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Evaluating the Role of Chatbots and Human Agents in the Age of AI

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Abstract –

In today's fast-moving world, businesses are always trying to find better ways to connect with their customers. It is not only about selling products or services anymore; how customers feel during their interaction with a company is very important. A good experience can make customers trust the business, return again, and even recommend it to others, while a bad experience can make them leave. To improve customer interactions and make services faster, many companies are now using AI-powered chatbots. These chatbots can answer questions instantly, give personalized responses, and handle many customers at the same time. For example, if a customer wants to check their order status or know how to return a product, a chatbot can provide quick answers without waiting in long queues. This saves time for customers and reduces the workload on human staff. Studies show that AI chatbots can lower customer service costs and improve response times, which benefits both customers and businesses.
This research aims to evaluate the roles, effectiveness, and limitations of both chatbots and human agents in customer interaction. The study will compare their performance in terms of response time, accuracy, customer satisfaction, and empathy. It will also analyse how AI advancements such as Natural Language Processing (NLP) and Machine Learning (ML) are improving chatbot capabilities. The research further explores how human–AI collaboration can create an ideal balance between automation and personal connection. Data will be collected through surveys, to identify the best practices for integrating chatbots and human agents in modern organizations.

Survey results (n=100) show chatbots score higher on speed and availability while human agents score higher on empathy and trust. The study recommends hybrid deployment with smooth escalation to improve overall satisfaction.

Keywords: Artificial Intelligence, Service, Experience, Satisfaction, Personalized support, Efficiency, Trust.

1. Introduction:

In today's world, Artificial Intelligence (AI) has become an important part of everyday life. One of the most common uses of AI is in communication systems, where it helps organizations connect with customers through chatbots and human agents.

Both play a key role in providing customer service, solving problems, and improving user experience, but they work in different ways.

A chatbot is an AI-powered computer program designed to simulate human conversation. It can understand and respond to user messages using Natural Language Processing (NLP) and Machine Learning (ML). Chatbots are used in many areas such as customer support, banking, e-commerce, education, and healthcare. They work 24/7, give quick responses, and handle multiple users at the same time. There are mainly two types of chatbots – rule-based, which work with predefined commands, and AI-based, which learn and improve from data and user interactions.

On the other hand, human agents are real people who directly communicate with customers to solve problems that require understanding, emotional support, or decision-making skills. They are mainly used in situations where human emotions, complex reasoning, or personal attention are needed. Human agents bring qualities like empathy, judgment, creativity, and flexibility, which machines still struggle to fully copy.

In modern organizations, both chatbots and human agents work together to provide efficient and satisfying service. Chatbots handle repetitive or simple tasks, while human agents focus on complex or sensitive issues. This combination helps companies save time and cost, while still maintaining a personal touch with customers.
The current study focuses on evaluating how both chatbots and human agents function, their characteristics, and how they can complement each other in the AI-driven era to achieve better communication and customer satisfaction.

2. Objectives:

- To study roles of chatbots and human agents.
- To measure the customers satisfaction with respect to usage of chatbots or human agents.
- To identify customer opinion about opting chatbots or human agents.

3. Literature Review:

Several researchers have examined the impact of chatbots and human agents in different fields. The following section reviews ten key studies relevant to this topic.

Phanidra Mangipudi [1] discusses the comparative study between AI-powered chatbots and human agents in customer service. The study highlights that chatbots provide faster responses, higher scalability, and effective handling of repetitive tasks. However, human agents perform better in emotionally complex situations that require empathy and understanding. The author recommends the use of hybrid models combining chatbots and human support integrated with Salesforce CRM and Computer Telephony Integration (CTI) systems. Quantitative surveys and case studies were conducted to evaluate performance metrics such as response time, satisfaction level, and resolution efficiency.

M. S. Ishar Ali [2] presents a comparative study of chatbots and human agents in the financial services sector of Sri Lanka. The research indicates that chatbots enhance service availability and customer satisfaction for routine banking operations. Nevertheless, customers still prefer human agents for trust-based tasks such as loan processing and dispute management. The paper suggests that chatbots should be

domain-specific and trained to handle queries effectively, along with clear escalation procedures for complex customer issues.

A systematic review by the International Journal of Educational Technology in Higher Education [3] examines the role of AI chatbots in the education sector. The study reveals that educational chatbots are effective tools for tutoring, answering student queries, and supporting administrative communication. They increase learner engagement and accessibility. However, they face challenges in providing emotional support and complex pedagogical reasoning. The review recommends integrating chatbots with well-defined learning goals, teacher supervision, and continuous evaluation systems.

A TechRxiv preprint [4] explores implementation considerations and Human-Computer Interaction (HCI) aspects of chatbot systems. The preprint emphasizes the need for prototyping hybrid workflows that involve both chatbots and human agents. It also proposes performance metrics to measure escalation efficiency and user satisfaction. As it is a preprint study, the findings should be interpreted cautiously, though it offers valuable insights into chatbot design and interaction evaluation.

The study by Frontiers in Psychology [5] focuses on the psychological dynamics of human–AI interaction. It examines factors such as anthropomorphism, trust, and emotional response in conversations with chatbots. The paper concludes that a higher sense of social presence and predictable conversational behavior increases user trust and acceptance. It further emphasizes the ethical necessity of transparent communication where users are informed when they are interacting with AI systems. These findings are useful in understanding the behavioral and emotional dimensions of chatbot use.

The ScienceDirect article [6] discusses the marketing and branding implications of using AI chatbots in business environments. According to the study, automation through chatbots enhances customer compliance and conversion rates during simple transactions. However, when chatbots fail to deliver accurate or empathetic responses, they can negatively impact brand perception. The paper recommends careful design and performance monitoring to ensure that chatbot interactions contribute positively to the company's image.

A study published by Taylor & Francis [7] in the domain of Human–Computer Interaction examines chatbot usability and conversation design. The authors highlight that clear dialogue flows, consistent chatbot persona, and well-defined fallback mechanisms contribute significantly to user satisfaction. The study also recommends iterative testing with real users and continuous monitoring of error logs to improve system accuracy and responsiveness.

According to a paper published in Springer's *Electronic Markets* journal [8], AI-based chatbots play a vital role in enhancing customer compliance during service interactions. The study reports that chatbots perceived as competent and transparent increase user cooperation and completion of service tasks. In contrast, manipulative design practices reduce long-term trust and customer loyalty. The authors suggest that ethical design principles should be prioritized in AI-based customer communication tools.

A PubMed Central (PMC) article [9] provides an overview of chatbot use in the healthcare sector, especially during the COVID-19 pandemic. The study outlines how AI-powered chatbots were employed for health triage, information sharing, and virtual assistance. It identifies critical issues related to data privacy, accuracy, and safety. The authors conclude that transparent data handling and user education are essential for maintaining public trust in healthcare chatbots.

Leveraging AI-Powered Chatbots to Enhance Customer Service Efficiency and Future Opportunities in Automated Support (Uzoka, Cadet & Ojukwu, 2024) — Review paper that synthesises research on chatbots in customer service and highlights that chatbots can handle up to ~70% of routine inquiries, reduce costs and response times, but stresses that a balanced approach combining bots + humans is essential.

These studies collectively highlight that chatbots bring efficiency, while human agents bring empathy. However, there is still a need to understand how both can work together effectively in hybrid systems.

4. Research Gap:

Although many studies have explored chatbots and human agents, most focus mainly on technical performance like speed and cost reduction, with less attention to emotional factors such as empathy, trust, and comfort. Research is often limited to single industries and rarely examines hybrid models using real user data. Long-term customer experiences, ethical concerns, and the emotional intelligence of chatbots remain underexplored.

This study is designed to fill these gaps through a comparative survey that measures customer satisfaction, empathy, and trust, and evaluates the effectiveness of a hybrid AI–human service model.

5. Methodology:

This research adopts a quantitative descriptive design to evaluate and compare the role, efficiency, and customer satisfaction levels associated with AI-powered chatbots and human agents in customer interactions. The primary objective is to measure their effectiveness in terms of response time, accuracy, empathy, trust, and overall satisfaction.

5.1. Research Design

The study follows a survey-based quantitative research approach. Primary data were collected through an online Google Form distributed among students, professionals, and general users. A total of 100 valid responses were recorded and analyzed.

The research aimed to:

1. Compare customer satisfaction levels between chatbots and human agents.
2. Identify areas where human agents perform better, especially in emotional or complex cases.
3. Examine the effectiveness of hybrid systems that combine chatbots and human agents.

5.2. Participants

Participants included individuals aged 18 to 30 years, representing both students and working professionals. The sample comprised 55% female and 45% male respondents. All participants voluntarily took part in the survey, and their responses were kept strictly confidential.

5.3. Data Collection Procedure

Data were collected through a structured questionnaire consisting of 20 questions.

The survey included:

Demographic details: Age, Gender, and Educational Background

Experience-related questions: Familiarity, Frequency of Use, Satisfaction Level

Perception-based questions: Empathy, Trust, Emotional Intelligence

Future perspectives: AI replacing humans, Preference for hybrid models

A 5-point Likert Scale (1 = Strongly Disagree to 5 = Strongly Agree) was used to measure participants' attitudes and opinions toward both chatbots and human agents.

5.4. Data Analysis Methods

The collected data were analyzed using Microsoft Excel and Google Sheets.

Descriptive statistical techniques such as percentages, mean scores, and frequency distributions were applied to interpret the data.

Visual representations such as bar charts, pie charts, and comparison graphs were created to present trends and relationships clearly.

Key performance metrics used in the analysis included:

Response Time and Availability

Empathy and Trust Levels

Efficiency and Accuracy

Overall Customer Satisfaction

5.5. Ethical Considerations

This study maintained full confidentiality and anonymity of all participants.

No personal identifiable information was collected. Participation was entirely voluntary, and respondents were informed about the purpose of the research before answering the survey.

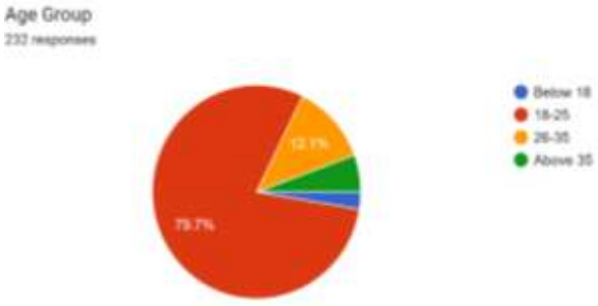
5.6. Summary

This methodology emphasizes real-world user experiences to compare chatbot and human-agent performance.

The study aims to highlight how a hybrid service model, integrating both AI chatbots and human agents, can enhance customer satisfaction, trust, and service efficiency in the modern digital environment.

6. Data Analysis and Interpretation:

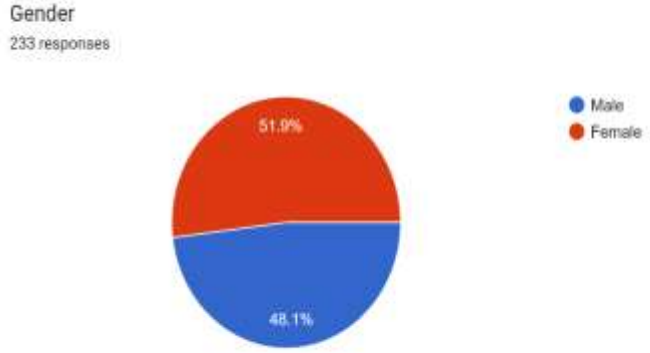
Age group:



Interpretation:

About 82% of respondents are below 25 years of age, showing that most participants are young and familiar with digital technology. Only 18% are above 25, meaning older users are less represented in this study.

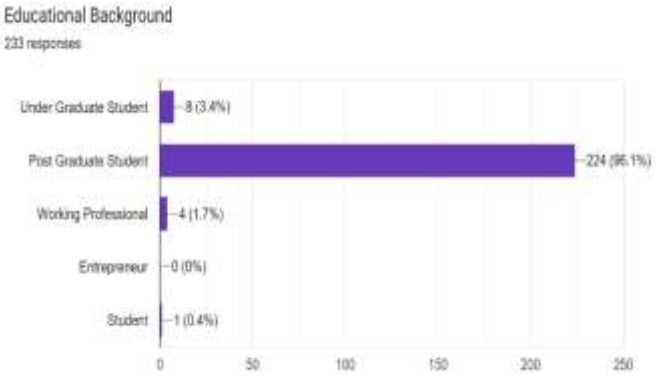
Gender:



Interpretation:

The gender distribution is almost equal, with 51.9% males and 48.1% females. This balance ensures that the results are not biased toward any particular gender.

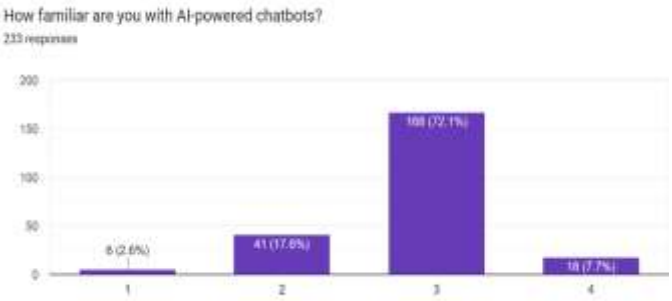
Educational Background:



Interpretation:

A large majority (96.1%) of respondents are postgraduate students, while only 2.1**%** are working professionals. This indicates that most participants have higher educational exposure and good awareness of digital tools and AI systems.

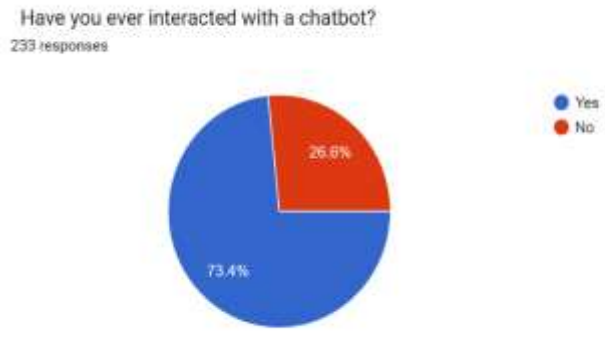
How familiar are you with AI-powered chatbots?



Interpretation:

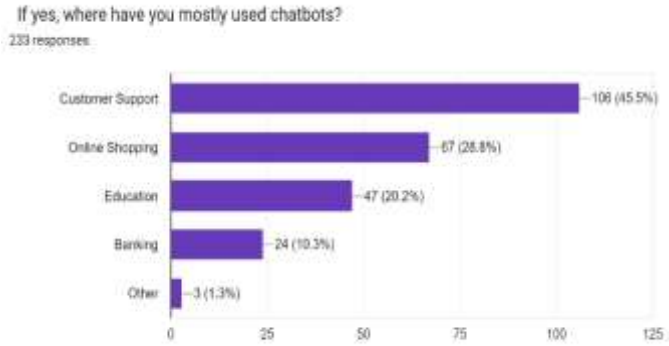
Around 72% of respondents selected Level 3 familiarity, showing moderate understanding of chatbots. This suggests that most users know how chatbots work but may not have advanced knowledge.

Have you ever interacted with a chatbot?



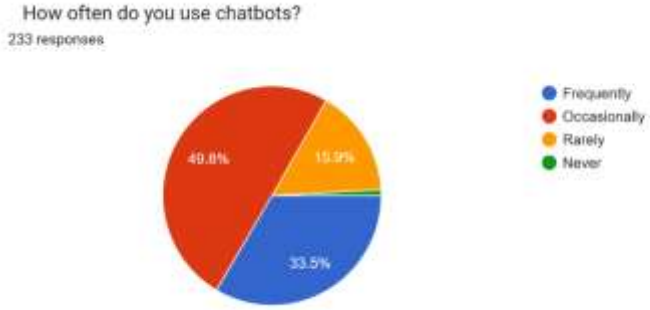
Interpretation:
About 73.4% of participants have used a chatbot before, while 26.6% have not. This indicates that chatbot usage is common, and most users have first-hand experience with AI-based service tools.

If yes, where have you mostly used chatbots?



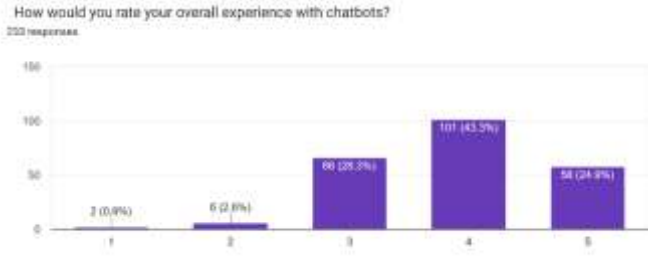
Interpretation:
About 40.6% of respondents use chatbots for shopping and about 37.2% use them for customer support. This shows that users mainly depend on chatbots in areas where they need quick information, order updates, and simple issue resolution.

How often do you use chatbots?



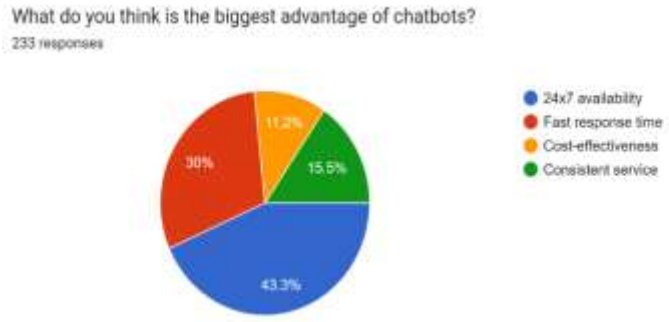
Interpretation:
About 54.2% of respondents use chatbots occasionally, while only a small portion use them regularly. This clearly shows that chatbot usage is mostly need-based and not a daily habit for most users.

How would you rate your overall experience with chatbots?



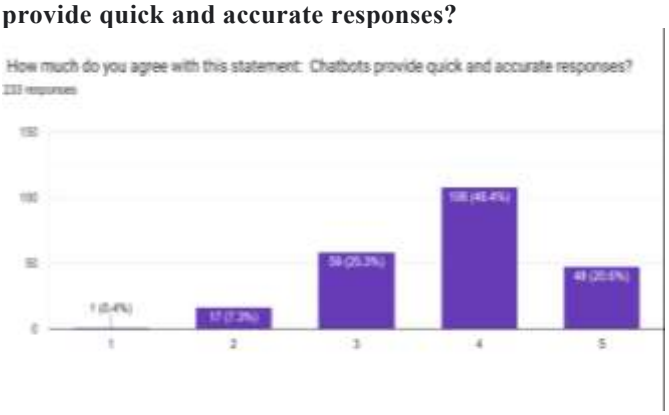
Interpretation:
About 43.3% rated their experience as 4, and 24.6% rated it as 5. Very few respondents gave ratings between 1–2. This indicates that chatbot experiences are generally positive and users are satisfied with their performance.

What do you think is the biggest advantage of chatbots?



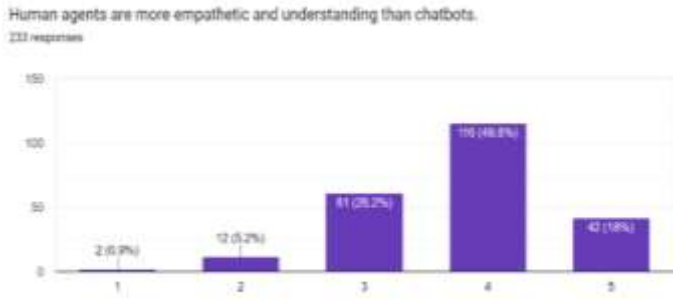
Interpretation:
Around 43.3% chose 24/7 availability as the biggest advantage, followed by 30% who chose fast responses. This shows that users value chatbots mainly for their constant availability and quick service.

How much do you agree with this statement: Chatbots provide quick and accurate responses?



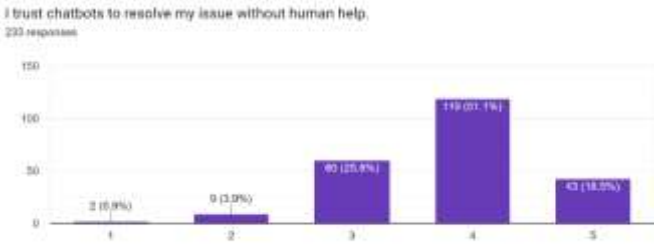
Interpretation:
About 46.4% of respondents selected level 4 agreement, and 20.6% selected level 5. This indicates that most users believe chatbots are fast and generally accurate in their responses.

Human agents are more empathetic and understanding than chatbots.



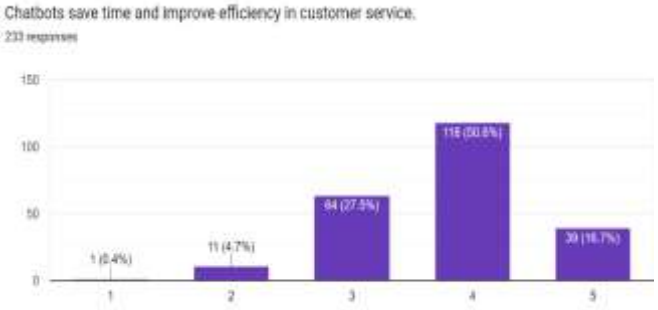
Interpretation:
Nearly 48.8% agreed, and 18% strongly agreed that human agents are more empathetic than chatbots. This shows that emotional understanding is still considered a strong human advantage over AI.

I trust chatbots to resolve my issue without human help.



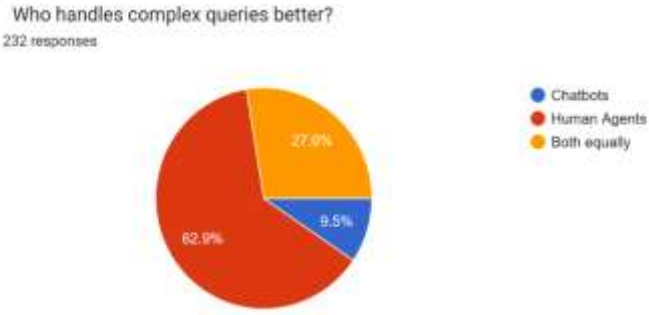
Interpretation:
Around 51.1% rated trust as 4 and 18.5% rated it as 5. This means users trust chatbots for simple tasks but do not rely on them completely for complex issues.

Chatbots save time and improve efficiency in customer service.



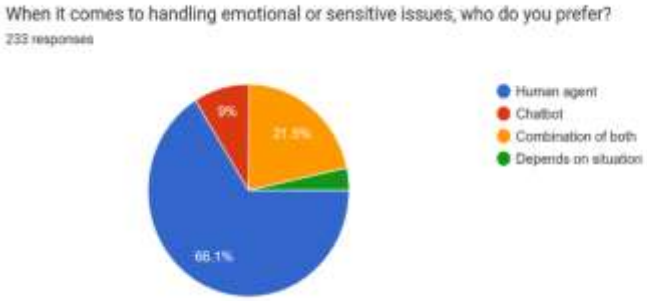
Interpretation:
About 60.8% agreed and 16.7% strongly agreed, showing that most users think chatbots help in reducing waiting time and speeding up service.

Who handles complex queries better?



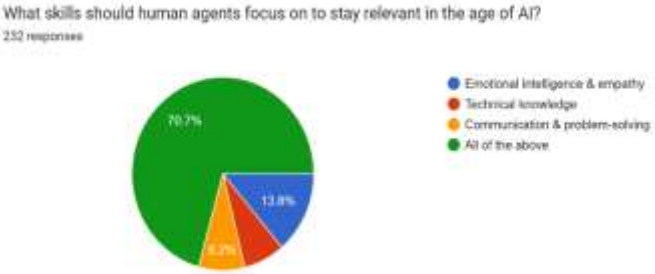
Interpretation:
A clear majority of 62.9% believe human agents handle complex problems better, while only 9.5% believe chatbots do. This shows that users still depend on humans for complicated or detailed issues.

When it comes to handling emotional or sensitive issues, who do you prefer?



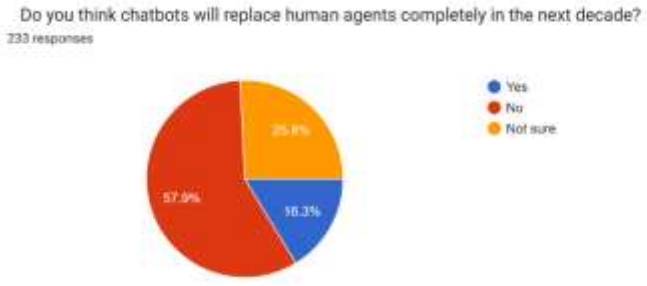
Interpretation:
About 68.1% of respondents prefer human agents for emotional or sensitive matters, while only 9% prefer chatbots. This highlights the need for human emotional intelligence in delicate situations.

What skills should human agents focus on to stay relevant in the age of AI?



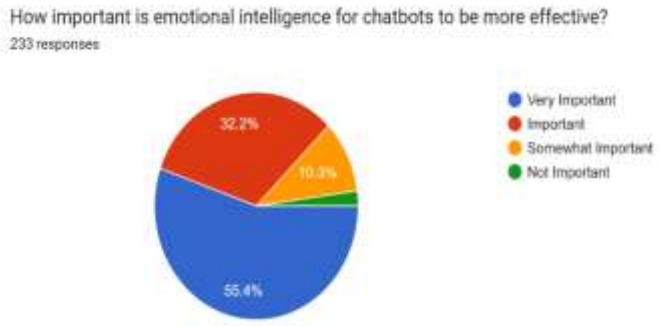
Interpretation:
Around 70.7% selected "All of the above," meaning respondents believe human agents must improve empathy, communication, problem-solving, and technical skills to work effectively with AI tools.

Do you think chatbots will replace human agents completely in the next decade?



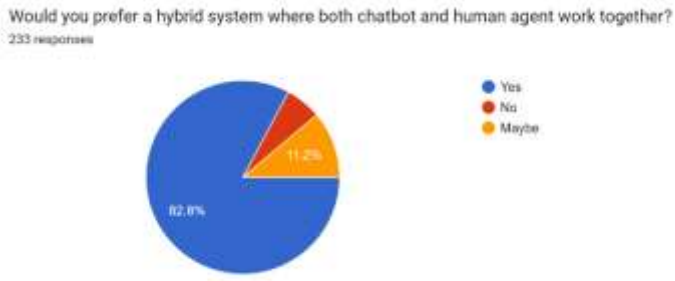
Interpretation:
About 57.9% answered No, while only 16.3% think replacement is possible. This indicates that most users believe humans will still be needed in the future.

How important is emotional intelligence for chatbots to be more effective?



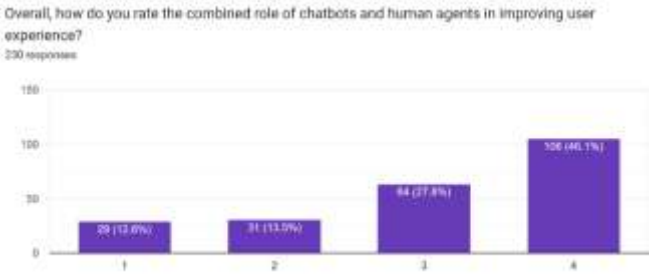
Interpretation:
A large percentage (65.4%) rated emotional intelligence as very important, and 22.2% rated it as important. This shows users want chatbots to be more human-like in understanding emotions.

Would you prefer a hybrid system where both chatbot and human agent work together?



Interpretation:
About 82.8% prefer a hybrid system where chatbots and human agents work together. This proves that a combined approach is the most preferred solution for customer service.

Overall, how do you rate the combined role of chatbots and human agents in improving user experience?



Interpretation:
Around 46.1% rated the hybrid model as 5, and 27.8% rated it as 4. This shows that users strongly support combining AI chatbots with human agents for the best experience.

7. Research Findings:

1. Chatbots are widely used and familiar to most user
About **73.4%** of respondents have used chatbots before, and **72%** reported moderate familiarity. This shows that chatbot adoption is high among young and educated users, supporting earlier research that AI tools are becoming common in daily digital interactions.

2. Chatbots are preferred for simple, quick tasks.
The highest usage was for **shopping (40.6%)** and **customer support (37.2%)**, where users need quick replies, order-related updates, and basic information. This aligns with past studies showing that chatbots perform well in repetitive, high-volume tasks.

3. Chatbots provide a positive and efficient user experience.
A large percentage of respondents rated chatbot experience as **4 (43.3%)** or **5 (24.6%),** and more than **60%** agreed that chatbots save time and improve efficiency.
This confirms research findings that AI improves service speed, availability, and cost-effectiveness.

4. Accuracy and speed are recognized strengths of chatbots.
More than **46%** agreed and **20.6%** strongly agreed that chatbots give quick and accurate responses.
This supports the literature stating that chatbots excel in automated, rule-based interactions.

5. Human agents are trusted more for complex and emotional tasks.
Around **62.9%** believe humans handle complex queries better, and **68.1%** prefer humans for emotional or sensitive issues. This supports academic research showing that empathy, emotional intelligence, and deep reasoning remain human strengths.

6. Users show moderate trust in chatbots but prefer human confirmation.
About **51.1%** rate their trust at level 4, while complete trust is limited. This finding matches earlier research that users still seek human involvement in important or high-risk situations.

7. Emotional intelligence is seen as important for improving chatbots.
About **65.4%** rated emotional intelligence as very important for chatbots.These echoes global research calling for emotionally aware AI that can better understand tone, mood, and user intent.

8. Chatbots will not replace humans completely.
More than **57.9%** of respondents said chatbots will **not** replace human agents in the next decade.
This aligns with academic literature suggesting that AI works best when combined with human expertise—not as a full replacement.

9. A hybrid model is the most preferred service approach.
A strong majority (**82.8%**) prefer a system where chatbots and human agents work together.
This supports research recommending hybrid systems for maximum efficiency, accuracy, and emotional support.

10. Human agents must upgrade skills to work effectively with AI.
About **70.7%** of respondents believe human agents need combined skills—empathy, communication, technical knowledge, and problem-solving.
This matches recent findings emphasizing the need for upskilling in the AI-driven workplace.

8. Recommendations:

- **Adopt a Hybrid Model:**

Combine chatbots and human agents to create a balanced customer service system. Chatbots should handle simple and repetitive queries, while human agents should focus on complex, emotional, or sensitive issues. This hybrid approach improves both efficiency and customer satisfaction (Adam, 2021; Mangipudi, 2025).

- **Enhance Emotional Intelligence in Chatbots:**
Integrate advanced NLP and ML algorithms to help chatbots understand tone, mood, and emotional context, making conversations more natural and empathetic (Liu, 2024; Mariani, 2023).
- **Implement a Smooth Handoff Mechanism:**
Ensure seamless transition from chatbot to human agent when the issue becomes complex. The system should retain chat history to avoid repetition and provide a consistent user experience (Følstad, 2021).
- **Ensure Data Privacy and Transparency:**
Follow strict data protection guidelines and inform users about how their data is collected and used. Users should have control over their shared information to build trust (Petronio, 2002).
- **Continuous Monitoring and Improvement:**
Regularly collect feedback and analyse chatbot performance to identify weaknesses. Update responses, add new data, and retrain AI models to maintain quality and accuracy (Deng & Yu, 2023).
- **Offer Personalized Interactions:**
Use customer data such as past interactions and preferences to deliver tailored support. Personalization increases engagement and strengthens brand trust (Barua, 2025).
- **Train and Empower Human Agents:**
Provide ongoing training for human agents to work effectively with AI tools. Focus on developing their emotional and decision-making skills for complex cases (Ali, 2025).
- **Integrate Future Technologies:**
Combine chatbots with predictive AI, IoT, and analytics to offer proactive and intelligent customer support that anticipates user needs (Tussyadiah & Miller, 2019).

9. Conclusion:

This study examined how chatbots and human agents perform in customer service and how users feel about both. The findings show that chatbots are highly valued for their speed, 24/7 availability, and efficiency. A large share of respondents (over 60%) agreed that chatbots save time and improve service. Most users also trust chatbots to handle simple tasks and provide quick information.

However, human agents continue to play an important role. The majority of respondents (about 62.9%) believe that humans handle complex queries better, and around 68% prefer human support for emotional or sensitive issues. This highlights that empathy, understanding, and judgment remain strengths of human agents.

The results also show that most users (82.8%) prefer a hybrid model, where chatbots handle basic tasks and human agents deal with advanced or emotional situations. This combination gives users a smooth, efficient, and satisfying service experience.

Overall, the study concludes that chatbots will not replace human agents completely. Instead, the future of customer service lies in collaboration between AI and humans. Chatbots will continue to improve with better emotional intelligence and natural language abilities, while human agents will need to upgrade their communication, empathy, and technical skills.

A balanced AI–human system can create a smarter, faster, and more user-friendly customer experience. Future research can explore how emotionally intelligent chatbots and advanced hybrid systems influence long-term trust, engagement, and user satisfaction.

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