human communication—have proliferated. Modern chatbots, which were once restricted to scripted, keyword-driven interactions, are increasingly using artificial intelligence (AI) to comprehend user intent and offer context-aware responses. Developments in machine learning (ML) and natural language processing (NLP) have propelled this evolution. AI chatbots now perform vital support tasks for a variety of industries by providing automated self-service, guided assistance, and immediate answers. Chatbots are used by banks and fintech companies in financial services for tasks like fraud alerts and balance inquiries; by retailers in e-commerce for product recommendations, order tracking, and virtual shopping assistance; and by healthcare organizations for symptom triage, appointment scheduling, and patient education. Our paper explores this journey "from scripted replies to intelligent assistance," focusing on the historical progression, current deployment in fintech, e-commerce, and healthcare, and future outlook. We incorporate real-world examples from both the United States and Europe, and provide an academic perspective with cited sources.

2. Historical Evolution of AI Chatbots

The concept of a conversational computer program dates back to Alan Turing's 1950 question of whether machines can exhibit human-like conversation. However, practical chatbots began in the 1960s. *ELIZA* (1966) was one of the first chatbots: it mimicked a Rogerian psychotherapist by reflecting user input through pattern-matching rules. Although ELIZA could carry on simple text dialogues, it had no real understanding and covered only very limited topics (e.g. responding to "I am sad" with "Why are you sad?"). A subsequent program, *PARRY* (1972), simulated a patient with

* Corresponding author: Alexandre Davitaia

schizophrenia using a rule-based model of "assumptions" and emotional weights. Like ELIZA, PARRY showed that simple AI rules could convincingly sustain conversation for short periods.

In the 1990s, chatbots moved online. *ALICE* (Artificial Linguistic Internet Computer Entity, 1995) introduced the AIML markup language for building extensive pattern libraries. ALICE's knowledge base had tens of thousands of templates, vastly more than ELIZA's few hundred patterns. Despite this expansion, ALICE still relied on scripted templates and lacked true language understanding. In 2001, *SmarterChild* on AOL and MSN became one of the first chatbots with dynamic, up-to-date information: it could answer questions about weather, news, or sports by fetching data in real-time. This marked a turning point: chatbots were now helpful for everyday tasks, retrieving live information through conversation.

Voice-driven AI assistants, such as Google Assistant, Amazon's Alexa, and Apple's Siri, were introduced in the 2010s and integrated cloud services, natural language processing, and speech recognition. These systems could handle spoken commands and perform tasks like setting reminders or controlling smart home devices. Simultaneously, customer support bots started moving from inflexible scripts to AI-driven systems. Early strategies in the 2010s frequently combined live agents and chatbot modules: basic bots would respond to basic inquiries or frequently asked questions before referring more complicated problems to humans. More adaptable, intent-based chatbots were made possible over time by the integration of machine learning. Large language models and deep learning are used by contemporary AI chatbots to comprehend free-form questions and produce logical responses.For example, by the early 2020s, companies began integrating generative AI (like ChatGPT) into chatbots to support nuanced customer interactions (see Section on E-commerce). In summary, chatbots evolved from **scripted pattern-matchers** in the 1960s–90s to today's **intelligent, data-driven assistants** capable of understanding intent and learning from interactions.

3. AI Chatbots in Fintech (Banking and Finance)

- **Enhanced Support and Personalization.** In the financial sector, AI chatbots have become vital for 24/7 customer assistance. Banks and fintech companies use chatbots to answer queries on account status, payments, fraud alerts, and more. Importantly, chatbots improve response speed and availability: as Infobip (2023) notes, "AI chatbots offer 24/7 support and faster response times" so clients can get help anytime for account inquiries or scheduling. This around-the-clock availability is critical in finance, where timely answers can prevent missed payments or detect fraud. Chatbots also personalize interactions by analyzing a user's financial behavior. For example, if a bot detects rising spending, it might suggest budgeting tools or higher savings interest rates. These proactive insights increase engagement and customer satisfaction. As Infobip points out, chatbots can leverage financial data to recommend products ("personalized sales and upselling") and can save the industry billions by automating routine support tasks.
- Efficiency and cost reduction. Reduced support costs are advantageous to financial institutions. Common questions (password resets, balance checks, transaction history) can be handled by chatbots without the need for human assistance. According to Infobip, banks could use chatbots to reduce support expenses by an estimated $7.3 billion a year. Additionally, chatbots are capable of triage: AI handles simple cases, while specialized agents handle complex ones. Call centers can concentrate on sales or high-value consultations thanks to this "bot-human collaboration," which increases productivity.
- **U.S. Example – Bank of America's Erica.** In practice, major U.S. banks have aggressively adopted chatbots. Bank of America launched *Erica* in 2018 as a virtual financial assistant in its mobile app. By 2024 Erica had engaged over **42 million clients** and answered **2 billion interactions**. According to Bank of America's press release, Erica processes about 2 million sessions per day, helping customers with tasks like viewing balances, paying bills, and receiving spending insights. The bot proactively sends about 30 personalized "insights" per month (e.g. alerts on unusual spending). Bank of America notes that Erica has responded to 800 million inquiries and delivered 1.2 billion personalized insights to date. In short, Erica exemplifies a large-scale AI support agent that functions as a 24/7 "concierge" for routine financial needs.
- **European Example – N26 and Swedbank.** Europe has similarly embraced banking chatbots. The German mobile bank *N26* implemented an AI assistant (built on the Rasa platform) to improve multilingual customer service. After launch, N26 saw **20%** of support chats handled by the chatbot, with a goal of reaching 30%. This allowed N26 to scale to millions of users while maintaining service quality. In Sweden, Swedbank's *Nina* (live since 2014, AI-enabled in 2016) now handles roughly 40,000 conversations per month, resolving about **81%** of customer queries on first contact. Bank managers report that Nina's automation lets human agents focus on sales and complex issues. Both examples illustrate how AI chatbots in Europe are increasing efficiency and customer satisfaction in banking, much like their U.S. counterparts. In summary, across fintech, AI chatbots have transformed customer support into a continuous, data-driven service, meeting modern clients' expectations for instant, personalized financial guidance (Bank of America, 2024; Infobip, 2023).

4. AI Chatbots in E-Commerce

Customized Support and Shopping. Chatbots are used in e-commerce as marketing tools, virtual sales assistants, and customer support representatives. They assist customers with orders or returns, answer inquiries about specifications, and lead customers through product catalogs. Chatbots can personalize online shopping by speaking in natural language. For example, chatbots are used by retailers to recommend products or offer fashion advice. H&M's fashion bot on the messaging app Kik, which offered style tests and outfit recommendations, was one early example. In a similar vein, Sephora's Kik chatbot quizzed and offered beauty advice to its customers. These bots mimicked conversational in-store advice. Leading e-commerce companies are incorporating cutting-edge AI today. Notably, in 2023, Zalando, a significant online fashion retailer in Europe, announced a fashion assistant powered by ChatGPT.This assistant lets customers ask open-ended fashion questions ("What should I wear to a summer wedding?") using their own words, and provides personalized clothing recommendations. The goal is to make the shopping process more intuitive and interactive. Other retailers (e.g. Zalando, as well as brands like Adidas and Decathlon) leverage AI chatbots to improve product discovery, mimic customer service, and even enable virtual try-ons or sizing assistance.

- **Customer Service Automation.** E-commerce chatbots also handle after-sales support. They answer FAQs (shipping status, returns policies), and can escalate issues to human agents when needed. This reduces wait times and increases order accuracy. According to a trade blog, many e-merchants use chatbots for "order status" and "payment" queries, freeing up live agents for complex problems. A data-driven estimate suggests that by 2025, about 80% of all online shopping interactions will involve some form of AI. In practice, bots can automate tasks like cart recovery (reaching out when a shopper abandons their cart) and lead generation by qualifying prospects via chat.
- **U.S. Example – Conversational Commerce.** In the U.S., large retailers and startups alike use chatbots. Amazon, for example, employs AI for its voice assistant Alexa which can facilitate shopping orders (though not purely a "chatbot," it similarly automates customer support queries). Other U.S. brands have experimented: e.g., Domino's Pizza's "Dom" bot for voice ordering, or Macy's customer service bots. Moreover, marketers use messaging platforms (like Facebook Messenger, WhatsApp) with AI bots to engage customers. A hallmark U.S. example is Sephora's chatbot-driven contest on Kik, which attracted users with interactive beauty quizzes.
- **European Example – Zalando and Others.** In Europe, beyond Zalando, many e-retailers use chatbots. For instance, Zalando's ChatGPT assistant is being rolled out to users in Germany, Austria, Ireland, and the UK. The beta version allows customers to have ongoing conversations and refine product searches with natural language. This illustrates the cutting-edge of e-commerce chatbots in Europe. Additionally, traditional retailers like H&M (Sweden) and others continue to innovate with style-chatbots on social platforms. The net effect is that AI chatbots in e-commerce are shifting from fixed Q&A scripts to more fluid, conversation-based shopping aids.

In conclusion, e-commerce chatbots improve the customer experience by lowering support overhead and offering immediate, customized shopping assistance. They serve as a virtual salesperson, available around-the-clock, assisting customers with product discovery, responding to inquiries, and even upselling. In terms of engagement and conversion, real-world implementations (Sephora, H&M, Zalando) show a noteworthy return on investment. According to one industry report, competitive online retailers now need "AI-powered solutions," such as chatbots for customer support and tailored recommendations.

5. AI Chatbots in Healthcare

- **Patient Support and Involvement.** The use of chatbots in the healthcare industry is more recent but is expanding quickly. The goals of AI assistants in healthcare are to reduce staff administrative workloads and enhance patient access to information. Symptom checking, medication reminders, appointment scheduling, and responding to frequently asked health-related questions are examples of common uses. At any time of day, chatbots can consistently and sympathetically respond to simple inquiries, such as "What are the side effects of this medication?" This round-the-clock accessibility is particularly helpful in the medical field, where prompt advice can have a significant impact on results. One overview points out that a major advantage is that healthcare chatbots "never sleep," providing patients with round-the-clock, immediate assistance. Additionally, they can customize care. For instance, a bot could modify recommendations to fit a diabetic patient's schedule or notify a provider of urgent symptoms.
- **Clinical Use Cases and Digital Triage.** Many healthcare chatbots function as triage tools. A patient may describe symptoms to a symptom-checking bot (like Babylon Health's or Ada Health's apps), which then guides them through questions and suggests possible conditions. A notable recent study (Stanford, 2025) reported that AI chatbots outperformed conventional methods in diagnostic decision-making and were on par with

ChatGPT-level systems. Although still investigational, such results hint at chatbots' potential in clinical support. Other use cases include mental health (e.g. *Woebot* or *Wysa*, which engage patients in cognitive-behavioral therapy techniques), chronic disease management (sending medication reminders or logging vitals), and general patient education. Hospitals have also piloted chatbots to streamline tasks; for example, one project used a chatbot to help patients fill out pre-visit forms and learn about procedures.

- **U.S. and European Examples.** In Europe, *Ada Health* (Germany) offers a well-known AI symptom checker. Ada's AI engages users with questions about symptoms and then gives a diagnosis-like suggestion; its accuracy in simple cases rivals that of physicians in some studies. In the UK, *Babylon Health* deployed a chatbot that asks health-related questions and connects users to telemedicine if needed. Both are used by millions as part of digital health services. In the U.S., examples include *Buoy Health*, an AI symptom checker used by Kaiser Permanente, and *Mayo Clinic's chatbot*, which answers patient inquiries on common topics. Additionally, the U.S. Veterans Health Administration launched a chatbot for COVID-19 screening at the pandemic's start. While we do not detail each, these examples underscore that both American and European healthcare systems are experimenting with chatbots to improve access and efficiency.
- **Difficulties.** The stakes are high for healthcare chatbots because providing patients with the wrong advice could be harmful. Safety and accuracy are therefore crucial. Other concerns include trust (patients may be dubious of automated advice) and privacy (sensitive health data must be protected under HIPAA or GDPR). According to a literature review, ensuring empathy and dependability are challenges, while user trust and integration into care are success factors. For example, as AI chatbots proliferate, a European review raises concerns regarding data security and legal issues. Healthcare chatbots are increasingly viewed as "digital allies" that can expedite patient triage and free up clinicians for complex care, despite these obstacles.

6. Future Outlook of AI Chatbots in User Support

Looking ahead, AI chatbots are expected to become more advanced, personalized, and integrated. Key trends include:

- **Generative AI and Conversational Fluency.** The rise of large language models (LLMs) like GPT-4 is accelerating chatbot capabilities. Integrating generative models allows chatbots to handle more natural, open-ended conversations. For example, Zalando's ChatGPT-based assistant demonstrates how e-commerce bots can now discuss broad topics in users' own language. We can anticipate chatbots in all sectors using similar models to generate contextually rich responses. This will improve user experience but also raises concerns about factual accuracy and hallucinations, which must be managed.
- **Multimodal and Voice Interfaces.** Future chatbots will increasingly support voice (spoken) as well as text, blurring the line between chatbots and voice assistants. In financial services, voice-bot integration means customers could speak commands to check balances. In healthcare, voice-enabled bots could assist visually impaired patients. Additionally, chatbots may tap into IoT data. For instance, one review suggests pairing health chatbots with wearable devices (smartwatches, glucose monitors) for continuous monitoring. A diabetic patient's bot might automatically note blood glucose from a wearable and adjust reminders. Such IoT integration will make chatbots more proactive and personalized.
- **Human-AI Collaboration.** Rather than replacing humans, chatbots will likely become "co-pilots" that assist human support agents. Current trends favor hybrid models where bots handle routine tasks and smoothly transfer to humans when needed. In healthcare and banking alike, we can expect more sophisticated handoff protocols and shared interfaces. For example, Infobip reports that banks are introducing "virtual assistants" that reduce agent workload by 50% (see Infobip banking trends). The goal is a seamless user experience: customers get immediate AI help, and are connected to humans only when it adds value.
- **Cross-Regional and Cross-Sector Expansion.** We expect chatbots to become standard across more countries and industries. However, regional differences will matter. Research indicates that user satisfaction with chatbots can vary by country (USA vs. UK) due to cultural expectations. Companies will need to tailor chatbots linguistically and culturally. In regulated sectors (banking, health), compliance with local laws (e.g. GDPR in Europe) will shape design.
- **Regulation and Ethics.** As chatbots grow more powerful, regulations will catch up. The EU's proposed AI Act may impose transparency and safety requirements on "high-risk" bots. Financial regulators may scrutinize AI advice in banking, and healthcare authorities will demand medical oversight for health bots. Ethical concerns – like bias in AI responses – will be a focus of future research. Ensuring that chatbots do not inadvertently propagate misinformation or unfair practices will be a key challenge.
- **Metrics and Adoption.** Organizations will increasingly quantify chatbot impact through metrics like first-contact resolution rate, customer satisfaction, and cost savings. Early successes, such as 86% reduction in wait times achieved by an ecommerce bot (case study of eye-oo store), will motivate others. Over time, user

expectations will rise: by 2025, many consumers may prefer interacting with bots if they are convenient and personalized.

In conclusion, AI chatbots have the potential to become increasingly human-like and essential to customer service. According to a 2025 health-tech analysis, for instance, AI chatbots have surpassed human clinicians in certain diagnostic tasks and will soon act as "AI co-pilots" to increase the capacity for care in the United States (due to provider shortages). Similarly, advanced personalization and even closer AI-human integration will be seen in banking and retail. Future healthcare chatbots will combine AI advancements with IoT data to manage chronic diseases and provide real-time assistance, according to researchers like Ng (2025). Overall, the trend is evident: chatbots will progress from providing pre-programmed responses to providing intelligent support that continuously learns and anticipates the needs of users in various industries (Adamopoulou & Moussiades, 2020; Lohani, 2025).

7. Conclusion

AI chatbots have evolved from basic scripted applications to intelligent customer service representatives. In the past, chatbots evolved from ELIZA's rule-based responses to the machine-learning-powered conversational systems of today. In reality, contemporary chatbots are improving customer service in the fintech, e-commerce, and healthcare industries. Around the world, chatbots are now used by banks like Bank of America and N26, retailers like Zalando and Sephora, and healthcare providers to respond to standard questions, handle triage problems, and customize interactions. According to industry reports, these systems increase user satisfaction, lower expenses, and provide round-the-clock service. Adoption of chatbots has observable advantages, as demonstrated by real-world examples, including quicker responses, higher first-contact resolution rates, and even higher sales conversions.

AI chatbots are expected to grow even more sophisticated and integrated in the future. More natural conversations are anticipated thanks to developments in NLP and generative AI, and proactive financial and health coaching will be made possible by IoT and data analytics. Accuracy, empathy, privacy, and regulatory compliance are still difficult to guarantee, though. To foster trust, stakeholders must carefully craft chatbot experiences. Combining AI effectiveness with human values should be the main goal for both industry and researchers. In the end, the future is in "AI-human symbiosis," where chatbots manage repetitive tasks and free up humans to concentrate on more complex decisions, as the literature has echoed (Bank of America, 2024; Ng, 2025). Chatbots will continue to develop from simple scripted assistants into intelligent virtual assistants that greatly enhance user support across industries if they are properly steered.

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