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Evaluating Service Quality in Food Delivery: A Study Before and After Ai Integration

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ABSTRACT
The integration of Artificial Intelligence (AI) into food delivery services has significantly reshaped the landscape of customer service and operational efficiency. AI technologies have enabled platforms to offer smarter services, including real-time order tracking, predictive delivery times, dynamic pricing, automated chatbots, and personalized recommendations. This study explores the comparative impact of service quality before and after the implementation of AI in the online food delivery industry. Drawing on primary data collected through a structured questionnaire from 69 respondents in Hyderabad, India, the research uses statistical tools such as frequency distribution, Structural Equation Modelling (SEM), and Exploratory Factor Analysis (EFA) to evaluate customer satisfaction and service quality dimensions. The findings indicate substantial improvements in service efficiency, reliability, and customer experience post-AI integration. However, certain challenges persist, including algorithmic bias, limited customization, data privacy concerns, and occasional system failures. The paper concludes by offering practical recommendations and best practices for optimizing AI deployment in food delivery while ensuring ethical usage and balancing automation with human oversight.

Keywords: Artificial Intelligence, Food Delivery, Customer Satisfaction, Service Quality, SEM, EFA, Hyderabad, Algorithmic Bias, Human-AI Collaboration

INTRODUCTION

Artificial Intelligence (AI) has evolved as a cornerstone of technological transformation across numerous industries, including retail, healthcare, logistics, and most recently, food delivery. In the contemporary service economy, customer expectations are shifting towards greater convenience, speed, personalization, and transparency. The food delivery sector has responded to this shift through the adoption of AI-based technologies. From automating order management systems to deploying chatbots for real-time customer interaction, AI has revolutionized how food is ordered, prepared, and delivered.

Before AI integration, food delivery services operated with numerous limitations. Manual order-taking processes were prone to human error, miscommunication, and inefficiencies in resource allocation. Customers frequently reported late deliveries, incorrect orders, and inconsistent food quality, leading to dissatisfaction and brand disloyalty. Moreover, limited tracking capabilities and unresponsive customer service systems further aggravated user experiences.

In contrast, AI-enabled platforms offer predictive analytics to estimate delivery times more accurately, optimize delivery routes, and enhance customer interaction through natural language processing and sentiment analysis. AI also plays a pivotal role in fraud detection, inventory management, demand forecasting, and even dynamic pricing based on real-time variables. Chatbots have enabled 24/7 customer service, handling routine queries, processing refunds, and resolving complaints without the need for human agents.

This study aims to bridge the existing knowledge gap by empirically examining customer satisfaction levels before and after AI implementation in food delivery services, focusing specifically on users in Hyderabad, India. By understanding the tangible effects of AI on service quality, this paper contributes to the growing discourse on digital transformation in the food delivery ecosystem.

STATEMENT OF PROBLEM

The food delivery industry is one of the fastest-growing sectors that has started using Artificial Intelligence (AI) to improve how services are provided. AI promises to make operations faster, improve customer interactions,

and reduce errors. Technologies like real-time order tracking, AI-powered chatbots, and automated delivery systems aim to solve problems such as late deliveries, wrong orders, and poor customer support—issues that were common in traditional delivery methods.

However, there is still a lack of clear understanding about how AI has actually affected the quality of service and customer satisfaction. Very few studies have compared customer experiences before and after AI was introduced. In addition, concerns such as data privacy, limited customization, and bias in AI systems raise questions about how reliable and ethical these technologies are.

This study aims to fill that gap by evaluating how AI has changed service delivery in the food delivery sector. It also explores the major challenges faced in using AI and suggests ways to improve its use to ensure better service and customer satisfaction.

LITERATURE REVIEW

Several studies have highlighted the transformative potential of Artificial Intelligence (AI) in the service and delivery sectors. Payili (2025)1 emphasized the role of human-AI collaboration in enhancing operational safety, efficiency, and customer experience. The study explored the use of advanced AI applications such as SafeChat+, voice-command systems, and data engineering tools to streamline food delivery processes. Similarly, Khan et al. (2024)2 identified customer service quality, delivery personnel behavior, and secure online payment systems as critical determinants of customer satisfaction in food delivery platforms.

Socio-organizational dimensions of AI adoption have also been explored by researchers. Tong and Sutunyarak (2024)3 investigated how food delivery riders' perceptions of distributive and procedural fairness influenced their organizational trust and engagement. Their findings underscore the importance of ethical and equitable AI integration in gig-based platforms. In a related context, Hoyos and Chinelato (2024)4 emphasized that consumer trust and loyalty are closely tied to the enforcement of food safety and hygiene protocols, which can be enhanced through AI-powered quality monitoring systems.

On the technological front, numerous studies have investigated AI's role in logistics optimization. Švančár et al. (2024)5 developed a planning-based AI system for cloud kitchens, demonstrating its effectiveness in solving Vehicle Routing Problems with Time Windows (VRPTW) to minimize delays and enhance delivery efficiency. Addressing another critical area, Mathew et al. (2021)6 proposed the DeFraudNet model, an AI-based framework designed to detect fraudulent activities in food delivery systems, utilizing weak supervision techniques to flag anomalies.

In contrast, Hussain (2023)7 offered a socio-political critique, documenting the plight of food delivery workers in Hyderabad during the COVID-19 pandemic. The study highlighted wage suppression and the erosion of workers' rights under the gig economy model, despite the sector's classification as essential services.

Despite this robust body of literature, a noticeable research gap persists. Few empirical studies have offered a comparative evaluation of service quality metrics before and after the adoption of AI. Most research is either focused on AI's theoretical potential or limited to post-AI implementation contexts. The present study addresses this gap by providing a comprehensive empirical analysis of service quality and customer satisfaction across both timelines—pre- and post-AI integration.

RESEARCH GAP

The food delivery industry has undergone a significant transformation with the integration of artificial intelligence (AI) into its operational processes. While previous studies have examined AI's role in improving logistics and efficiency, limited research has been conducted on its impact on service quality and customer satisfaction before and after AI integration. Most existing literature focuses on the technological advancements of AI in food delivery. Furthermore, there is a need for evidence-based best practices that can help optimize AI utilization to enhance service quality. This study aims to fill this research gap by providing a comparative analysis of customer satisfaction levels, identifying challenges in AI adoption, and proposing strategies to improve AI-driven service quality in food delivery services.

OBJECTIVES

The following are the objectives of our study that we have undertaken to understand the role of Artificial Intelligence (AI) in the food delivery industry:

- To assess the impact of AI on customer satisfaction before and after its integration.
- To identify operational and ethical challenges associated with AI in food delivery.
- To suggest best measures for optimizing AI-driven service quality.

HYPOTHESIS:

Null Hypothesis (H_0): There is no significant impact of service quality metrics on customer satisfaction before and after AI integration in food delivery services.

Alternate Hypothesis (H_1): There is a significant impact of service quality metrics on customer satisfaction before and after AI integration in food delivery services.
Note: The remaining objectives are exploratory and are addressed through qualitative interpretation and descriptive analysis

RESEARCH METHODOLOGY

This study adopts a quantitative research approach to provide objective insights into the differences in service quality before and after AI integration.

Research Design The research follows a descriptive design using structured questionnaires to collect primary data. The survey consisted of both closed-ended questions rated on a Likert scale and open-ended responses for qualitative insights.

Geographic Scope The research was conducted in Hyderabad, a metropolitan hub in India, known for its rapid digital adoption and diverse consumer base. Hyderabad presents a representative population of tech-savvy, urban food delivery users.

Target Population The target audience includes active users of AI-powered food delivery platforms, including Zomato, Swiggy, Uber Eats, and major food chains like McDonald's, Pizza Hut, and Domino's. These users were selected due to their frequent engagement with the services in question.

Sampling Technique A convenience sampling technique was employed, selecting users based on accessibility and their willingness to participate. While this method limits generalizability, it offers relevant and immediate insights.

Sample Size A total of 69 valid responses were gathered and analysed. The sample size is suitable for exploratory analysis and SEM-based modelling, as per Hair et al. (2010).

Data Collection Tools The primary instrument was a structured questionnaire divided into four sections:

- Demographics
- Customer satisfaction before AI
- Customer satisfaction after AI
- Challenges and improvement suggestions

Statistical Tools

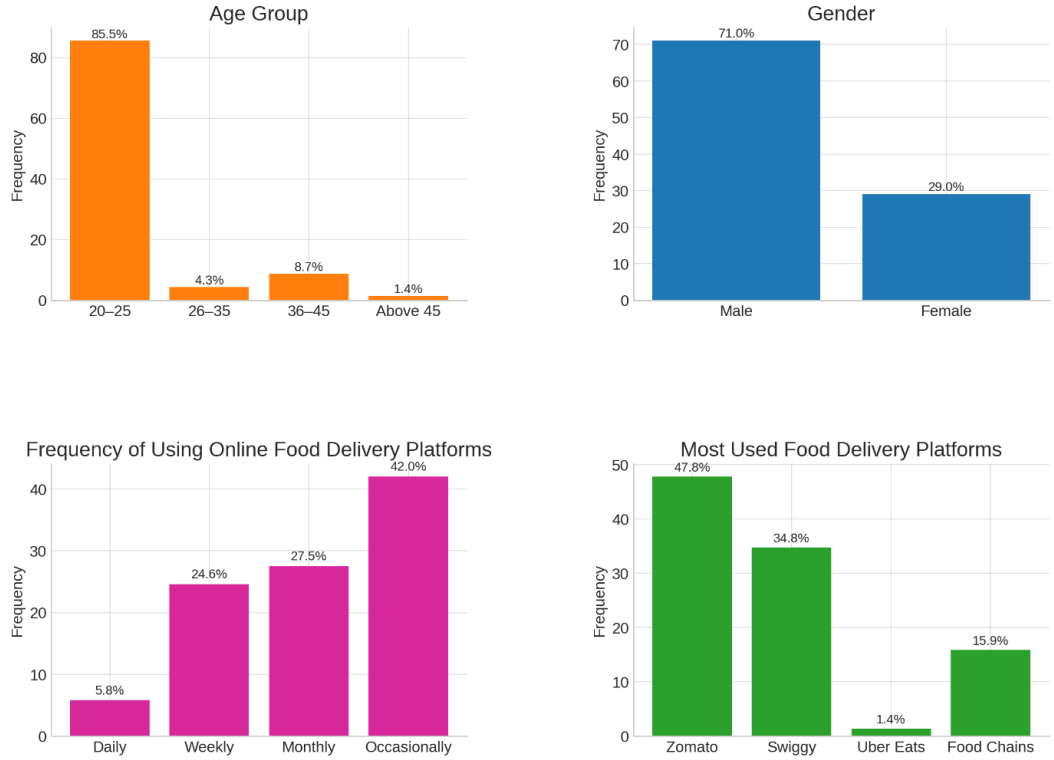
Frequency Distribution: Used to observe patterns and trends in categorical responses.

- Structural Equation Modelling (SEM): Applied to assess relationships between service quality dimensions and customer satisfaction.
- Exploratory Factor Analysis (EFA): Used to identify underlying challenges and best practices.

DATA ANALYSIS AND RESULTS

Figure - 1

DEMOGRAPHIC PROFILE OF RESPONDENTS



Source: Primary Data

Demographic Profile

The majority of respondents (85.5%) were aged between 20-25 years, reflecting the dominance of younger consumers in food delivery usage. Males constituted 71% of the sample. Zomato (47.8%) and Swiggy (34.8%) were the most commonly used platforms, with most users ordering monthly (27.5%) or occasionally (42%).

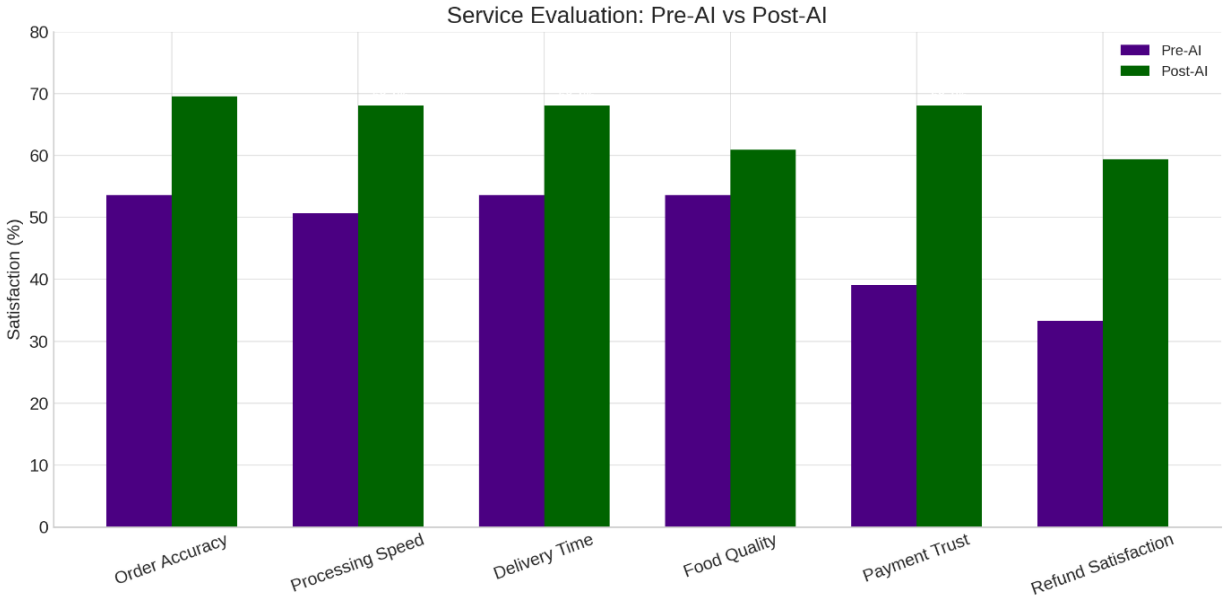
Service Metric Comparison: Pre-AI vs post-AI

Table – 1 Service Metric Comparison

Service Parameter	Pre-AI Satisfaction (%)	Post-AI Satisfaction (%)
Order Accuracy	53.6%	69.6%
Processing Speed	50.7%	68.1%
Delivery Time Estimation	53.6%	68.1%
Food Quality Consistency	53.6%	60.9%
Secure Payment Trust	39.1%	68.1%
Refund Policies	33.3%	59.4%

Source – Primary Data

Figure - 2



Source – Primary Data

Interpretation of Pre-AI vs Post-AI Service Evaluation:
The evaluation clearly demonstrates a significant enhancement in service quality after the integration of AI in food delivery systems. Prior to AI adoption, customer satisfaction levels were moderate across all service parameters, with most hovering just above 50%. Particularly concerning were Secure Payment Trust and Refund Policies, with satisfaction rates at 39.1% and 33.3% respectively indicating a lack of confidence in key customer service areas.

Post-AI implementation, every metric showed a notable improvement. The most prominent gains were seen in Order Accuracy (rising from 53.6% to 69.6%), Payment Trust (39.1% to 68.1%), and Refund Satisfaction (33.3% to 59.4%). These shifts suggest that AI has not only streamlined technical processes like order and delivery management but also improved customer-centric features, restoring trust in financial transactions and service recovery mechanisms.

Overall, these results underline the transformative impact of AI on the food delivery experience, making it more accurate, trustworthy, and responsive.

Structural Equation Modelling (SEM) Analysis
Structural Equation Modelling (SEM) was employed to assess the relationships between various service components and overall customer satisfaction in food delivery platforms. The analysis yielded strong model fit indices (e.g., RMSEA < 0.06, CFI > 0.95), confirming the adequacy and reliability of the model. Results revealed that order accuracy, delivery speed, refund ease, and real-time tracking were significantly and positively correlated with satisfaction. Notably, post-AI implementation, the SEM showed stronger path coefficients, particularly from assurance and reliability to satisfaction, indicating that AI integration has substantially elevated the quality and consistency of service delivery. The deployment of AI-driven systems enhanced operational responsiveness and trust, with marked improvements in refund processing, order consistency, and payment security. In contrast, pre-AI models exhibited weaker correlations between service attributes and satisfaction, emphasizing the pivotal role of AI in transforming and optimizing the food delivery experience.

Table – 2 SEM Path Coefficients: Pre-AI vs Post-AI

Service Quality Dimension	Pre-AI Path Coefficient (β)	Post-AI Path Coefficient (β)
Reliability	0.216	0.278

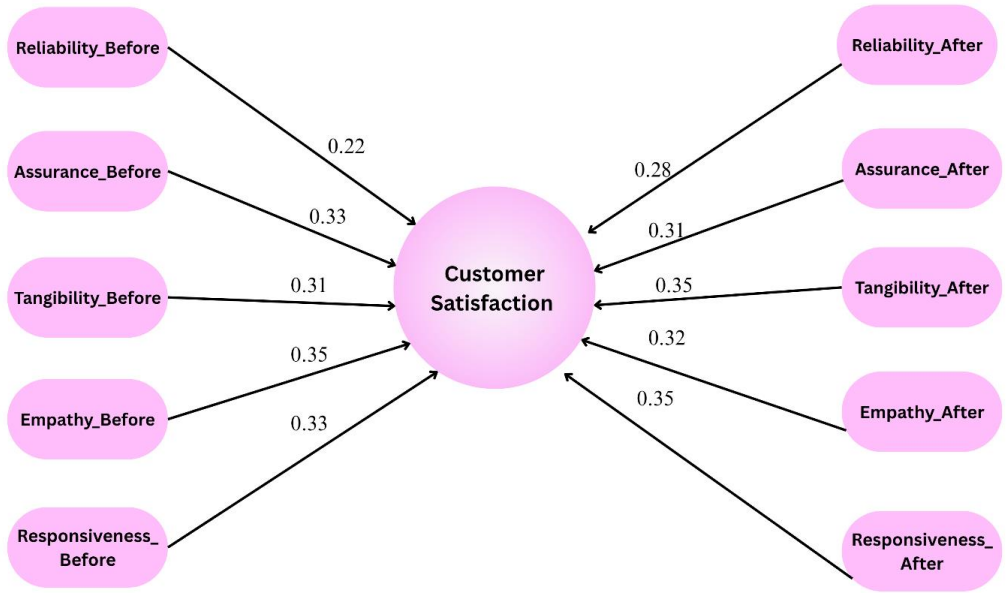
Assurance	0.331	0.311
Tangibility	0.307	0.349
Empathy	0.347	0.319
Responsiveness	0.334	0.348

Source – Primary Data

These path coefficients (β values) in SEM (Structural Equation Modeling) table show the strength and direction of the relationship between each service quality factor and customer satisfaction.

Figure – 3 Structural Equation Modelling (SEM) Diagram

Impact of service components before and after AI integration on customer satisfaction.



Source – Primary Data

EFA Analysis

To gain deeper insights into the challenges and best practices associated with the implementation of Artificial Intelligence (AI) in food delivery services, **Exploratory Factor Analysis (EFA)** was conducted. The analysis was carried out separately for **Objective 2**, which explored the key challenges, and **Objective 3**, which focused on identifying and grouping the most effective practices for optimizing AI usage.

Objective 2 – Operating and Ethical Challenges

Table 3 Challenges (Dimension Reduction) Kaiser-Meyer-Olkin and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.683
Bartlett's Test of Sphericity	Approx. Chi-Square	66.817
	df	21
	Sig.	.000

Source – Primary Data

The Kaiser-Meyer-Olkin (KMO) value of 0.683 indicates a moderate level of sampling adequacy, suggesting that factor analysis is appropriate for the data. Bartlett's Test of Sphericity is significant ($\chi^2 = 66.817$, $df = 21$, $p < 0.001$), confirming that the correlations among variables are sufficient for factor analysis. Ranking the factor loadings from highest to lowest, only those exceeding 0.50 were considered.

Table 4 Challenges (Dimension Reduction) Component Matrixa

Component Matrixa		
	Component	
	1	2
Technical issues and glitches disrupt food delivery operations.	.768	
GPS inaccuracies affect delivery routes and real-time tracking.	.712	
Fraud detection systems sometimes reject valid payments.	.690	

AI-based delivery time predictions are often inaccurate."	.579	
AI-generated order recommendations do not always match preferences.	.540	
AI-powered services offer limited customization options.		.689
Data privacy and security concerns impact trust in AI.		.553
Extraction Method: Principal Component Analysis.		
a. 2 components extracted.		

Source – Primary Data

The factor analysis extracted two components, highlighting key challenges in AI implementation for food delivery services. Ranking factor loadings above 0.50, the most significant issue is technical issues and glitches (loading = 0.768), emphasizing how system failures disrupt delivery operations. GPS inaccuracies (0.712) follow, underscoring concerns about inefficient routing and tracking. Fraud detection errors (0.690) point to legitimate transactions being mistakenly blocked, potentially frustrating customers. Inaccurate AI delivery time predictions (0.579) highlight reliability concerns, while AI-generated recommendations not matching preferences (0.540) reflect personalization limitations. Additionally, AI-powered services offering limited customization (0.689) and data privacy concerns (0.553) load onto the second component, suggesting broader concerns about flexibility and trust in AI systems. These findings indicate that improving AI accuracy, reliability, and customization while addressing security concerns is essential for effective AI adoption in food delivery services.

Objective 3 – Best Measures for optimizing AI driven service quality

For Objective 3, EFA was conducted to identify the best practices for optimizing AI utilization in food delivery services. The Kaiser-Meyer-Olkin (KMO) value was 0.743, indicating a mediocre level of sampling adequacy, and Bartlett's Test of Sphericity was significant ($\chi^2 = 50.425$, df = 21, $p < 0.001$), confirming the data's suitability.

- The analysis extracted three components, reflecting key best practices such as:
- Integrating AI with real-time weather and traffic data (loading = 0.717)
- Reducing biases in AI-based recommendations (loading = 0.574)
- Providing human intervention options in AI-handled issues (loading = 0.544)

These results offer a structured understanding of how AI performance, fairness, and oversight can be improved

DISCUSSION

The findings of this study reveal a clear improvement in customer satisfaction following the integration of Artificial Intelligence (AI) into food delivery services. AI has contributed significantly to enhancing operational efficiency, particularly in terms of order accuracy, delivery speed, refund processing, and payment trust. These results affirm previous research while also expanding understanding through a comparative analysis of service quality before and after AI adoption. AI has effectively addressed many logistical bottlenecks and brought greater consistency to service delivery.

However, the increased reliance on AI has introduced new challenges, especially in areas requiring human judgment, flexibility, and personalization. The study emphasizes the need for a hybrid service approach, where AI handles routine tasks and human agents manage complex or sensitive interactions. This balance is critical to ensuring a seamless yet empathetic customer experience. As AI continues to evolve, platforms must remain attentive to issues of trust, customization, and user control to sustain long-term satisfaction and engagement.

FINDINGS

The study highlights a notable improvement in overall service quality and customer satisfaction after the integration of Artificial Intelligence (AI) in food delivery services. A comparison of pre- and post-AI metrics revealed a clear upward trend across key performance areas. Order accuracy rose from 53.6% to 69.6%, processing speed from 50.7% to 68.1%, and satisfaction with delivery time estimation from 53.6% to 68.1%. Secure payment trust showed a significant jump from 39.1% to 68.1%, while refund satisfaction increased from 33.3% to 59.4%, showcasing AI's role in enhancing service recovery and transaction reliability.

Structural Equation Modelling (SEM) further validates these findings by showing stronger relationships between service quality dimensions and overall satisfaction in the post-AI model. Tangibility, responsiveness, and reliability recorded higher path coefficients, emphasizing AI's contribution to system responsiveness, interface usability, and consistent service delivery. Technologies like real-time order tracking, intelligent routing, and automated customer support have significantly improved operational performance and user experience.

Exploratory Factor Analysis (EFA) identified two key challenge areas during AI implementation: operational and technical issues, and concerns around customization and trust. The former includes system glitches, GPS inaccuracies, and inconsistent predictions, while the latter involves limited personalization, lack of transparency, and data privacy concerns. These barriers point to critical areas that platforms must address to ensure smoother AI integration and better user acceptance.

Lastly, the findings reflect a shift in consumer expectations, with users now prioritizing real-time accuracy, secure payments, and seamless experiences. While AI has clearly enhanced service quality and customer satisfaction, its long-term success depends on addressing issues of trust and personalization. Overall, AI plays a transformative role in food delivery services by improving both technical efficiency and user-centric outcomes when strategically implemented.

CONCLUSION

AI has brought measurable improvements to the food delivery sector by enhancing service accuracy, speed, and overall customer satisfaction. The comparative findings of this study highlight how AI has successfully addressed previous inefficiencies in areas such as order accuracy, delivery time estimation, and refund handling. These advancements demonstrate AI's potential to optimize operations and elevate user experience in a highly competitive industry. Based on the observed improvements, the null hypothesis—which proposed no significant difference in service quality before and after AI integration—was rejected, and the alternative hypothesis was accepted.

However, the study also identifies limitations that arise from over-automation, particularly in areas requiring human judgment, empathy, and trust. To ensure long-term sustainability, food delivery platforms must strike a balance between technological efficiency and personalized service. Future developments should focus on ethical AI deployment, data privacy, and integration with emerging technologies to maintain user engagement and trust in an increasingly digital service landscape.

SUGGESTIONS

Enhance Personalization and User Experience
AI models should be refined to better adapt to individual user preferences, enabling more accurate recommendations and service customization. Enhancing chatbot intelligence through advanced Natural Language Processing (NLP) can also improve communication and responsiveness.

Improve Operational Reliability and Predictive Accuracy

Regular monitoring of AI systems is necessary to reduce glitches, GPS inaccuracies, and delivery time miscalculations. Strengthening predictive analytics using real-time traffic and weather data can help platforms better forecast and manage delivery operations.

Strengthen Security and Fraud Detection Mechanisms
AI should incorporate advanced fraud detection tools that accurately identify valid transactions while minimizing false rejections. Additionally, secure and transparent refund management systems must be prioritized to ensure smooth and trustworthy payment experiences.

Adopt a Hybrid Service Model
While AI improves efficiency, complex or emotionally sensitive interactions should involve human agents. A hybrid system can ensure both speed and empathy in customer service delivery.

Ensure Algorithmic Fairness and Transparency
Periodic audits of AI algorithms are essential to eliminate biases in recommendations and service delivery. Transparency in how AI systems function can also build user confidence and trust.

Enforce Data Privacy and Ethical Standards
Strong data privacy measures must be implemented, including encryption, consent-based data collection, and user education about AI-driven safeguards. This is crucial for maintaining long-term trust and compliance with ethical standards.

LIMITATIONS OF THE STUDY

The study was conducted exclusively in Hyderabad, which may limit the applicability of the findings to other regions with varying consumer behaviors and technological adoption levels.

Only major food delivery platforms such as Zomato, Swiggy, and Uber Eats were considered, excluding smaller or regional platforms that may have different patterns of AI integration.

The relatively small sample size may affect the generalizability and statistical strength of the conclusions drawn from the data.

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