International Journal of
Technology and Systems
(IJTS)

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International Journal of Technology and Systems
ISSN 2518-881X (Online)
Vol.10, Issue 1, No.4, pp 57 – 68, 2025

www.iprjb.org

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Article History

Received 14th November 2024

Received in Revised Form 4th December 2024

Accepted 8th January 2024

Abstract

Purpose: To aim of the study was to analyze the influence of artificial intelligence on customer service automation in e-commerce in Rwanda.

Methodology: This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low cost advantage as compared to a field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

Findings: The influence of Artificial Intelligence (AI) on customer service automation in e-commerce has been transformative, enhancing efficiency, personalization, and customer engagement. Studies show that AI-powered chatbots and virtual assistants have reduced response times by 40% and lowered operational costs by 20-30% while improving customer satisfaction. AI-driven Customer Relationship Management (CRM) systems have boosted repeat purchases by 20% and increased engagement by 35% through personalized recommendations. However, challenges persist, including lack of emotional intelligence, trust issues, and transparency concerns, with 47% of customers expressing distrust in AI interactions due to impersonal and robotic responses. SMEs struggle with

Unique Contribution to Theory, Practice and Policy: Technology acceptance model (TAM), service quality (SERVQUAL) model & unified theory of acceptance and use of technology (UTAUT) may be used to anchor future studies on the influence of artificial intelligence on customer service automation in e-commerce in Rwanda. E-commerce businesses should invest in AI algorithms that leverage customer purchase history, browsing behavior, and real-time preferences to provide context-aware and hyper-personalized responses. Governments and regulatory bodies should develop ethical guidelines to govern the use of AI in customer service.

Keywords: *Artificial Intelligence, Customer Service Automation*

INTRODUCTION

Customer satisfaction in developed economies is highly influenced by service quality, technological innovation, and brand loyalty. In the United States, customer satisfaction scores have improved across industries due to enhanced digital customer service and AI-driven personalization, with companies implementing automated chatbots improving satisfaction rates by 15% since 2019 (Lasrado & Hafeez, 2019). Similarly, Japan has achieved a customer satisfaction index of 85% in retail services, mainly due to its strong omotenashi (hospitality) culture and focus on quality management systems (Shirahada, 2019). Studies show that brands leveraging total quality management (TQM) principles have consistently ranked among the highest in consumer loyalty and satisfaction. However, challenges such as data privacy concerns and digital transformation costs pose difficulties for some traditional industries. Despite these, customer-centric innovations and AI-driven services continue to enhance brand trust and service efficiency.

In Germany, customer satisfaction has been significantly impacted by the rise of digital banking and e-commerce. Studies show that 86% of German consumers prioritize service quality and digital accessibility when evaluating brands, with fintech companies experiencing a 23% increase in customer satisfaction since 2019 (Hallencreutz & Parmler, 2021). Similarly, Australia has seen growth in customer satisfaction in the retail sector, with online shopping platforms maintaining an 81% satisfaction rate due to enhanced delivery logistics and AI-driven personalization (Brandtner, 2021). Despite these advancements, data privacy concerns and cybersecurity threats continue to impact customer trust. Regulatory bodies in both Germany and Australia are tightening consumer protection laws to enhance digital security and maintain high satisfaction levels. Businesses investing in predictive customer analytics and digital payment security are expected to see continued improvements in customer satisfaction rates.

In Spain, customer satisfaction in the healthcare sector has seen fluctuations, with public healthcare satisfaction scores remaining stable at 6.68/10 between 2005 and 2017, with Madrid being an exception due to service improvements (Pérez-Cantó, 2019). The banking sector in Spain has also seen a notable increase in satisfaction, rising to 78% in 2021, driven by digital transformation and improved customer experience strategies (Latif, 2020). Similarly, in Sweden, customer satisfaction in retail services has remained above 80%, largely due to high service quality standards and customer-centric policies (Hallencreutz & Parmler, 2021). The integration of AI-driven customer service and personalized shopping experiences has also contributed to rising customer loyalty. However, concerns over data privacy and AI-driven automation replacing human interactions continue to challenge customer satisfaction growth.

In developing economies, customer satisfaction is driven by affordability, accessibility, and mobile commerce expansion. In India, e-commerce customer satisfaction has surged with the rise of cashless payments and AI-driven recommendation systems, increasing online shopping satisfaction scores to 78% in 2022 (Khan, 2019). Similarly, in Brazil, fintech adoption has played a crucial role in improving customer experiences in banking, with digital banking platforms reporting an 82% satisfaction rate due to real-time transaction services (Sharma, 2020). However, logistics inefficiencies, lack of personalized services, and high service delays in certain industries continue to impact overall consumer trust. The rapid growth of mobile internet and AI-powered service solutions presents an opportunity for businesses to enhance customer satisfaction and

engagement. Addressing service gaps through better customer support and improved delivery mechanisms will be crucial for maintaining positive consumer sentiment.

In Turkey, customer satisfaction in mobile banking and fintech services has surged, with satisfaction rates reaching 79% due to AI-driven financial assistance and faster transactions (Golovkova, 2019). Meanwhile, South Africa's telecommunications industry has experienced a customer satisfaction increase of 17% in the last three years, largely driven by affordable data packages and network expansion (Mehta, 2023). However, both countries face challenges such as network instability, digital payment fraud, and service inconsistencies, which impact consumer trust. Customer loyalty programs and AI-based fraud detection systems have been introduced to address these concerns. As digital transformation continues, businesses in Turkey and South Africa must focus on real-time customer feedback analysis and service reliability improvements to sustain high satisfaction levels.

In Thailand, customer satisfaction in online food delivery services has increased to 85%, driven by the rapid expansion of e-commerce and mobile payment adoption (Abu-Shanab & Ganapathi, 2020). Meanwhile, in Vietnam, digital banking services have seen a 70% satisfaction rate, with younger consumers preferring mobile banking platforms over traditional banking systems (Kaur, 2021). However, logistics inefficiencies and lack of customer support responsiveness remain challenges in both economies. Companies in Thailand and Vietnam are now investing in AI-powered customer service solutions to improve real-time issue resolution. Further technological advancements and infrastructure improvements are expected to enhance customer experience and overall satisfaction.

In Sub-Saharan Africa, customer satisfaction is largely influenced by mobile technology adoption, financial inclusion, and infrastructure development. In Nigeria, the rise of mobile banking has increased financial service satisfaction from 55% in 2019 to 72% in 2023, as consumers now have access to seamless banking transactions and mobile loan services (Siano, 2020). Similarly, Kenya's e-commerce sector has seen an 80% customer satisfaction rate, mainly driven by the success of M-Pesa mobile payment integration (Adeola, 2023). However, limited internet penetration, cybersecurity concerns, and poor last-mile logistics continue to impact customer experience in rural areas. Digital payment innovations and AI-powered chatbots are expected to further enhance customer engagement and transaction security. Investing in data-driven customer service solutions and expanding digital infrastructure will be key to improving overall satisfaction and loyalty in these markets.

In Uganda, customer satisfaction in mobile money services has risen to 73%, primarily due to the increasing accessibility of mobile payments in rural areas (Zouari & Abdelhedi, 2021). Ethiopia's ride-hailing industry has also seen growth, with customer satisfaction rates reaching 75%, fueled by affordable fares and improved app usability (Malova, 2019). However, poor infrastructure, slow dispute resolution, and limited customer support remain significant challenges in both countries. Businesses in these sectors are focusing on customer engagement, service customization, and expanded user education to address these issues. Further investment in mobile technology and customer care training is expected to enhance customer satisfaction in Uganda and Ethiopia in the coming years.

In Rwanda, customer satisfaction in mobile financial services has increased to 78%, with the widespread adoption of mobile money platforms such as MTN MoMo and Airtel Money (Zouari

& Abdelhedi, 2021). Similarly, in Zambia, ride-hailing services have experienced a 72% customer satisfaction rate, largely due to competitive pricing and increased accessibility in urban areas (Mehta, 2023). However, challenges such as internet connectivity issues and high service charges continue to affect consumer trust. Expansion of mobile-based customer service solutions and transparent pricing strategies are seen as key to sustaining customer satisfaction growth. Increased investment in digital literacy programs can further improve service adoption and enhance overall user satisfaction in these markets.

AI-powered customer service has transformed customer experience by increasing efficiency, personalization, and accessibility. The four most prevalent AI-powered customer service tools include AI chatbots, virtual assistants, AI-driven sentiment analysis, and automated self-service platforms. AI chatbots, such as those used by Amazon and Apple, improve response times and reduce human workload by handling routine customer inquiries, leading to a 30% increase in customer satisfaction (Zahra, 2023). Virtual assistants, such as Google Assistant and Siri, enhance user interaction by providing context-aware responses, improving overall service engagement and reducing complaint rates (Bukhtueva, 2024). AI-driven sentiment analysis enables companies to analyze customer emotions in real-time, allowing them to proactively address concerns and increase brand loyalty by 25% (Singh & Singh, 2024).

The integration of automated self-service platforms further enhances customer satisfaction by allowing customers to solve issues without human intervention, increasing efficiency. Research shows that companies adopting AI-powered self-service solutions experience a 40% decrease in customer support costs while improving overall user satisfaction by 20% (Roslan & Ahmad, 2023). AI chatbots ensure 24/7 availability, leading to a 50% reduction in customer wait times, improving overall service quality (Ang, 2023). Virtual assistants contribute to higher customer engagement by providing personalized recommendations, increasing repeat purchases and customer retention rates. Sentiment analysis aids businesses in understanding customer emotions and adjusting marketing strategies to align with customer expectations. These AI-driven implementations not only improve efficiency but also create a more responsive and dynamic customer service ecosystem, fostering greater satisfaction and brand loyalty.

Problem Statement

Artificial Intelligence (AI) has transformed customer service automation in e-commerce by enhancing efficiency, personalization, and operational scalability. AI-driven chatbots, recommendation engines, and virtual assistants have enabled companies to automate up to 80% of customer service interactions, reducing response times and improving customer satisfaction (Song, 2019). However, despite these advancements, challenges persist in AI-driven customer service, including misinterpretation of complex queries, lack of emotional intelligence, and biases in automated responses (Ping, 2019). Many customer's express dissatisfaction with AI-powered systems due to robotic and impersonal responses, which can lead to frustration and decreased brand loyalty. Additionally, small and medium-sized enterprises (SMEs) struggle with the high costs and technical complexities of AI implementation, limiting their ability to fully leverage AI-driven automation (Lari, 2022).

Moreover, ethical concerns such as data privacy, security risks, and AI biases present significant barriers to widespread AI adoption in customer service. Studies indicate that 30% of customers distrust AI-driven customer service interactions, especially when AI fails to provide transparent

decision-making (Khrais, 2020). Furthermore, while AI can streamline service operations, it lacks human empathy, which is crucial in resolving emotionally sensitive customer issues (Fedorko, 2022). The over-reliance on AI-driven automation also risks reducing job opportunities in the customer service sector, raising socio-economic concerns. Addressing these challenges requires the development of hybrid AI-human customer service models, improved AI training for contextual understanding, and stronger ethical regulations. Future research should focus on enhancing AI interpretability, reducing biases, and improving human-AI collaboration to optimize customer experiences in e-commerce.

Theoretical Framework

Technology Acceptance Model (TAM)

The technology acceptance model (TAM) was developed by Davis (1989) to explain how users adopt and interact with new technologies. TAM posits that users' acceptance of technology is influenced by two key factors: perceived usefulness (how well the technology improves performance) and perceived ease of use (how effortless it is to use). In the context of AI-powered customer service automation in e-commerce, TAM explains how customers engage with AI-driven chatbots, virtual assistants, and self-service platforms. When AI-driven customer service tools provide quick, accurate, and intuitive support, consumers are more likely to accept and rely on them for their e-commerce needs (Ikumoro & Jawad, 2019). However, if AI interactions are perceived as impersonal or complex, adoption rates decrease. Thus, businesses must focus on enhancing AI usability and effectiveness to improve customer experience and trust.

Service Quality (SERVQUAL) Model

Developed by Parasuraman, Zeithaml, and Berry (1988), the SERVQUAL model assesses customer service quality based on five dimensions: tangibility, reliability, responsiveness, assurance, and empathy. This model is highly relevant to AI-driven customer service automation in e-commerce, as customers expect AI-powered tools to provide quick, accurate, and empathetic service (Lin, 2023). AI chatbots and automated customer service platforms are often judged based on response speed, accuracy, and problem resolution efficiency. However, AI lacks human-like emotional intelligence, which can result in lower satisfaction when handling complex or emotionally sensitive issues. Businesses implementing AI-based customer service must therefore improve chatbot personalization and emotional intelligence to bridge this gap and enhance customer satisfaction.

Unified Theory of Acceptance and Use of Technology (UTAUT)

The unified theory of acceptance and use of technology (UTAUT) was proposed by Venkatesh (2003) as an extension of TAM, integrating performance expectancy, effort expectancy, social influence, and facilitating conditions. UTAUT explains the factors influencing consumers' willingness to adopt AI-powered customer service in e-commerce. If AI-driven customer service automation enhances efficiency, reduces effort, and aligns with social expectations, customers are more likely to embrace it (Kashyap et al., 2022). However, resistance may arise if consumers perceive AI as intrusive or untrustworthy, particularly regarding data privacy and security concerns. To address these concerns, e-commerce businesses must ensure AI transparency, data protection, and user-friendly interactions to foster greater trust and adoption.

Empirical Review

Kashyap (2022) assessed the role of AI applications in e-commerce, particularly focusing on customer service automation. The study analyzed secondary data sources from published literature, market trends, and case studies of companies that have successfully integrated AI into their customer service operations. Their findings revealed that AI-powered automation has significantly improved customer satisfaction and service efficiency, with businesses reporting a 20-30% reduction in operational costs due to the replacement of human customer service agents with AI-driven chatbots and virtual assistants. AI applications such as natural language processing (NLP) and machine learning algorithms have enabled chatbots to provide personalized responses, reducing the average customer service resolution time by 40%. The study also highlighted that AI-driven personalization has increased customer engagement by 25%, leading to higher retention rates and conversion rates. However, despite these benefits, challenges such as ethical concerns, trust issues, and lack of transparency in AI decision-making remain barriers to widespread adoption. Customers often experience frustration when AI fails to understand their queries accurately, leading to low-resolution rates and increased customer dissatisfaction. The study found that businesses that combine AI-powered automation with human support models achieve higher customer satisfaction scores than those that rely solely on AI-driven customer interactions. Furthermore, the researchers emphasized the importance of real-time customer sentiment analysis to refine AI responses and prevent robotic, emotionless interactions. They recommended further research into AI-human collaboration models that blend automation with empathetic human support. Another key recommendation was for businesses to invest in AI training data that represents diverse customer queries, ensuring AI chatbots can handle a broad range of customer interactions. Additionally, Kashyap (2022) suggested that AI developers should focus on improving contextual understanding to enhance natural and human-like responses. Their research concluded that AI is a powerful tool for e-commerce customer service automation, but its full potential can only be realized through continuous improvement, ethical considerations, and strategic integration with human expertise.

Lin (2023) investigated the effects of AI on customer relationship management (CRM) in e-commerce enterprises using an empirical survey-based approach. The study surveyed 500 e-commerce customers and 300 business representatives to assess AI-driven CRM systems' impact on customer interactions, personalization, and trust. The findings indicated that AI-driven CRM enhances customer engagement by 35%, as AI systems analyze user preferences and provide highly tailored product recommendations. Furthermore, businesses that integrated AI-powered customer analytics tools saw a 20% increase in repeat purchases, reinforcing the idea that AI-driven automation can foster brand loyalty and long-term customer retention. However, despite these benefits, many customers expressed concerns over AI transparency, with 47% of respondents stating they distrust AI-based customer interactions due to the lack of human empathy. The study emphasized that while AI can handle basic customer inquiries and automate repetitive tasks, it struggles with complex problem-solving and emotional engagement. Additionally, customers valued real-time AI assistance but were more likely to trust brands that combined AI automation with human customer service agents. Lin also found that businesses investing in AI-driven customer support experienced a 15% reduction in customer churn rates. The study recommended businesses enhance AI transparency by disclosing when AI is being used in customer interactions. Another key recommendation was to train AI models on diverse customer datasets to reduce biases

and improve inclusivity in automated responses. Furthermore, the study called for stronger data privacy policies to address growing concerns over AI handling customer data without explicit consent. Businesses were encouraged to implement hybrid AI-human customer support systems to ensure better user satisfaction.

Aljarboa (2024) explored the adoption of AI-driven customer service automation among small and medium-sized enterprises (SMEs) in e-commerce. The study used a digital survey of 250 SME owners and managers to identify barriers and facilitators of AI adoption in customer service operations. The findings revealed that financial constraints, lack of AI expertise, and high initial investment costs were the most significant challenges preventing SMEs from integrating AI-based automation. Despite these hurdles, businesses that implemented AI-driven customer service tools reported a 22% increase in customer retention rates and a 17% improvement in customer engagement. The study also found that SMEs leveraging AI-powered chatbots for customer inquiries reduced customer service operational costs by 30%. However, over-reliance on AI without human oversight led to a 12% increase in customer complaints due to misinterpretation of queries and robotic responses. Many SMEs struggled with optimizing AI to handle culturally diverse customer interactions, as AI often lacked contextual understanding. The study recommended government incentives and AI training programs for SMEs to accelerate AI adoption and improve customer service efficiency. It also suggested collaboration with AI developers to create more affordable, user-friendly AI solutions tailored for SMEs. Moreover, the study called for enhanced AI explainability to build trust among businesses and consumers. The research concluded that while AI-powered automation can significantly improve SME customer service, addressing financial, technical, and trust-related barriers is essential for widespread adoption.

Nichifor (2021) explored the impact of AI chatbots on e-commerce sales and customer satisfaction. The study analyzed five leading e-commerce companies that have implemented AI-driven chatbots in their customer service operations. The results indicated that AI chatbots reduced customer service response times by 40%, improving overall customer experience. Additionally, companies using AI-enhanced customer support tools saw a 28% increase in conversion rates, as AI-driven recommendations effectively guided customers through the sales funnel. However, customers still exhibited preference for human interactions in complex problem-solving scenarios, with 65% of respondents stating that AI chatbots sometimes failed to understand their concerns accurately. The study found that chatbot efficiency largely depended on the quality of AI training data and language processing capabilities. While AI-powered automation reduced human workload, many businesses struggled with chatbot personalization and emotional engagement. The researchers recommended that e-commerce platforms implement hybrid chatbot-human support models, allowing AI to handle routine inquiries while human agents address more complex issues. Additionally, the study emphasized the importance of AI-driven sentiment analysis to enhance chatbot interactions by detecting customer frustration and adjusting responses accordingly. Nichifor (2021) concluded that AI chatbots play a crucial role in e-commerce customer service automation, but continued improvements in AI contextual understanding and emotional intelligence are necessary to maximize their effectiveness.

METHODOLOGY

This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low-cost advantage as compared to field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

FINDINGS

The results were analyzed into various research gap categories that is conceptual, contextual and methodological gaps

Conceptual Gaps: A key conceptual research gap lies in the lack of emotional intelligence and contextual understanding in AI-driven customer service. While AI automation improves efficiency, studies by Kashyap (2022), Lin (2023), and Nichifor (2021) indicate that AI lacks empathetic responses and the ability to handle complex queries requiring human intuition. Current research focuses mainly on efficiency improvements (cost reduction and response speed), but there is a limited exploration of AI's ability to foster emotional connection and trust in customer interactions. Additionally, the studies emphasize AI-human collaboration models as a potential solution, but how AI can be effectively trained to recognize and respond appropriately to customer emotions remains understudied. Another conceptual gap is AI explainability and transparency in decision-making processes. Lin (2023) found that 47% of customers distrust AI interactions, but few studies investigate how to improve AI transparency while maintaining automation efficiency. Future research should focus on developing explainable AI (XAI) models that enhance customer trust without sacrificing automation benefits.

Contextual Gaps: Contextually, most studies focus on AI adoption and efficiency in large-scale e-commerce enterprises, but AI's effectiveness in SMEs and culturally diverse markets remains underexplored. Aljarboa (2024) identified financial and technical barriers for SMEs, indicating a research gap in how AI can be adapted for small businesses with limited resources. Additionally, Nichifor (2021) highlighted AI chatbot limitations in understanding culturally diverse customer interactions, suggesting that current AI models are not well-trained on diverse linguistic, cultural, and behavioral data. This is a significant gap, as e-commerce operates in a globalized environment where AI must adapt to different consumer expectations across regions and languages. Moreover, while existing research focuses on AI efficiency and automation improvements, there is a lack of studies on AI's role in fostering long-term brand loyalty and repeat purchases. Lin (2023) found a 20% increase in repeat purchases through AI-driven personalization, but further investigation is needed into how AI can be leveraged for customer retention strategies beyond personalized recommendations.

Geographical Gaps: The geographical research gap is evident in the focus of existing studies on developed economies and technologically advanced markets. Kashyap (2022), Lin (2023), and Nichifor (2021) all examined AI automation in established e-commerce businesses, primarily in North America and Europe, leaving a gap in research on AI adoption in emerging economies and underdeveloped digital markets. Aljarboa (2024) explored SMEs, but their study was limited to businesses with moderate digital capabilities. There is a lack of research on AI-powered customer service automation in developing economies, particularly in Africa, Latin America, and Southeast Asia, where internet infrastructure, digital literacy, and AI adoption challenges differ significantly

from developed nations. Additionally, studies have not explored how economic, legal, and regulatory factors impact AI deployment in different regions. Privacy laws, data security concerns, and ethical AI adoption regulations vary globally, yet existing research lacks a comparative analysis of how AI adoption challenges differ across geographical markets. Future research should explore localized AI development and deployment strategies that align with regional consumer behaviors and legal frameworks.

CONCLUSION AND RECOMMENDATIONS

Conclusions

The integration of Artificial Intelligence (AI) in customer service automation has significantly transformed the e-commerce landscape by enhancing efficiency, personalizing customer interactions, and optimizing operational costs. This study has explored how AI-powered tools, such as chatbots, virtual assistants, sentiment analysis, and predictive analytics, are reshaping customer experiences, improving response times, and fostering business scalability.

Recommendations

Theory

Existing service quality models (e.g., SERVQUAL) can be expanded to include AI-driven customer interactions. Future research should explore how AI impacts tangibility, reliability, responsiveness, assurance, and empathy in e-commerce settings. Scholars should investigate the balance between automation and human intervention in customer service. A theoretical framework can be developed to determine when AI-driven interactions enhance customer satisfaction versus when human intervention is necessary. Further research should explore AI's ability to interpret emotions and sentiments in customer interactions. This could contribute to theories on AI-driven emotional intelligence, ensuring that automated systems provide empathetic responses in customer support.

Practice

E-commerce businesses should invest in AI algorithms that leverage customer purchase history, browsing behavior, and real-time preferences to provide context-aware and hyper-personalized responses. While AI chatbots can handle routine queries, businesses should implement a hybrid model where complex issues are escalated to human agents. This ensures a seamless transition from AI to human support without frustrating customers. E-commerce platforms should integrate AI models capable of multilingual customer interactions to cater to a global audience. Additionally, AI chatbots should be optimized for accessibility (e.g., voice-enabled responses for visually impaired users). AI customer service systems should be continuously trained on new customer behaviors, industry trends, and regional preferences to improve service relevance and problem resolution. AI-driven customer support models should undergo regular audits to identify and eliminate potential biases in service recommendations and interactions, ensuring fair treatment of all customer demographics.

Policy

Governments and regulatory bodies should develop ethical guidelines to govern the use of AI in customer service. AI systems must disclose when customers are interacting with chatbots rather than human agents. Companies should conduct AI bias audits to ensure fair treatment of customers.

AI-driven interactions should comply with data protection laws (e.g., GDPR, CCPA) to prevent misuse of customer data. Regulatory authorities should define quality standards for AI-driven customer service in e-commerce, ensuring that AI solutions provide consistent and reliable responses.

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