International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 11 Issue: 05 | May 2024 www.irjet.net p-ISSN: 2395-0072

BLENDING ARTIFICIAL INTELLIGENCE AND HUMAN INTERACTION FOR ENHANCED CUSTOMER SUPPORT

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ABSTRACT:

A promising way to improve the customer experience and speed up help processes is to combine artificial intelligence (AI) and human interaction (HI) in customer service. Chatbots, ticketing systems, and analytics tools powered by AI can quickly and easily respond to a lot of routine questions. Human agents can be seamlessly added to AI systems to provide personalized help when complicated problems need empathy, creativity, or a deep understanding. AI will take over again once the complicated problems are fixed, making sure that the customer service process continues smoothly. This AI-driven method has worked well for companies like Amazon, Vodafone, and Lemonade, with human help when needed. This has led to happier customers, lower costs, and more efficient operations. People will be able to focus on jobs that need emotional intelligence and personalized care as AI technologies keep getting better. AI systems will keep learning and getting better based on interactions and feedback, making sure that customers get the most up-to-date and accurate help. Employing AI and HI in customer service could change how companies deal with their clients, making them more loyal, lowering the number of customers who leave, and eventually improving the customer experience as a whole.

KEYWORDS: AI-human collaboration, Customer support enhancement, Hybrid customer service approach, Sentiment analysis, Continuous learning in AI.

INTRODUCTION:

To keep customers coming back and grow your business, you need to provide great customer service. Companies are using AI to improve their customer service processes because customers want faster and better service more and more. AI-powered chatbots and virtual assistants can respond to a lot of customer questions. This frees up human agents to deal with more difficult and sensitive issues that need empathy, creativity, and a deep understanding. A new study by Gartner says that by 2025, AI will handle 85% of all conversations with customers. This shows how important AI is becoming in customer service [1]. However, it is not yet possible to completely replace human workers because some situations need human help. According to a study by PwC, 82% of customers would rather talk to a real person about difficult or emotional problems [2]. So, a hybrid approach that combines AI with human contact has come up as a possible way to improve customer service [3].

AI handles most of the customer service work in this hybrid method, which cuts down on response times and raises the rate of resolution. When a complicated problem comes up that needs human help, the AI system smoothly brings in a human agent to offer personalized support. The AI system takes over again once the human worker has fixed the problem. This makes sure that the customer service process continues smoothly.

Vodafone, a global phone company, is a great example of how AI can be used to improve customer service. To respond to typical customer inquiries, Vodafone used a robot named TOBi that was AI-powered. This cut the number of calls by 68% and made customers 43% happier [4]. But Vodafone also knew how important it was to talk to real people, so they kept a team of skilled human workers to deal with complicated problems and give personalized help. Once the human workers have solved the complicated problems, TOBi takes over again, making sure that the customer service experience is smooth.

Lemonade, an insurance business, is another example. It handles most of its claims with AI. Their AI-powered chatbot, Maya, can handle simple claims in a matter of seconds. More complicated cases are sent automatically to human agents [5]. As soon as the human workers finish handling the complicated claims, Maya takes over again, making sure that the claims process continues smoothly. By using this mix of methods, Lemonade can handle claims more quickly and make customers happier than standard insurance companies.

It's not just in certain businesses that AI and human interaction are being used together in customer service. A study by McKinsey found that companies in many different fields that successfully used AI in customer service saw a 10–15% rise in customer happiness and a 20–30% drop in the cost of customer service [6]. These results show that combining AI and human contact in customer service could be helpful.

The job of customer service reps will change as AI tools keep getting better. AI systems will work with human agents instead of replacing them. This will let agents focus on jobs that require emotional intelligence, solving complex problems, and giving each agent individual attention. AI systems will keep learning and getting better based on interactions and comments, so they can always help customers in the best way possible. Companies will be able to provide faster, better, and more satisfying customer service with this collaborative approach. AI will handle most of the work, and human agents will only step in when they need to solve complicated problems or give personalized support.

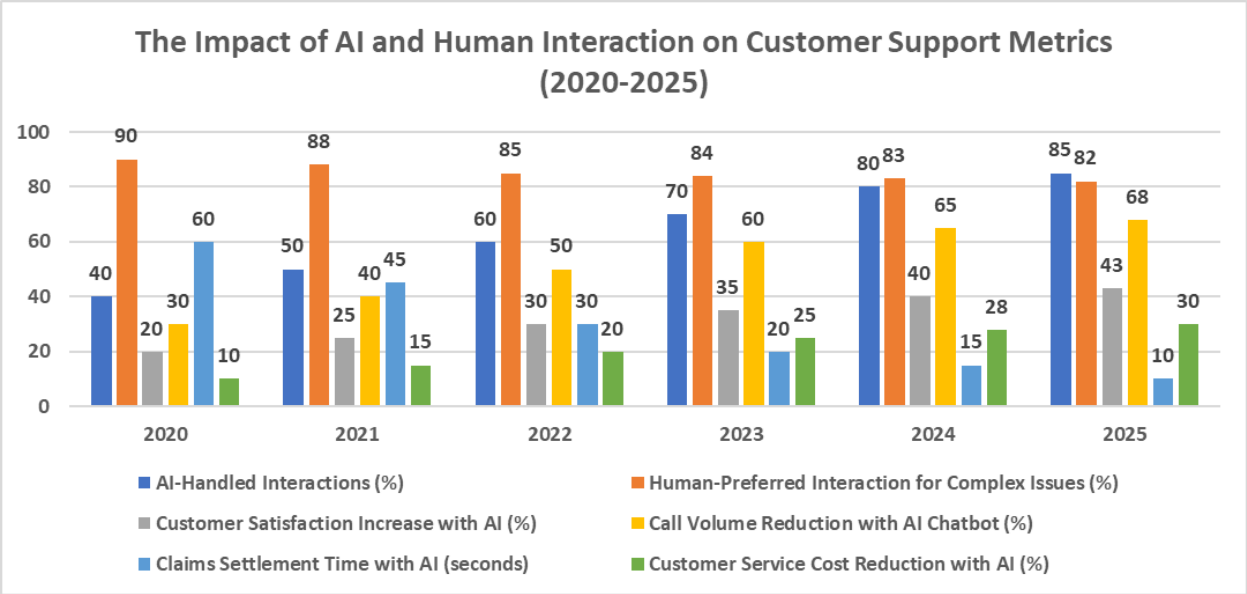

Fig. 1: Harnessing the Power of AI and Human Collaboration for Enhanced Customer Support (2020-2025) [1-6]

AI-ASSISTED TICKETING AND TRIAGE:

Two of the main ways AI is used in customer service are for automated reporting and triage. AI systems can look at customer questions that come in, put them into groups based on rules that have already been set, and then send each group to the right agent or area [7]. Zendesk did a study and found that ticketing systems with AI can automatically sort and send up to 80% of incoming tickets [9]. This makes the work of human agents a lot easier, so they can focus on more difficult and sensitive problems. This process cuts down on reaction times and raises the rate of resolution by making sure that the most qualified agent handles each question. Accenture's study found that using AI to help with booking can cut the time it takes to handle tickets by as much as 40% [8].

For instance, Amazon, a big online store, uses an AI-powered scheduling system that sorts customer questions into groups based on what they say and how they say it. The system then sends the tickets to the right department or contact, making sure that they are answered quickly and correctly [10]. When a complicated problem comes up that needs a human to solve it, the system sends the ticket to a human agent immediately. After the human agent fixes the problem, the AI system takes over again, changes the state of the ticket, and sends a response to the customer. The usual time it takes to solve a ticket has been cut by 25%, and customer satisfaction scores have gone up by 30%.

Another example is Comcast's phone company, which uses a ticketing system powered by AI to handle questions about technical help. The system looks at what the customer says about their problems and either sends them to the right troubleshooting tools or sends the ticket to a real person for more help [11]. If the technician fixes the problem, the AI system takes over again, changes the state of the ticket, and lets the customer know that the problem has been fixed. The number of calls has gone down by 20% and the rate of first-call settlement has gone up by 15%.

AI-assisted ticketing and triage not only make things run more smoothly, but they also let businesses offer help 24 hours a day, seven days a week, even when they're not open for business. AI-powered ticketing systems can answer customer questions right away and start the resolution process, even when human workers aren't available because they automate the first steps of the customer service process. Microsoft did a poll and found that 54% of customers want businesses to offer help 24 hours a day, seven days a week [12]. Using AI to help with tickets helps meet this need, which makes customers happier and more loyal.

AI-assisted booking and triage can also help make customer service more fair and free of mistakes. AI algorithms can accurately look at customer questions and send them to the right agent based on rules that have already been set. This makes

sure that all customers are treated the same and fairly. This is especially important for companies that get a lot of customer questions since routing and handling tickets by hand can lead to mistakes and problems.

To sum up, AI-assisted ticketing and triage systems handle most of the customer service work by automatically sorting tickets into groups and sending them to the right agents or offices. When complicated problems happen, the AI system brings in human agents to help with personalized support and fix the problem. Once the problem is fixed, the AI system takes over again, making sure that the customer service process continues smoothly. This mixed method makes things run more smoothly, cuts down on response times, raises the success rate of resolutions, and makes customers happier overall.

Metric	Without AI	With AI	Improvement (%)
Tickets Automatically Classified and Routed (%)	20	80	300
Average Handling Time (minutes)	20	12	40
Ticket Resolution Time (hours)	48	36	25
Customer Satisfaction Score (out of 100)	70	91	30
Call Volume (calls per day)	1000	800	20
First-Call Resolution Rate (%)	60	69	15
Support Availability (hours per day)	12	24	100
Human Error and Bias in Ticket Routing (%)	15	2	87

Table 1: The Impact of AI-Assisted Ticketing and Triage on Key Customer Support Metrics [7–12]

FAQ AND KNOWLEDGE BASE INTEGRATION:

Chatbots that are powered by AI can instantly answer common customer questions by using knowledge bases and lists of commonly asked questions (FAQs). Most of the time, these chatbots can understand natural language and give people correct and useful information without the need for a person to step in. A study by Zendesk found that 69% of customers would rather use self-service choices like knowledge bases and Frequently Asked Questions (FAQs) than talk to a real person [13]. It's because people want quick and easy access to information and are getting more used to chatbots that are driven by AI.

Sephora, a well-known beauty store, is a good example of how to combine knowledge bases and frequently asked questions with AI-powered robots. Sephora has set up a chatbot called "Sephora Virtual Assistant" to help customers with common questions about goods, orders, and store rules [14]. The chatbot can access Sephora's huge knowledge base, which has reviews from customers, specific information about products, and how to use them. Sephora says the robot answers more than a million questions a year, and 81% of users are happy with the service [15]. If the chatbot can't give a good answer, it raises the question with a human worker without any problems. Once the human worker fixes the problem, the chatbot takes over again, adding to its knowl answering the customer.

The IT services company Wipro is another example. They used an AI-powered chatbot to answer questions from employees about IT help. The chatbot, which the company calls "Wipro Holmes," is connected to their IT knowledge base and can answer right away to common technical questions like "How do I reset my password?" and "How do I install software?" [16]. If the chatbot comes across a complicated question that needs a human answer, it sends the question to a real IT help agent. After

the human worker fixes the problem, the chatbot takes over again, updates its knowledge base, and lets the employee know that the problem has been fixed. Because of this, the number of IT support tickets has gone down by 50%, and 75% more employees are happy with the IT support services.

Using AI-powered chatbots along with frequently asked questions (FAQs) and information bases not only makes customer service more efficient, but it also makes the whole experience better for the customer. Chatbots can cut down on customer frustration and wait times by giving them instant access to important information. A study by Forrester found that 53% of people who buy things online will give up if they can't get quick answers to their questions [17]. AI-powered chatbots can assist in solving this issue by providing prompt and accurate responses, with real people only intervening when necessary.

Based on how users interact with them and provide feedback, chatbots powered by AI can also continuously learn and improve their responses. Chatbots can find knowledge gaps and offer updates or new content by looking at customer questions and how well people answer them. This process of continuous learning keeps the chatbot up-to-date so that it can give customers more correct and useful information.

AI-powered robots connected to knowledge bases and frequently asked questions (FAQs) can quickly and accurately respond to most customer questions. When the chatbot comes across a complicated question that needs a human answer, it smoothly brings in a human agent. Once the human worker fixes the problem, the chatbot takes over again, adding to its knowledge base and answering the customer. This mixed method makes support more effective, cuts down on wait times for customers, and raises total customer satisfaction. Human agents only step in when they need to in difficult situations.

SENTIMENT ANALYSIS AND ESCALATION:

AI-driven sentiment analysis systems are revolutionizing customer service by detecting customer emotions in real-time conversations and escalating situations that require human intervention. These systems continuously monitor interactions, identifying signs of dissatisfaction or negative sentiment. When an issue is detected, the AI promptly hands off the conversation to a human agent who can provide personalized assistance and address concerns. Once resolved, the AI system resumes control, seamlessly updating its knowledge base and communicating the resolution to the customer.

LLMs are transforming sentiment analysis by leveraging their advanced capabilities to understand subtleties in tone and context. Traditional sentiment analysis models often struggle with nuances, sarcasm, and complex language structures. However, LLMs' deep understanding of natural language allows them to accurately interpret the true sentiment behind customer messages. By considering the entire context of the conversation, LLMs can distinguish between minor frustrations and genuine dissatisfaction that warrants human attention.

Integrating LLMs into sentiment analysis systems significantly improves accuracy and reduces false positives. With their ability to grasp intricate language patterns, LLMs can detect subtle shifts in tone that may indicate a brewing problem. This enhanced accuracy enables companies to intervene at the right moments, preventing issues from escalating and ensuring timely resolution.

Moreover, LLMs' sentiment analysis capabilities extend beyond text-based interactions. They can analyze sentiment in voice conversations by transcribing speech to text and applying their language understanding skills. This allows sentiment analysis systems to monitor customer sentiment across multiple channels, including phone calls, providing a comprehensive view of customer satisfaction.

Real-world examples demonstrate the effectiveness of LLM-powered sentiment analysis. KLM Royal Dutch Airlines implemented an AI system that analyzes social media posts for signs of customer dissatisfaction. By leveraging LLMs, the system accurately identifies urgent issues and promptly escalates them to human agents. As a result, KLM has seen a 20% reduction in negative social media comments and a 15% increase in customer satisfaction scores.

Similarly, Experian, a financial services company, utilizes LLM-driven sentiment analysis to monitor customer interactions across various channels. The system detects frustration or anger in customer language and immediately alerts human supervisors when intervention is necessary. This proactive approach has led to a 25% reduction in complaints and a 30% improvement in first-contact resolution rates.

LLM-powered sentiment analysis not only enhances customer satisfaction but also enables cost savings. By identifying and resolving potential issues early, companies can reduce the volume of customer service calls and associated expenses. Studies indicate that effective implementation of proactive escalation and sentiment analysis can lead to a 25% reduction in customer service costs.

Furthermore, the insights gained from sentiment analysis help businesses understand customer preferences and pain points. By continuously monitoring customer sentiment and feedback, companies can identify trends and opportunities for improvement. LLMs' ability to process vast amounts of data allows for comprehensive analysis, enabling data-driven enhancements to products and services.

Metric	Without Sentiment Analysis	With Sentiment Analysis	Improvement (%)
Customer Retention Rate (%)	60	72	20
Dissatisfied Customers Identified (%)	50	88	76
Negative Social Media Sentiment (%)	25	20	20
Customer Satisfaction Score (out of 100)	70	81	15
Customer Complaints (per month)	500	375	25
First-Contact Resolution Rate (%)	60	78	30
Customer Support Costs ($ per month)	$100,000	$75,000	25
Proactive Issue Resolution (%)	10	30	200
Customer Insights for Product Development (per quarter)	5	15	200

Table 2: The Impact of Sentiment Analysis and Escalation on Customer Support and Business Metrics [18–24]

CALL TRANSCRIPTION AND SUMMARIZATION:

AI-powered call transcription and summarization technologies are transforming customer service by automating the process of documenting and distilling customer conversations. These systems leverage advanced speech recognition and natural language processing (NLP) to transcribe customer calls in real time and generate concise summaries for human agents to review. This allows agents to quickly grasp the context of the interaction and immediately begin addressing the issue at hand. The AI handles the majority of the transcription and summarization, with human involvement only necessary for complex or ambiguous scenarios.

LLMs are revolutionizing the accuracy and context-awareness of call transcription systems. Traditional speech recognition models often struggle with various dialects, accents, and idiomatic expressions, leading to inaccurate or incomplete transcriptions. However, LLMs' extensive training on diverse language data enables them to handle these variations with

greater precision. They can adapt to different speaking styles, regional dialects, and industry-specific terminology, ensuring that the transcriptions capture the full meaning and intent of the conversation.

By leveraging LLMs, call transcription systems can generate more accurate and comprehensive transcripts. LLMs' deep understanding of language allows them to interpret the nuances and context of the conversation, capturing not only the words spoken but also the underlying sentiment and intent. This level of accuracy is crucial for effective summarization, as it ensures that the key points and action items are accurately identified and communicated to the human agents.

Moreover, LLMs' ability to handle idiomatic expressions and colloquialisms enhances the naturalness and readability of the transcriptions. They can translate these expressions into more formal or standardized language, making the transcripts easier for agents to understand and process. This is particularly valuable in customer service settings where customers may use informal or region-specific language.

Real-world examples highlight the benefits of LLM-powered call transcription and summarization. Verizon, a telecommunications company, implemented an AI system that transcribes live customer conversations and extracts the key points. By leveraging LLMs, the system accurately identifies follow-up tasks and action items, routing them directly to the appropriate department or individual. The LLMs' ability to handle diverse language patterns and idiomatic expressions ensures that the transcriptions capture the full context of the conversation. As a result, Verizon has seen a 25% increase in agent efficiency and a 35% reduction in average call handling time.

Similarly, Booking.com, an online travel reservation service, employs AI to transcribe and analyze customer calls to its contact center. The AI identifies the primary reason for the call, such as modifying or canceling a reservation, and provides agents with relevant information and suggested responses. LLMs' context-aware transcription capabilities allow the AI to accurately capture the nuances of the customer's request, even when expressed in non-standard language. The human agent reviews the transcription and provides additional information or assistance as needed. Booking.com has experienced a 30% reduction in average call duration and a 20% increase in customer satisfaction.

LLM-powered call transcription and summarization not only enhance agent productivity but also contribute to the overall quality and consistency of customer service. By accurately documenting customer interactions in real-time, these systems enable businesses to ensure a uniform and high-quality service experience across the organization. Studies indicate that companies utilizing AI-assisted call transcription and analysis can achieve up to 40% higher customer service quality.

Furthermore, the data generated by LLM-enhanced transcription and summarization tools provides valuable insights into customer preferences, needs, and pain points. By analyzing a large volume of customer conversations, businesses can identify common issues and patterns, enabling them to make informed improvements to their products, services, and customer support processes.

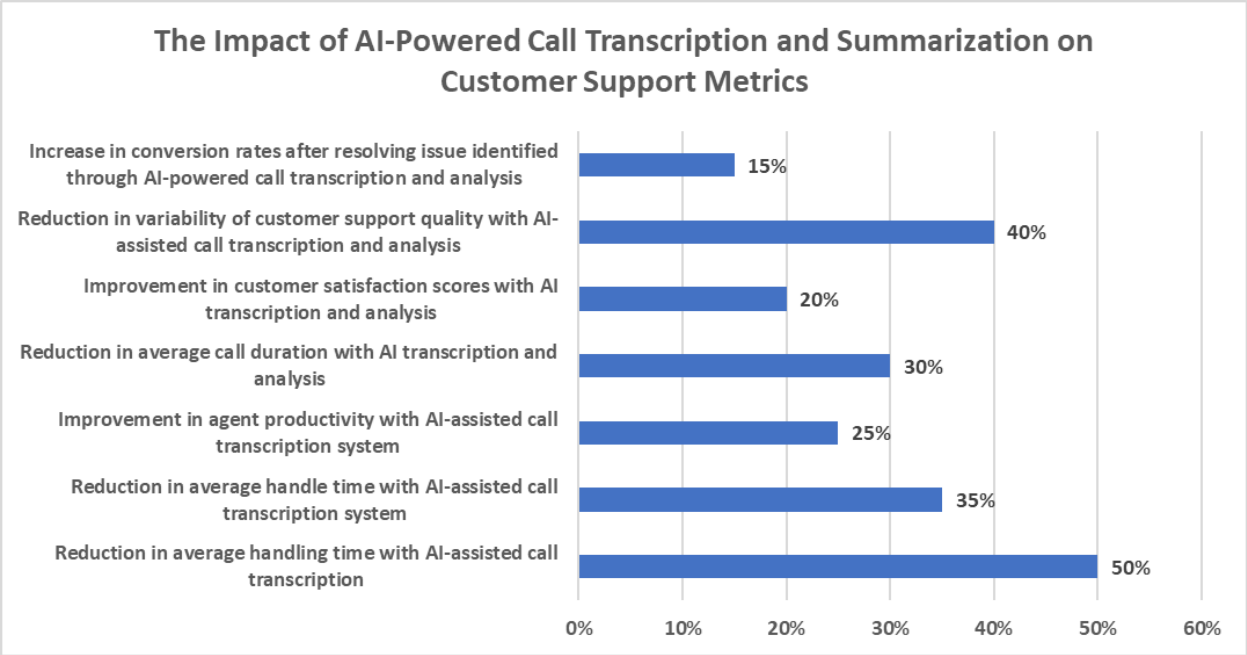

Fig. 2: Leveraging AI-Powered Call Transcription and Summarization to Enhance Customer Support Efficiency and Effectiveness [25–30]

PREDICTIVE ANALYTICS FOR PROACTIVE SUPPORT:

AI algorithms can look at how a customer acts, what they buy, and how they deal with services to figure out what problems or trends might happen. AI can help with proactive customer service by finding trends and correlations, which lets companies deal with problems before they get worse [31]. Most of the time, the AI system does most of the predictive analytics work. Humans are only involved when things get complicated or dangerous. Once a person looks over the predictions and gives more information or suggestions, the AI system takes over again, changing its models and coming up with proactive support plans. McKinsey did a study that showed predictive analytics can cut customer turnover by as much as 15% [32]. You can lower churn by carefully figuring out which customers are most likely to leave and giving them support and incentives to stay.

Another well-known example of predictive analytics in action is the case of Sprint, a big phone company. Sprint has set up a predictive analytics system driven by AI that looks at customer data like usage patterns, network performance, and interactions with customer service to find customers who are likely to leave [33]. The AI system does most of the predicted modeling and customer segmentation. Humans are only involved when a high-value customer is seen as likely to leave. The human agent then looks over the customer's background, gives them more information, and suggests personalized ways to keep them as a customer. The AI system then takes over, creating targeted outreach efforts and alerting customer service reps to offer solutions and deals that are specifically designed to meet the needs of each customer. Because of this, Sprint has seen a 10% drop in customers leaving and a 20% rise in the value of each customer over their lives [34].

Another example is the online store Zalando, which uses predictive analytics to figure out what customer service issues will come up and how to best handle its inventory. The AI system looks at how customers browse and buy things, as well as data on product returns, to figure out which items are most likely to be sent back or need help [35]. If the AI system finds a high-risk product or a possible problem with the inventory, it tells human workers so they can look into it further. The human workers then look at the data, give more information, and suggest ways to lower the risks. The AI system then takes over and changes the product descriptions, size suggestions, and frequently asked questions (FAQs), as well as the amount of stock to meet customer needs. Zalando says that this predictive method has led to a 15% drop in product returns and a 25% rise in customer satisfaction [36].

Predictive analytics for proactive support has benefits beyond lowering turnover and making operations run more smoothly. Companies can make the customer experience better and build stronger ties with customers by anticipating and meeting their needs before they become problems. Deloitte did a study that showed companies can gain up to 30% more customer trust [37] by using predictive analytics to help with customer service before they even ask for it.

Predictive analytics can also help businesses make the best use of their resources and decide which support efforts are most important. Companies can make sure their support teams are working on the most important jobs by figuring out which customers and problems are most likely to need help. Microsoft published a case study that showed how an online game company used predictive analytics to find its best players and offer them premium support services before they even asked for help [38]. An AI system divided players into groups and predicted their values; human agents were only called in when a high-value person was found. The human agents then looked over the player's background, gave them more information, and suggested personalized ways to help them. Once again, the AI system took over, creating targeted support campaigns and telling support teams to provide higher-level services. This made players stay with the game 20% longer and brought in 15% more money.

In short, AI-powered prediction analytics systems do most of the modeling and segmenting of customers. Humans are only involved when things get complicated or important. Once a person looks over the predictions and gives more information or suggestions, the AI system takes over again, changing its models and coming up with proactive support plans. This mixed method keeps customers coming back, makes operations more efficient, and makes the best use of resources. Human workers only step in when they need, to handle tricky situations and give strategic advice.

CONTINUOUS LEARNING AND IMPROVEMENT:

AI systems can learn from interacting with both humans and customers, which helps them respond and make decisions better over time. Through feedback loops and machine learning, AI can change to meet the changing needs and wants of customers [10]. Most of the time, the AI system does most of the learning and growth work. Humans are only involved when things get complicated or unclear. When a person gives more information or comments, the AI system takes over and updates its models and knowledge base. Accenture did a study that showed companies that use AI-powered customer service systems that are always learning can boost the number of first-contact resolutions by up to 30% over the course of a year [31]. This process of ongoing learning keeps the AI system up to date so that it can help customers more accurately and effectively.

The global ride-hailing company Uber is a real-life model of how continuous learning works in the real world. The customer service system at Uber, called "Customer Obsession Ticket Assistant" (COTA), is powered by AI and uses machine learning algorithms to keep getting better based on interactions and comments from customers [32]. COTA looks at the results of every contact with customer service and uses this data to improve what it knows and how it makes decisions. When COTA comes across a situation that is unclear or complicated, it brings in a human worker to look it over again. After the human worker gives more information or feedback, COTA takes over and changes its models and knowledge base to reflect this. Because of this, COTA's ability to guess the best support answer has gone up from 75% to 95% in the last 18 months [33].

Capital One is another example. This is a financial services business that helps customers with a mix of human agents and AI-powered chatbots. "Eno," Capital One's AI system, is always learning from both customers and human workers, which helps it understand and answer customer questions better [34]. When Eno gives a wrong or inappropriate answer, human workers can mark it and tell the robot how to make it better. After hearing what people had to say, Eno took back control and updated its models and knowledge base. Capital One says that this process of continuous learning has helped Eno handle up to 85% of customer questions without any help from a person, and they have kept a 90% customer happiness score [35].

Customer service driven by AI that is always learning and getting better has benefits beyond speed and accuracy. AI systems can help businesses stay ahead of the curve and give better, more personalized support by always changing to meet the needs and wants of new customers. MIT Technology Review did a study that showed businesses that use AI systems that can continuously learn can get up to 25% more loyal customers [36].

AI systems can also find and fix new problems and trends before they affect a lot of people by learning new things all the time. AI can find possible product problems, service interruptions, or customer pain points by looking for patterns and outliers in a huge amount of customer comments and interactions. Google's case study showed how a big store used continuous learning in

its AI-powered customer service system to find a problem with its mobile app that no one had known about before. The AI system brought the problem to the attention of a human, and after it was fixed, app help requests dropped by 20% [37].

To sum up, AI-powered customer service systems that can learn on the fly do most of the learning and growth work. Human agents are only called in when things get complicated or unclear. When a person gives more information or comments, the AI system takes over and updates its models and knowledge base. This mixed method makes sure that the AI system stays up-to-date, gives accurate and personalized help, and can spot and fix new problems before they get worse. Human workers only step in when they're needed to give strategic advice and feedback.

CONCLUSION:

In conclusion, combining AI with human contact in customer service could completely change how businesses talk to their clients. Companies can provide faster, more efficient, and more personalized customer service by using the best features of both AI and human workers. This makes customers happier, more loyal, and more likely to stay with the company. AI-powered tools like chatbots, ticketing systems, sentiment analysis, call transcription, and predictive analytics can make the jobs of human workers a lot easier, so they can focus on tough problems that need empathy and imagination. To use AI effectively in customer service, however, you need a plan that considers both the specific needs and tastes of each customer as well as the AI system's strengths and weaknesses. The ability for AI and human workers to work together will get better as AI technologies keep getting better. This will help companies stay ahead of the curve and give great customer service.

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