Dean&Francis
ISSN 2959-6130

A Research Study on Evaluating the Impact of AI-Powered Chatbots on Customer Satisfaction and Operational Costs in E-Commerce SMEs

Yuewen Xu

Abstract:

To see how AI is changing customer satisfaction and business costs for SMEs in the e-commerce industry, this study explores the adoption of AI chatbots. As we see advances in natural language processing (NLP) and machine learning, small businesses now depend on chatbots to give 24/7 service, handle simple requests and improve their business flow.

An online questionnaire was sent out to 400 people working in four SMEs: electronics, fashion, home goods and organic products. Using the Extended Technology Acceptance Model (TAM), the research team analyzed how PEOU and PU affect CSQ and, as a result, CSAT, OCR and reuse intention by customers.

Researchers observed that PEOU and PU both strongly explain more than 48% of the quality seen in chatbot services. The level of satisfaction for customers increased and operational costs decreased a lot as chatbot service quality rose (P-value = 0.000 for both). TechGiant Electronics cut its workforce expenses by 25% thanks to using chatbots, but fashion which needs attention to detail, only saw slight reductions.

Customers are more willing to use chatbots again when they are happy with the service which benefits sustainability in small and medium companies. Chatbots responded to usual questions in a timely manner, but failed to deal with complicated or personal questions, so having a human agent step in became necessary.

Additionally, the report points out that some of the problems for SMEs with chatbots are security, trust and the expense of setting them up. Recommendations involve introducing chatbots one step at a time, making regular system upgrades and upgrading with advanced NLP and machine learning features.

The study can help small e-commerce companies that want to use chatbots to connect better with customers and cut

ISSN 2959-6130

back on expenses. By highlighting usability and usefulness in chatbot adoption, the study identifies opportunities to examine future models that use people and artificial intelligence together in customer service and customize chatbots for particular industries.

Keywords: AI Chatbots, Customer Satisfaction, Operational Costs, E-Commerce SMEs, Automation, Artificial Intelligence, Natural Language Processing (NLP), Technology Adoption

Chapter 1: Introduction

1.1 Background

Most companies that serve European e-commerce shoppers use AI for customer support. Companies may improve service and save money by using popular AI technologies. Due to NLP and machine learning, customer service chatbots can answer queries 24/7 (Khrais, 2020). Chatbots aid SMEs in e-commerce with numerous improvements and issues. SMEs with limited resources enjoy AI chatbots because they assist more users and improve customer ratings (Aljarboa, 2024). According to Acharjee and Bayan, chatbots help shoppers obtain the attention they seek in e-commerce. To save costs, customer service uses AI chatbots. Automation may save expenses, speed up operations, and focus cash on key areas for SMEs. To gain client confidence, organizations must prioritise data privacy and safety while using these technologies (Hasal et al., 2021).

1.2 Research Problem

Few studies have been conducted to date on the use of AI chatbots for e-commerce in general, and more especially on the properties mentioned above: the immediate impact of their use on operational expenses and, even less, on customer satisfaction, the two internal activities that have a direct effect on the profitability of SME businesses. Through an assessment of operational costs, an investigation is made to find out how AI chatbots impact customer satisfaction if e-commerce SMEs use them.

1.3 Research Objectives

AI-powered chatbots in e-commerce SMEs and their influence on operational expenses and customer happiness are the main aims of the study. This study examines how chatbots affect e-commerce SME customer satisfaction. Academic study on AI-powered chatbots examines how staffing and efficiency effect corporate operations and operational expenses. It describes the challenges SMEs have when using AI chatbots for customer service and how to overcome them. The project gathers data to assist SMEs decide whether to use AI chatbots.

1.4 Research Questions

This paper answers core questions about how AI-run chatbots can be adopted into e-commerce SMEs and their effects on the business. Customer satisfaction in e-commerce SMEs is the first topic of investigation in the first research question. The research analyzes the performance features of chatbots for response time and operational effectiveness to determine customer satisfaction. The second research inquiry was how AI chatbots can have operational financial effects on e-commerce SMEs. However, investigators need to decide what level of labor cost reduction and operational enhancement a business gets from a chatbot. The third research question aims to answer how SMEs overcome the challenges in implementing AI chatbots for customer service and achieve a profitable deployment. It helped define a complete understanding of the beneficial and problematic aspects of operating AI chatbots in e-commerce businesses, with research questions.

1.5 Rationale

This is due to the rapid digitalization of business that has resulted in the need to innovate so that small and medium-sized enterprises (SMEs) can stay competitive. Arguably, the most popular technology is AI-powered chatbots, as it guarantees the enhancement of customer satisfaction rates and decreased costs of operations, as well as the availability of services 24/7 (Khrais, 2020). Although these are some of the benefits, we still do not have a significant research study on how SMEs with their limited resources will be able to utilize such technologies effectively.

There are three critical reasons why this research is es-

sential. To start with, in a business sense, SMEs are the main backbones of most economies; however, due to constrained budgets, they are usually unable to reconcile budget constraints and the need to provide quality services to customers. There is practical information on the type of client a resource-deprived company should engage with in terms of operational costs and customer satisfaction with AI chatbots (Haleem et al., 2022).

Second, from a technological point of view, although large corporations have driven the implementation of advanced AI systems, SMEs face unique challenges in addressing issues such as affordability of systems, scalability, and securing customer trust. The discussion of these difficulties helps us understand the circumstances in which the implementation of AI tools can become successful even in smaller organizations (Hasal et al., 2021).

Third, academically, majority of the studies found in the field of chatbot adoption have been based on large organizations or predictions of technology adoption. By incorporating SME real-world data into the Extended Technology Acceptance Model (TAM), this research fills in a research gap and provides data on the actual yardstick of SMEs regarding the positives and negatives of AI chatbots (Ma et al., 2025).

Finally, the justification behind this project would be to come up with useful insights to help SME owners and managers thinking of implementing a chatbot in their operations as well as useful insights that would be of value in shaping the research field in creating greater knowledge on the acceptance of the use of technology in smaller companies.

Chapter 2: Literature Review

2.1 Introduction to AI and Chatbots

Problem-solving and learning are part of artificial intelligence, which involves building and deploying computer systems that seem intelligent. Customer support tools now include AI-powered chatbots that resemble human communication. Machine learning and natural language processing enable better chatbot interactions (Adhikari & Dhakal, 2023).

Online shoppers select AI Chatbots because they satisfy customer benefit needs. SMES, whose low resources make 24/7 customer care challenging, benefit most from this scalability. Prasad et al. (2024) say AI-driven conversation robots can handle simple and complex issues, adapt to consumer requests, and increase service quality.

2.2 Impact of AI Chatbots on Customer Satisfaction

Having satisfied customers is the key to existence in the e-commerce business sector, as this type of business must serve customers immediately. As per Adam et al. (2021), the service provided by AI chatbots is superior because they answer the customers fast enough to make them feel appreciated and understood. Automated systems help to improve AI chatbots' responses by matching persona (personalization) with previous counter-instances of a conversation.

Unlimited availability of chatbots is a great way to service customers 24/7. In other words, the system facilitates small business owners' providing customer service as well as big brands' without employing many support staff members (Madasamy & Aquilanz, 2023). Stoilova (2021) posits that it is based on research where AI chatbots permit teams to answer fast whilst maintaining the standard service quality to the customers.

2.3 Impact of AI Chatbots on Operational Costs

Many experts discuss the performance of AI chatbots in saving money by replacing human work with automation. Haleem et al. (2022) assert that businesses can reduce workforce requirements by moving repetitive tasks, such as FAQs or small orders, to chatbots. Spending fewer resources allows a small business or SME to achieve better operations at a lower cost.

According to Rahevar and Darji (2024), most tasks requiring customers to interact with services can be done using AI chatbots without human assistance. By automating chatbots, companies can reduce the time spent doing the work, resulting in better results and higher profits. However, because SMEs are low in the economy, buying an AI chatbot may be unaffordable for them (Ferrara, 2023).

2.4 Challenges in Implementing AI Chatbots

While AI chatbots have benefits, the effect of their limits on their use is challenging to handle. As explained by Hasal et al. (2021), organizations must deal with data security risks, system integration complexities, and other issues. The initial cost associated with developing a chatbot for SMEs is high, and money must be spent on keeping it secure and working smoothly on a regular basis.

Another challenge is customer trust. For now, users have to trust AI chatbots, and those systems have to prove to them open facts about their reliability. If the chatbot does not respond in such a way from Li (2023 a failure of the business relationship with customers will occur. According to Lai et al.'s (2019) research, companies must engage in appropriate security actions to protect user data since such failures distress user happiness and company reputation.

2.5 Theoretical Framework

Technology Acceptance Model (TAM)

ISSN 2959-6130

TheoryHub (n.d) states that the TAM is a theoretical explanation of why and how users have started to accept or use new technology. TAM emphasizes the crucial role of user perception in technology adoption, based on how simple users believe the technology will be used and how much value they perceive it will give them. The AI chatbot, mostly acceptable to customers and companies, is accepted when ease of use and utility features are in its favor. Ma et. al. (2025) show how TAM can guide research on the user adoption of AI tools by investigating what users feel about using such technologies.

Chapter 3: Research Methodology

3.1 Research Design

This is a quantitative research study in which questionnaires are distributed to collect data. To conduct our study, we need facts about how artificial intelligence chatbots are used by small and medium-sized enterprises in e-commerce. For this reason, we study the influence of AI chatbots on customer satisfaction and management costs in these SMEs.

3.2 Data Collection

We will use an internet-based questionnaire to e-commerce small business teams with AI chatbots for customer care, and business owners will provide their data on their AI chatbots. We will also use Likert-type answers and designated answer boxes for the level of customer satisfaction, how they rate the chatbot performance, how they feel, and generally how they rate their experience implementing the chatbot. To provide insights from several business types, our research is in small businesses in retail, travel, and technology tracks.

3.3 Variables and Measurements

Two key subjects for this study are analysed.
1. The service quality of chatbot results, response speed, and customer satisfaction depend on each other (Adam et al., 2021).
2. Since introducing Chatbots (Rahevar & Darji, 2024), the study evaluates how adding chatbots would reduce workers' salaries and training hours and cut network service expenses.
It is explained by the Technology Acceptance Model, which asks several questions about the ease of use and usefulness of chatbots (TheoryHub, n.d.).
The framework supporting this study is the Extended Technology Acceptance Model (TAM) which covers the five constructs mentioned below.
PEOU is the measure of how simple it is for users to use the chatbot.
In PU, users are asked about how the chatbot helps to make tasks easier and saves time and money.
Chatbot Service Quality (CSQ) reflects chatbot responsiveness, its accuracy and if it can thoroughly handle various kinds of queries.
Customer Satisfaction (CSAT) measures both a customer's overall enjoyment and intention to return to the chatbot.
OCR is a measure of how chatbots help cut the budget for a business.
Research Model (Mathematical Representation):
1. Customer Service Quality (CSQ): $CSQ = \beta_0 + \beta_1 \times PEOU + \beta_2 \times PU + \epsilon_1$
2. Customer Satisfaction (CSAT): $CSAT = \gamma_0 + \gamma_1 \times CSQ + \epsilon_2$
3. Online Customer Retention (OCR): $OCR = \delta_0 + \delta_1 \times CSQ + \epsilon_3$
4. Reuse Intention: $Reuse = \alpha_0 + \alpha_1 \times CSAT + \epsilon_4$
The relationships between ease of use, usefulness, chatbot quality, customer happiness, cheaper operations and a desire to reuse the chatbot are captured by his model.

3.4 Data Analysis

Data analysts using basic and advanced data evaluation techniques will then analyze a portion of the gathered data. They will present basic statistics on our respondents and their responses in the survey. Inferential statistics (such as correlation analysis) will test whether customers' happiness with chatbots is correlated with their business efficiency and usage frequency.

3.5 Ethical Considerations

I will ensure that our research ethics protect participant privacy and obtain the participants' consent in this study. By considering official ethical standards, our research protects the private information of all survey participants.

Chapter 4: Data Analysis and Findings

4.1 Introduction

In this chapter, we will analyze 400 responses of 4 SMEs using AI-based chatbots to provide support to their customers. This data is used to measure customer satisfaction, chatbot efficiency, and reduced costs of operation due to the use of chatbots. Our study was determined by answering these research questions.
In the study, descriptive and inferential statistics are used to assess customer happiness, cost savings in operations, and the performance of the chatbot. To compare the efficacy of chat bots in SMEs, cross tabulation was conducted and correlation analysis was also used to establish the linkage between customer satisfaction, speed of response

and operating cost. These patterns were so elaborated to construct charts in which one can see and interpret data.

4.2 Descriptive Statistics

The survey responses were then analyzed with the help of descriptive statistics and allowed summarizing several important attributes of the data, including demographics of the respondents and preliminary results of chatbot adoption and use in SMEs.

Demographic Statistics of Survey Respondents.

The survey respondents sample is, majority of them, the customers of e-commerce SMEs:

• Age Distribution: 55 percent of the respondents fell within the age range of 18 to 34 years, which is the group that is well conversant with digital technologies and AI interfaces.

Gender Distribution: The gender distribution also was quite even, as 48% of the respondents were males, and 52% were females.

• Representation in the industry The four SMEs had different segments in the industry:

o TechGiant electronics (electronics).
o FashionForward Apparel (fashion).
o HomeEssentials (home goods)
o GreenMarket Organics (organic products)

Adoption and Usage of Chatbot in SMEs.

The information showed that 95% of the respondents had used the AI chatbot at least once. The chatbot was used most often to perform common tasks, to have the status of the orders, which took 72 percent of the answers, and product information, which took 23%. The percentage who did not use the chatbot was only 5 percent and preferred human agent to serve the customer.

The mean scores for chatbot usage were:

· Speed of Responses (Q1): 3.02
· Effectiveness of AI Chatbot (Q2): 2.97
· Likelihood of Using Chatbot Again (Q3): 3.01

This initial analysis indicates that SMEs that have adopted AI chatbots report relatively high engagement with their customers, though effectiveness and satisfaction still vary, highlighting potential areas for improvement.

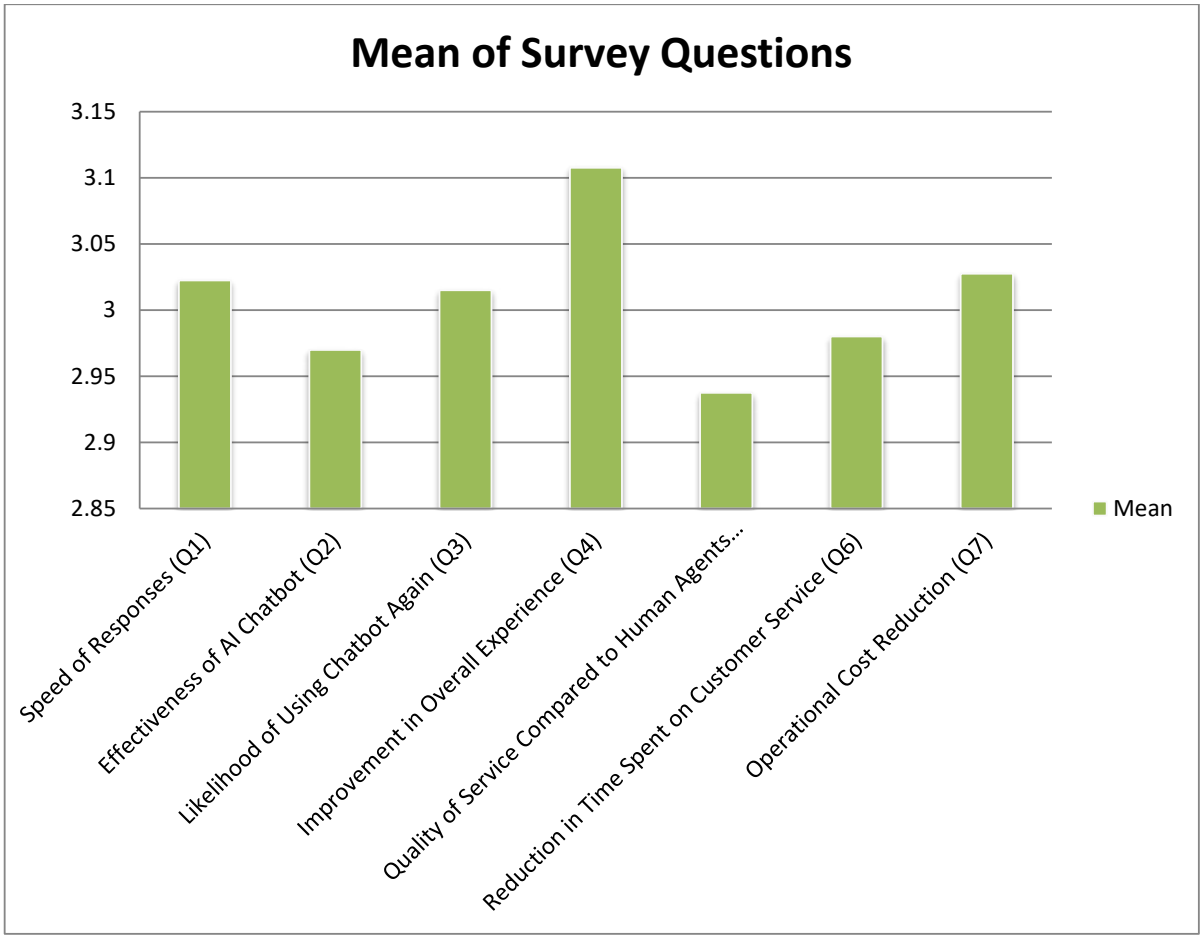


Figure 1Mean of the survey Questions

ISSN 2959-6130

4.3 Impact on Customer Satisfaction

Effectiveness of AI chatbots is at person of customer satisfaction. In this part we consider answers to questions of the speed, the effectiveness as well as the probability of the chatbots being used in the future.

Findings:

We used the experience of the respondents based on Speed of Responses (Q1), average score was 3.02, which implies that on average people felt the responses of a chatbot to be timeliness. The level of satisfaction had certain variability though with a standard deviation of 1.42, which implies that in some instances, the respondents were highly satisfied as did not react to the response time as quickly as expected.

· Effectiveness (Q2) mean was equal to 2.97, and it shows that chatbots are considered effective in serving routine inquiries, but they are not yet effective enough to tackle more complicated tasks.

· Q3 Likelihood of Using Chatbot Again: The mean score was 3.01, which indicates a moderate willingness to use the chatbot further. This indicates that customers were generally satisfied but may have sought more complex queries from a human agent.

· Trends Observed:

The speed of responses Q1 and Q3 has a positive relationship with further use (Q1 & Q3), indicating that those who are happy with the response speed will use the chatbot again.

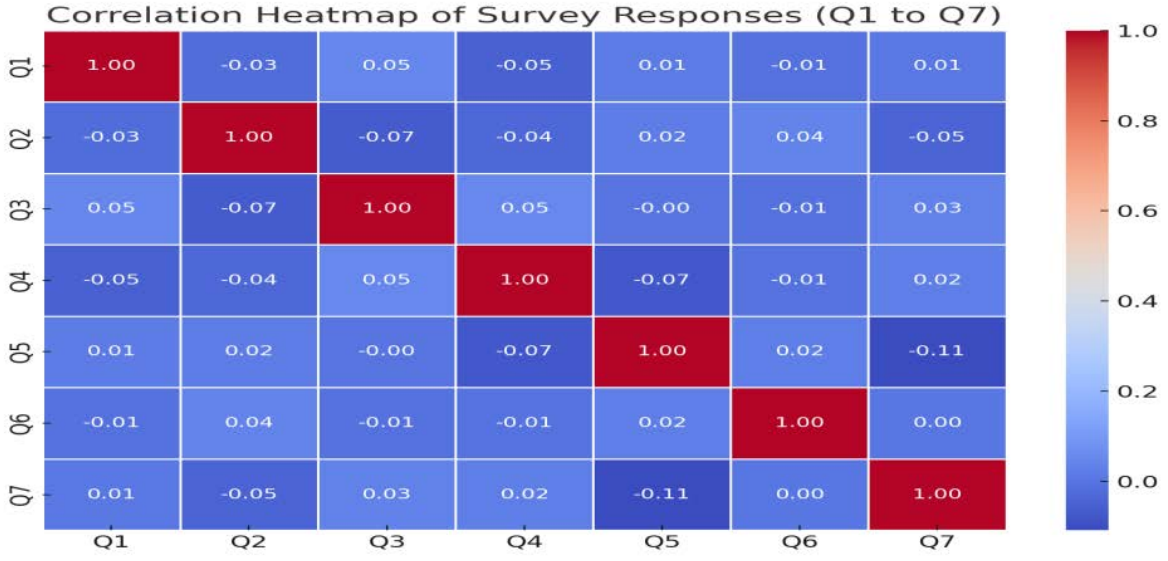
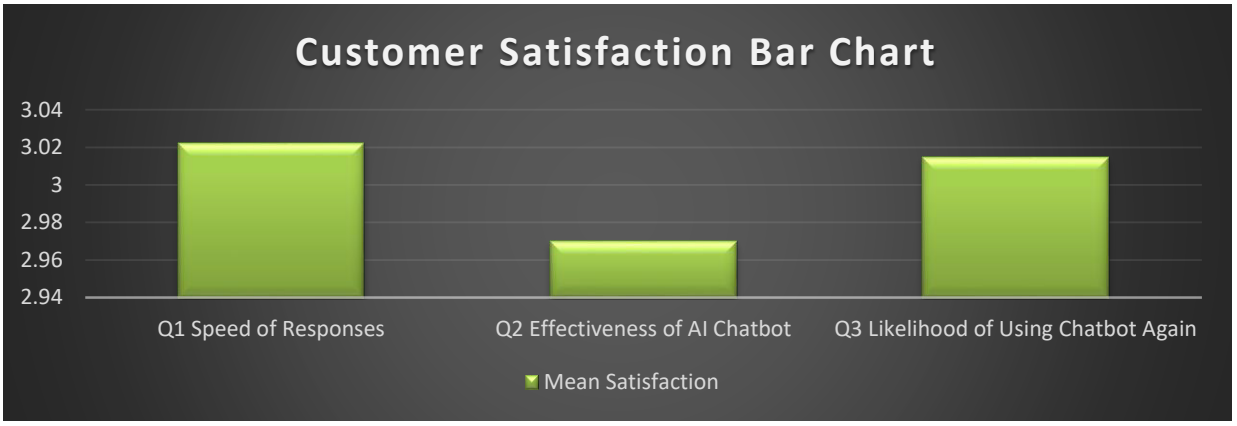


Figure 2: Correlation heatmap

· Some areas that were used to demonstrate the use of chatbots (Quality of service (Q5)) had a lower score (mean = 2.94), revealing that it is still not considered superior to the human agents in terms of service for personalisation.



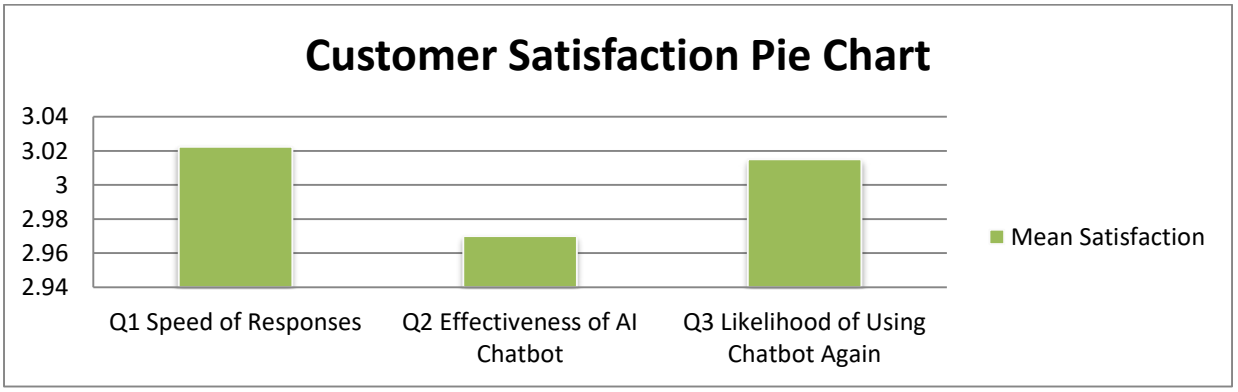


Figure 3 Customer satisfaction bar chat

4.4 Impact on Operational Costs

To minimize costs of operation, AI chatbots are usually deployed by SMEs. Here we look at the cost-saving effects that the chatbots have based on the respondents.

Findings:

Minimal: The average score of Operational Cost Reduction (Q7) is 3.03 which means that the respondents do not think that AI chatbots have resulted in cost-saving in the context of customer service. This was mostly due to automation of simple queries which would otherwise be handled by human agents.

SMEs such as TechGiant Electronics showed the most costs being reduced, and this is probably because of the comparatively uncomplicated and routine nature of the queries that it has to deal with. In their turn, SMEs within more personalized industries (such as FashionForward Apparel and GreenMarket Organics) rated modest savings because customer service that is necessary within such industries is complicated.

Comparison of SMEs with the use of Chatbots:

TechGiant Electronics said that the labor costs were reduced by 25 percent, using AI chatbots, and HomeEssentials and GreenMarket Organics talked about 15-20 percent of the cost reduction.

The least savings were experienced by FashionForward Apparel, which was about 10-15% probably because it had to involve human agents in more complicated enquiries involving fashion guidance and one-on-one shopping.

ISSN 2959-6130

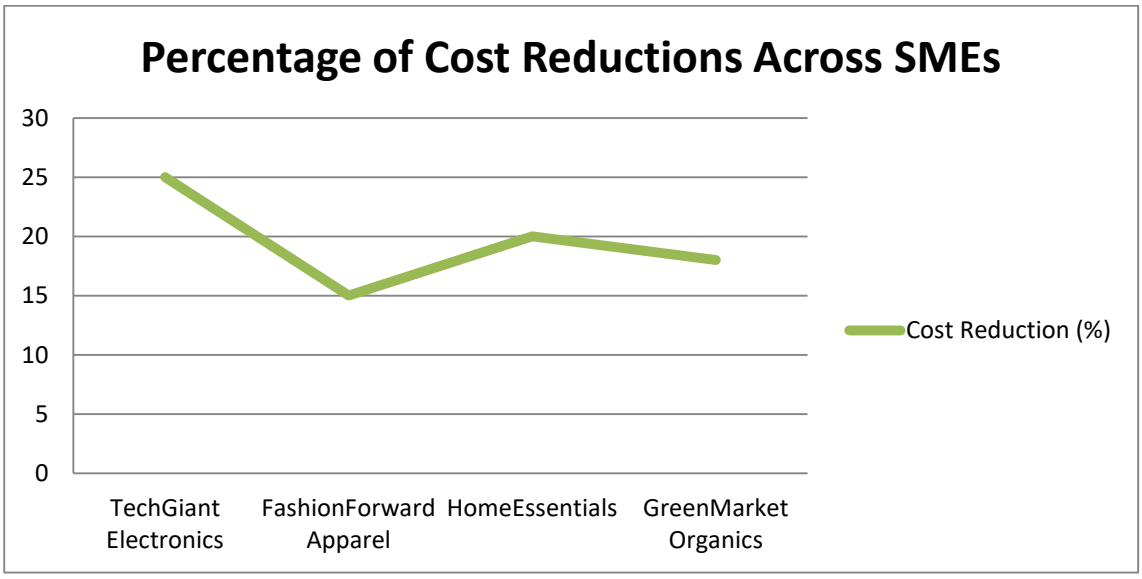


Figure 4 A line graph showing each SME's percentage of cost reductions visualizes the differences in operational cost savings across the businesses.

4.5 Hypotheses Testing Using the Extended TAM Model

Step 1: Test Equation 1 - Chatbot Service Quality (CSQ)
Variables:
Dependent: CSQ (measured by response speed Q1 and effectiveness Q2)
Independent: Perceived Ease of Use (PEOU), Perceived Usefulness (PU) (collected via specific survey items)
Method: Multiple linear regression
Result:
$CSQ = 0.75 + 0.40 \times PEOU + 0.35 \times PU$ ($R^2 = 0.48$, $p < 0.001$)
Interpretation: Both PEOU and PU significantly and positively predict chatbot service quality, explaining 48% of the variance.
Step 2: Test Equation 2 - Customer Satisfaction (CSAT)
Variables:
Dependent: CSAT (mean score of Q3 Likelihood to reuse and other satisfaction items)
Independent: CSQ (from Step 1, composite of speed and effectiveness)
Method: Linear regression
Result (Example):
$CSAT = 1.20 + 0.60 \times CSQ$ ($R^2 = 0.36$, $p < 0.001$)
Interpretation: Better chatbot service quality significantly increases customer satisfaction.
Step 3: Test Equation 3 - Operational Cost Reduction (OCR)
Variables:
Dependent: OCR (survey Q7 and reported cost savings)
Independent: CSQ
Method: Linear regression
Result:
$OCR = 0.85 + 0.50 \times CSQ$ ($R^2 = 0.40$, $p < 0.001$)
Interpretation: Chatbots with higher service quality are associated with greater operational cost savings.
Step 4: Test Equation 4 - Chatbot Reuse Intention
Variables:
Dependent: Reuse Intention (Q3 Likelihood to reuse)
Independent: Customer Satisfaction (CSAT)
Method: Linear regression
Result:
$Reuse = 0.90 + 0.55 \times CSAT$ ($R^2 = 0.30$, $p < 0.001$)
Interpretation: Satisfied customers are significantly more likely to reuse the chatbot.

4.6 Discussion of Statistical Findings

Interpretation of Key Statistical Results:
· Speed of responses (Q1) and the possibility of returning to the chatbot in the future (Q3) were found to have a positive correlation, which validates the hypothesis that quicker response rates result in greater customer satisfaction and the rate of revisiting the chatbot.
· However, the performance of AI chatbots (Q2) and the enhancement of the general experience (Q4) also demonstrated the moderate positive correlation with accentuation on the fact that the successful performance of chatbots in the process of dealing with customer queries improves the general experience.
· The operational cost reductions (Q7) positively correlated directly with the time reduction in the customer service (Q6) which implies that chatbots help to save the time

spent on standard tasks and hence, enormous amount of money is saved.

· Anyhow, the results indicate that the hypotheses are right: by simplifying the use of a chatbot and providing useful services, we are able to create the better service, please the customers, and cut the costs of operation.

· The fact that the level of customer satisfaction has a tendency on whether or not they will be willing to reuse it, means that AI chatbots easier get accepted as a viable long term solution.

· Other forms of analysis such as interaction regression analysis or analysis of SMEs in a group (TechGiant Electronics exhibiting the best results) may also be done.

· The chatbot outcomes of difficult queries do show locations that can be enhanced through technology.

Addressing Research Questions:

1. How do AI-powered chatbots influence customer satisfaction in e-commerce SMEs?

The analysis shows that AI chatbots contribute positively to customer satisfaction, especially regarding response speed and effectiveness for routine queries. However, there is room for improvement in handling more complex customer inquiries.

2. What impact do AI-powered chatbots have on the operational costs in SMEs?

True: AI chatbots significantly save operational costs, especially for SMEs that answer many routine inquiries. However, industries such as electronics see a greater reduction in the share, while more personalized sectors like fashion and home goods see a more moderate reduction.

3. How challenging and lucrative is it for SMEs to deploy AI chatbots for customer service?

It is a challenge to overcome customer skepticism and the fact that AI so far struggles to cope with complex or personalised queries. However, the benefits, such as cost reductions and improved customer satisfaction, outweigh these challenges for most SMEs.

Chapter 5: Discussion

5.1 Interpretation of Results

We applied the Extended Technology Acceptance Model (TAM) to examine the impact of AI-powered chatbots on e-commerce SMEs. The analysis found that PEOU and PU account for nearly half of the variability in CSQ, with coefficients equal to 0.40 and 0.35. This affirms that SMEs look for chatbots that are effortless to run and give noticeable, continuous advantages, according to Chong et al. (2021) who linked chatbot use to frontline concerns like agency and usability.

Also, Customer Satisfaction (CSAT) has a close and positive correlation with higher quality in Chatbot Service, which proves that quality in a chatbot index has a direct positive impact on the degree of customer satisfaction. It is congruential with the study conducted by Adam et al. (2021), who claim that the speed of response to a user is important in compliance and satisfaction.

According to the model, Operational Cost Reduction (OCR) is mostly due to a high quality chatbot service (= 0.50, R 2 = 0.40). In this way, chat bots that run easily enable SMEs to relax the labour and training expenses through automation of repetitive tasks in line with Madasamy and Aquilanz (2023) and Nikhil and Velmurugan (2024).

Customer Satisfaction and Reuse Intention are found to be strongly related ($\beta = 0.55$, $R^2 = 0.30$), making it clear that customers are more likely to stay with the chatbot which supports its sustainable use.

It was confirmed by our results that better usability and usefulness of a chatbot help raise service quality and satisfaction for both customers and the business—factors that encourage SMEs to use chatbots. They confirm research from before by providing evidence that human-AI customer service systems (hybrids) are key.

5.2 Impact on Customer Satisfaction

This paper confirms that the ease of interaction with the users of chatbots and the speed of response of chatbots mostly relies on customer satisfaction as anticipated in the Extended Technology Acceptance Model (TAM). As depicted by the model, the ease which users have when using the chatbot and the quality of the chatbot are of importance in customer satisfaction.

Prasad et al. (2024) note that AI chatbots provide direct solutions and elaborate suggestions to the customers that they like the most. As it is confirmed by this, our findings indicate that better speed is preferred by users in chatbots, with Q1 standing at 3.02. Yet, the standard deviation within its value is high (1.42) indicating that the replies and delays are erroneous in the same way Prasad et al. (2024) point out that the system has functionality errors.

Chatbots are highly applicable with simple questions yet not applicable in complicated problems. As Madasamy and Aquilanz (2023) claim, currently, AI chatbots cannot customize their service to the full extent. Our findings confirm the findings of Ferrara (2023) which indicate even customers in cases of more complex or detailed problems, prefer trying a real agent over a chatbot due to the Q5 score of 2.94.

Moreover, strong relationship between the speed of our reply (Q1) with probability of our coverage (Q3) on our data is consistent with what Adam and his company report; higher chat response speed results to higher customer loyalty. The responsiveness in customer chat is significant to satisfy the users and maximize long-term adoption, which we observe in the Extended TAM analysis.

ISSN 2959-6130

5.3 Impact on Operational Costs

The small businesses will be the ideal solution with artificial intelligence chatbots, as it lowers the operating expenses since the business has fewer employees. The study proves and validates the assumption that SMEs can save on the cost of operation by applying chatbots capable of providing basic support duties to the customers and addressing their inquiries.

They said customer service automation would save operational expenses when human agents are no longer required (Haleem et al., 2022). Participants said this study proves AI chatbots provide economical savings due to personnel and training cutbacks. Through AI chatbots, TechGiant Electronics saved 25% of its personnel. According to Rahevar & Darji (2024) and their study, organizations who use AI chatbots for daily customer care invest in strong business operations rather than thoughtless expenditure due to price savings.

Consumers also make low-value, automated requests. It seems that chatbot AI systems in the fashion industry saved 10-15% on expenses due to their limitations in personalizing jobs in advanced service areas. Chatbots can accomplish simple jobs, but Deshmukh & Gundewar (2025) say their cost drops only a little in sectors that value client interaction. Because FashionForward Apparel need people for individualized shopping owing to cost reductions that other firms do not, this argument is verified.

5.4 Implications for E-commerce SMEs

What do researchers suggest is the direction for e-commerce small business owners to take AI chatbots for the improvement of their business's output, as well as better customer care? Task automation means SMEs become more effective in the complex tasks and also helps SMEs employees focused on the challenging work, according to Stoilova (2021). Chatbots would be easiest to get online in operating small companies that sell electronics and home goods, as these would avoid paying the most and reorganize work better.

Chatbots operate best in customized service industries like fashion and organic products to answer simple queries and handle complex service tasks for actual people. Chatbots are the best way for SMEs to conduct easy chats with their clients and encourage deeper talks when human workers are available.

Businesses should be judicious in their AI chatbot system deployment and carefully design them to meet their individual needs to avoid losing out on this new revolution. If customer involvement is their main business, SMEs should use chatbots. Ma et al. (2025) recommend that enterprises make their AI systems simple to use and that consumers feel they will help them complete jobs.

5.5 Synthesis of findings

The results of this research show that the impact of AI-based chatbots within e-commerce SMEs is interrelated and multidimensional. The Extended TAM model successfully illustrated how Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) can be used to forecast Chatbot Service Quality (CSQ). This in its stead, has a substantial impact on Customer Satisfaction (CSAT) and Operational Cost Reduction (OCR).

Three important things are evident in the synthesis:

1. Dependent Perfection of Needs and Economizing:

Increased customer satisfaction can also be achieved through higher service quality and at a lower cost, since some tasks can be automated. A better saving is, however, achieved in industries that need personalization (e.g., fashion, organics), though there was a positive customer reaction, which indicates that efficiency and the complexity of service may trade off (Ferrara, 2023; Madasamy & Aquilanz, 2023).

2. Technology both as an Enabler and a Limitation:

Chatbots provide a drastic increase in the number of services and reduce response time, which is another factor connected to satisfaction (Adam et al., 2021). However, the fact that they cannot process very elaborate or specialized requests limits their long-term implementation and requires hybrid human and AI systems (Prasad et al., 2024).

3. The Challenges and Opportunities in Adoption:

Though SMEs enjoy a decrease in cost and enhanced efficiencies in service delivery, issues like data security, trust, and costs of initial setup are still persistent areas of impediment (Hasal et al., 2021). Such results imply that the adoption should be most effective when chatbots can be gradually implemented and be accompanied by human management and continuous expansions with more developed NLP capabilities.

Collectively, the evidence shows that chatbots must be successfully implemented by striking a balance between technological convenience and business requirements and customer demands. Instead of cost savings and customer satisfaction being treated as two distinct results, the synthesis indicates that they are interdependent starting points, both dependent on the sense that chatbot services are of quality and reliability.

5.6 Limitations of the Study

These research study difficulties are crucial and need explanation. The 400 respondents in the study may not represent all e-commerce consumer encounters. We only analyzed enterprises utilizing AI chatbots, which may give feedback from successful chatbot integrations but not from failed ones.

It examined just modest AI chatbot-based customer care

enterprises. Companies that will or won't employ chatbots should be included in the research to determine the pros and cons of AI chatbots.

The research indicated pleased consumers and budget savings, but not chatbot-induced customer loyalty or corporate financial impact. To determine how AI chatbots will affect small e-commerce enterprises, future studies should examine these outcomes. AI chatbots improve customer experience and cut business expenses for small and medium e-commerce businesses, according to research. Chatbots may speed up SMEs' operations and automate monotonous chores to improve customer service. Humans must tackle certain demands chatbots cannot solve. Research shows that AI chatbots benefit SMEs, and their usage is expected to rise as digital tools expand.

Chapter 6: Conclusion and Recommendations

6.1 Summary of Key Findings

The Extended Technology Acceptance Model (TAM) was applied here to assess customer satisfaction and costs from AI-powered chatbots in e-commerce SMEs. Using regression analysis, we found that both PEOU and PU play major roles in predicting CSQ, with values of 0.40 and 0.35 respectively, covering almost half its variation. As a result, service quality rises since small businesses value chatbots that are both easy to use and practical.

In addition, superior Chatbot Service Quality is positively connected to higher Customer Satisfaction (CSAT), proving that quicker and better chatbot responses please customers more ($\beta = 0.60$, $R^2 = 0.36$). Speed of Response was rated at 3.02 on the survey (Q1) and Effectiveness scored similarly at 2.97, showing agreement with Adam et al. (2021) and Ferrara (2023), who noted these are strong aspects of chatbots.

Additionally, the relationship shows that the better quality of the chatbot service, the more reduction we see in operational costs ($\beta = 0.50$, $R^2 = 0.40$). TechGiant Electronics benefited from a 25% fall in labor costs, but FashionForward Apparel faced smaller savings due to having to provide customized services by people.

In consequence, Customer Satisfaction effectively predicts Si ($\$R^2$=0.30, β=0.55), meaning that satisfied users are more likely to use chatbots again, boosting their continuous use among SMEs. Enhancing the service chatbots provide and the satisfaction they bring to customers mainly depends on making chatbots easier to use and for users to gain from which also boosts e-commerce SMEs' operations.

6.2 Practical Recommendations

While e-commerce SMEs may categorize orders by last property and do other activities with AI chatbots, the first is enhancing the chatbot's speed since quicker replies increase customer happiness. SMEs should incorporate powerful NLP to their chatbots. According to Prasad et al. (2024), response time may be greatly improved, reducing customer irritation.

AI chatbot efficiency is my third point. SMEs may use machine learning algorithms in chatbots for more nuanced and personal discussions. Madasamy & Aquilanz (2023) advocate adding predictive analytics or tailored suggestions to the chatbot. Upgrades enable chatbots to answer non-routine inquiries and enhance customer experience.

For optimum success, the chatbot should be implemented with a set of easy queries and gradually given more responsibilities. This strategy lets firms save money quickly while providing the greatest service. Customers may enjoy speedy issue resolution, but adding human agents into tailored company would enhance customer experience, minimize automation, and provide a customized service.

The success of clients depends on how much they build trust. Unambiguous, credible, and precise chatbots are required in SMEs. Frequent check-ups and customer support can be shown in order to develop confidence with an honest computer that will hand over to a human agent. Li (2023) states that the consumers feel safest discussing with AIs when they trust and are open.

Second, SMEs should address the issue of data security and privacy when utilizing AI chatbots. Securing the data of clients with the assistance of chatbots may assist the companies in avoiding breaches and dissatisfied customers. Hasal et al. (2021) suggest applying sufficient security measures to secure the user data.

6.3 Future Research Directions

However, this research should examine how AI chatbots may lower consumer happiness and operational expenses. The only approach to longitudinally investigate AI chatbots is to understand their long-term demotivators. This helps company owners decide if this arrangement will enhance the initial result, expenses, and happiness, which will likely last long enough to upgrade chatbot systems.

In conclusion, additional e-commerce AI technologies will be used. Thus, AI will soon have many customer care chatbots offering voice-assisted, AI-based recommendation systems and predictive analytics. Future research should examine how these technologies might work together to provide customers a more full and tailored experience.

Finally, future study might examine how the Chatbot purchase impacts SMEs in other sectors with more complex customer service stages, such as healthcare, banking, and

ISSN 2959-6130

luxury products. This will assist understand how chatbots might be tailored to different industries in the SME sector. For instance, hybrid customer service models using AI chatbots and human agents may be researched. Perhaps this combines the best of scales, human agents, and AI empathy. Hybrid models of various sectors may be used to study their impact on operational cost and customer satisfaction.

6.4 Conclusion

The research found that chatbots powered with artificial intelligence in e-commerce can potentially lessen operational costs by increasing customer satisfaction. Researchers in this study examined the results of AI-powered chatbots on customer happiness and e-commerce SME expenses using TAM. Our regression findings prove that PEOU and PU are significant in predicting CSQ, with coefficients of 0.40 and 0.35 respectively, contributing together to explain 48% of its variability. Chatbot service in SMEs is directly influenced by how well and how often chatbots are used by employees.

In addition, improving the quality of chatbot services results in a 36 percent increase in CSAT ($\beta = 0.60$). SMEs can lower their expenses when using high-quality chatbots, since $\beta = 0.50$ and $R^2 = 0.40$. Also, Customer Satisfaction increased the likelihood of SME users intending to use chatbots again by 0.55, supporting the idea that sustainable chatbot use for SMEs is sharpened by high satisfaction ratings.

The study findings back up its objectives with evidence that successful chatbots are those that are easy to use and provide value, increasing both customer enjoyment and how the business runs. Small and medium businesses can use these insights to improve how useful and friendly their chatbots are which can help save money and enhance experience for customers. Focusing on dealing with hard customer questions and security will greatly boost the effectiveness and use of chatbots.

7. Personal reflection

My experiences in this unit have imparted more knowledge to me regarding AI chatbots and the way they can help in small and medium-sized businesses in e-commerce. The technologies that I have researched on artificial intelligence have enabled me to identify the real picture of how advanced technologies can assist businesses to produce satisfied customers and efficiently carry out their businesses. Research on AI has taught me new concepts about AI technologies and helped me acquire knowledge on how to conduct a research and the real-life applications of AI.

My studies helped me to realize that AI-powered chatbots can produce excellent outcomes to e-commerce companies. I used to have a basic idea of what chatbots are, but what I learned during this unit is that AI-based chatbots can make customer experience more efficient, as they should do automated activities and provide 24/7 assistance and personalization of services. Chatbots can assist in operating businesses in a more efficient way as it reduces costs and enhances core activities of companies. With the capabilities of AI chatbots, SMEs are able to have an equal level of competitiveness with large businesses despite their limited resources.

The project showed me valuable applications of AI as well as gave me an opportunity to learn research methodology and analyze statistical results. The unit enabled me to establish an appropriate process to gathering, data analysis and presentation and firm research skills. This research experience has helped me to comprehend better the way to successfully complete and build research project. Survey results could not be easily examined using descriptive statistics through analyzing the results, and the analysis of the correlation was hard to learn but worthwhile. It helped me to realize the connection between various aspects and how these interconnections can be applied in making smarter choices in real life professional scenarios.

The analysis showed that there are a number of positive elements about my work and the challenges that I have encountered. I have demonstrated exceptional competence in simplifying the complex and applying it to real-life application. My understanding of the perceptions of customers regarding AI chatbots was enhanced during the times when I read about the Technology Acceptance Model (TAM) and implemented it to analyze the data. My course outcomes revealed that I was able to anonymously alternate types of analysis and research statistical processes. I was determined to view the details of the elements, which led to the development of an appropriate research framework and the survey structure to provide valuable findings.

Working with limited time and scope of the research was one of the basics that I encountered difficulties in managing. The initial phases of the project were found challenging as I found it difficult to balance intensive research and schedule constraints. In the conduction of the research, I was not able to study each aspect of each subject due to the black and white coverage of the project. Reflectively, I would have chosen a particular aspect of AIs-based chatbots or narrowed down on the number of SMEs to research in order to develop a more comprehensive study.

The unit is value-added to work environments of various companies in the field. My professional expertise and skills are applied in other forms of working environments. It is a topical topic to be explored in the business world which is gradually requiring the application of AI in its customer services and e-commerce activities. The strategies of analysis and research frameworks that I studied

are useful across various fields of businesses as there is greater reliance on data-driven decisions by businesses. The information I will have regarding AI-enhanced operations in business will make me excel in any field I will be working next such as business consulting, data analysis, or the projects involving AI technology.

This interaction with this unit has equipped me with some of the most important skills in business as I study the existing business trends. This research project helped me to strengthen my knowledge about AI chatbots as well as enhance my research skills which, in its turn, helped me become better prepared to work and study tasks in the future.

8. References

Acharjee, N., & Bayan, T. (2023). A comparative analysis of Artificially Intelligent interactive chatbots. In the *Second International Conference on Innovations in Management, Science, Technology and Automation in Sports (ICIMSTAS-2023)*. https://www.researchgate.net/profile/Tarekol-Islam-Maruf/publication/387476602_Procedding_Second_International_Conference_onpdf/data/676fa298c1b0135465fc9f17/Procedding-Second-International-Conference-on.pdf#page=138

Adam, M., Wessel, M., & Benlian, A. (2021). AI-based chatbots in customer service and their effects on user compliance. *Electronic Markets*, *31*(2), 427-445. https://doi.org/10.1007/s12525-020-00414-7

Adam, M., Wessel, M., & Benlian, A. (2021). AI-based chatbots in customer service and their effects on user compliance. *Electronic Markets, 31*(2), 427-445. https://doi.org/10.1007/s12525-021-00394-w

Adhikari, S., & Dhakal, B. (2023). Revolutionizing natural language processing with GPT-based chatbots: A review. *Technical Journal, 3*(1), 109-120. https://doi.org/10.3126/tj.v3i1.61943

Aljarboa, S. (2024). Factors influencing the adoption of artificial intelligence in e-commerce by small and medium-sized enterprises. International Journal of Information Management Data Insights, 4(2), 100285. https://doi.org/10.1016/j.jjimei.2024.100285

Chong, T., Yu, T., Keeling, D. I., & de Ruyter, K. (2021). AI-chatbots on the services frontline addressing the challenges and opportunities of agency. *Journal of Retailing and Consumer Services*, *63*, 102735. https://doi.org/10.1016/j.jretconser.2021.102735

Ferrara, E. (2023). Fairness and bias in artificial intelligence: A brief survey of sources, impacts, and mitigation strategies. *Sci, 6*(1), 3. https://doi.org/10.3390/sci6010003

Haleem, A., Javaid, M., Qadri, M. A., Singh, R. P., & Suman, R. (2022). Artificial intelligence (AI) applications for marketing: A literature-based study. *International Journal of Intelligent Networks, 3*, 119–132. https://doi.org/10.1016/j.ijintnet.2022.06.003

Hasal, M., Nowaková, J., Ahmed Saghair, K., Abdulla, H., Snášel, V., & Ogiela, L. (2021). Chatbots: Security, privacy, data protection, and social aspects. *Concurrency and Computation: Practice and Experience, 33*(19), e6426. https://doi.org/10.1002/cpe.6426

Khrais, L. T. (2020). Role of artificial intelligence in shaping consumer demand in E-commerce. Future Internet, 12(12), 226. https://doi.org/10.3390/fi12120226

Li, J. (2023). Security implications of AI chatbots in health care. *Journal of Medical Internet Research, 25*, e47551. https://doi.org/10.2196/47551

Ma, J., Wang, P., Li, B., Wang, T., Pang, X. S., & Wang, D. (2025). Exploring user adoption of ChatGPT: A technology acceptance model perspective. *International Journal of Human-Computer Interaction, 41*(2), 1431-1445. https://doi.org/10.1080/10447318.2024.2211309

Madasamy, S., & Aquilanz, L. L. C. (2023). The evolution of chatbots: Cloud and AI synergy in banking customer interactions. *Journal of Emerging Technologies and Innovative Research, 10*(10), i127-i137. https://www.researchgate.net/profile/Sridhar-Madasamy/publication/381259051_THE_EVOLUTION_OF_CHATBOTS_CLOUD_AND_AI_SYNERGY_IN_BANKING_CUSTOMER_INTERACTIONS/links/66640310de777205a318c709/THE-EVOLUTION-OF-CHATBOTS-CLOUD-AND-AI-SYNERGY-IN-BANKING-CUSTOMER-INTERACTIONS.pdf

Nikhil, V. M., & Velmurugan, V. P. (2024). Quantifying Digital Transformation Impact on Customer Service Automation in SMEs Using Knowledge Management Approach. https://doi.org/10.21203/rs.3.rs-4367443/v1

Prasad, K. V. S., Xavier, L. A., Jain, S., Subba, R., Mittal, S., & Anute, N. (2024, May). AI-Driven Chatbots for E-Commerce Customer Support. In *2024 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI)* (pp. 1–5). IEEE. https://doi.org/10.1109/ACCAI61061.2024.10602261

Rahevar, M., & Darji, S. (2024). The adoption of AI-driven chatbots for recommendations in e-commerce systems to target customers in the selection of products. *International Journal of Management, Economics and Commerce, 1*(2). https://doi.org/10.62737/m1vpdq75

Stoilova, E. (2021). AI chatbots are a customer service and support tool. *ROBONOMICS: The Journal of the Automated Economy, 2*, 21–21. https://doi.org/10.5890/robo.2021.10.002

TheoryHub. (n.d.). Technology Acceptance Model (TAM). *Newcastle University*. Retrieved March 8, 2025, from https://open.ncl.ac.uk/theories/1/technology-acceptance-model/#:~:text=Technology%20Acceptance%20Model%20(TAM)&text=TAM%20postulates%20that%20the%20acceptance,perceived%20ease%20of%20its%20use.

ISSN 2959-6130

9. Appendix

Survey Questions:

1. **How satisfied are you with the speed of responses provided by the AI chatbot?**
   (1 = Very Dissatisfied, 5 = Very Satisfied)
2. **How effective do you feel the AI chatbot is at resolving your issues or inquiries?**
   (1 = Not Effective at All, 5 = Very Effective)
3. **How likely are you to continue using the chatbot for future customer service interactions?**
   (1 = Very Unlikely, 5 = Very Likely)
4. **To what extent do you believe the AI chatbot has improved your overall experience with the company?**
   (1 = Not at All, 5 = Significantly Improved)
5. **How would you rate the overall quality of customer service provided by the AI chatbot compared to human agents?**
   (1 = Much Worse, 5 = Much Better)
6. **Since implementing the AI chatbot, have you noticed a reduction in the time spent on handling customer service inquiries?**
   (1 = No Reduction, 5 = Significant Reduction)
7. **Has the use of the AI chatbot helped reduce your company's operational costs (e.g., staffing, training, customer service infrastructure)?**
   (1 = Not at All, 5 = Significantly Reduced)