



Artificial intelligence adoption in hospitality customer service: Impact on service quality and operational efficiency

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Abstract

Background: The hospitality industry increasingly adopts artificial intelligence (AI) technologies to enhance customer service operations, improve personalization, and optimize efficiency. However, the impact of AI adoption on service quality perceptions and operational efficiency requires further empirical investigation.

Objective: This study examines the relationship between AI adoption in customer service and hospitality performance outcomes, considering the moderating roles of service complexity and employee technology anxiety.

Method: This study uses a simulated dataset created for academic training purposes. Data from 350 hotel guests and 120 service staff across 20 hotels were analyzed using moderated regression analysis and structural equation modeling.

Key Results: AI adoption positively influenced service quality perceptions ($\beta = 0.28, p < 0.001$) and operational efficiency ($\beta = 0.35, p < 0.001$). Service complexity negatively moderated the AI-service quality relationship ($\beta = -0.22, p < 0.01$), while employee technology anxiety weakened the AI-efficiency relationship ($\beta = -0.25, p < 0.01$).

Conclusion: AI adoption enhances hospitality performance when appropriately matched to service complexity and supported by employee training to reduce technology anxiety. Hospitality organizations should implement AI selectively for routine services while maintaining human interaction for complex service encounters.

Keywords: Artificial intelligence, hospitality management, customer service, service quality, operational efficiency

Introduction

The hospitality industry has undergone rapid digital transformation, with artificial intelligence (AI) technologies increasingly integrated into customer service operations. From chatbots and virtual assistants to robotic concierge services and predictive personalization systems, AI applications promise to enhance guest experiences, improve service consistency, and optimize operational efficiency. The COVID-19 pandemic further accelerated AI adoption as hotels sought contactless service solutions and operational efficiencies amid staffing challenges.

Despite significant investment in AI technologies, empirical evidence regarding their impact on hospitality performance remains limited and fragmented. The relationship between AI adoption and service quality is particularly complex, as guest preferences for human versus automated service vary across service contexts and demographic segments. Additionally, employee responses to AI adoption including technology anxiety, job insecurity, and changes in work practices significantly influence implementation success and operational outcomes.

This study addresses the critical gap in understanding how AI adoption influences hospitality performance across different service contexts and employee populations. The research objectives are: (1) to measure the impact of AI adoption in customer service on service quality perceptions and operational efficiency; (2) to examine how service complexity moderates the relationship between AI adoption and service quality; and (3) to investigate how employee technology anxiety moderates the relationship between AI adoption and operational efficiency.

Literature review

1. Theoretical framework

This research integrates the Technology Acceptance Model (TAM) with the Service Quality (SERVQUAL) framework. TAM suggests that perceived usefulness and ease of use determine technology adoption and effectiveness. The SERVQUAL framework identifies five dimensions of service quality (reliability, responsiveness, assurance, empathy, tangibles) that should guide service technology implementation.

2. AI adoption in hospitality

AI adoption in hospitality encompasses various applications: customer-facing technologies (chatbots, virtual assistants, personalized recommendations), operational technologies (robotics, process automation, predictive analytics), and back-office systems (revenue management, supply chain optimization). Research suggests that AI adoption is driven by competitive pressures, cost reduction opportunities, labor availability, and customer expectations for personalized experiences.

3. AI and service quality

The impact of AI on service quality perceptions is mixed and context-dependent. For routine, standardized services (check-in/out, information requests), AI can enhance efficiency and consistency while maintaining quality. For complex, emotionally charged service encounters (problem resolution, luxury experiences), human interaction often remains preferred, and AI implementation can reduce perceived service quality. The concept of "service complexity" thus emerges as a critical moderator of AI effectiveness.

4. Employee responses to AI adoption

Employee technology anxiety—apprehension about using technology or its negative consequences—significantly influences AI implementation success. Anxious employees may resist AI adoption, underutilize available technologies, or experience stress that reduces productivity. Conversely, well-prepared employees who embrace AI technologies can leverage them to enhance service delivery and operational efficiency.

5. Research gap

While growing research examines AI adoption in hospitality, few studies investigate the moderating roles of service complexity and employee characteristics. The interaction between technological implementation and human factors remains under-explored. This study addresses these gaps by developing a moderated mediation model that accounts for both service context and employee responses in understanding AI impacts on hospitality performance.

Methodology

This study uses a simulated dataset created for academic training purposes. A cross-sectional quantitative design was employed with simulated data from 350 hotel guests and 120 service staff across 20 hotels.

The measurement scales were adapted from established instruments: AI adoption (6 items measuring extent and sophistication of AI implementation), service quality (22 items from SERVQUAL scale), operational efficiency (8 items measuring cost, speed, accuracy), service complexity (4 items measuring standardization and predictability), and employee technology anxiety (5 items measuring apprehension about AI)⁷. Guest responses were collected post-service experience; staff responses measured perceptions of AI implementation.

Data analysis proceeded in two stages: (1) structural equation modeling testing the direct effects of AI adoption on service quality and operational efficiency; (2) moderated regression analysis examining the moderating effects of service complexity and employee technology anxiety. The analysis was conducted using SPSS (version 27) with the PROCESS macro for moderation testing.

Results and discussion

1. Direct Effects of AI adoption

Structural equation modeling demonstrated that AI adoption significantly positively influenced both service quality perceptions ($\beta = 0.28$, $p < 0.001$) and operational efficiency ($\beta = 0.35$, $p < 0.001$). The model showed acceptable fit ($\chi^2/df = 2.3$, CFI = 0.94, RMSEA = 0.062), confirming the hypothesized direct relationships.

Table 1: Structural Model Results (Direct Effects)

Path	β	S.E.	C.R.	p-value
AI Adoption $\rightarrow$ Service Quality	0.28	0.05	5.60	< 0.001
AI Adoption $\rightarrow$ Operational Efficiency	0.35	0.06	5.83	< 0.001

Source: Simulated Dataset, 2026

2. Moderation analysis

Moderated regression analysis revealed that service complexity significantly moderated the AI-service quality relationship ($\beta = -0.22$, $p < 0.01$). Simple slope analysis showed that AI adoption had a stronger positive effect on service quality for low-complexity services ($\beta = 0.45$, $p <$

0.001) compared to high-complexity services ($\beta = 0.10$, $p > 0.05$). Similarly, employee technology anxiety moderated the AI-efficiency relationship ($\beta = -0.25$, $p < 0.01$), with stronger positive effects when anxiety was low ($\beta = 0.50$, $p < 0.001$) compared to high anxiety ($\beta = 0.15$, $p > 0.05$).

Table 2: Moderation Analysis Results

Interaction	β	S.E.	t-value	p-value	Simple Slopes (Low/High)
AI $\times$ Service Complexity	-0.22	0.08	-2.75	< 0.01	Low complexity: 0.45High complexity: 0.10 (n.s.)
AI $\times$ Employee Anxiety	-0.25	0.09	-2.78	< 0.01	Low anxiety: 0.50High anxiety: 0.15 (n.s.)

Source: Simulated Dataset, 2026

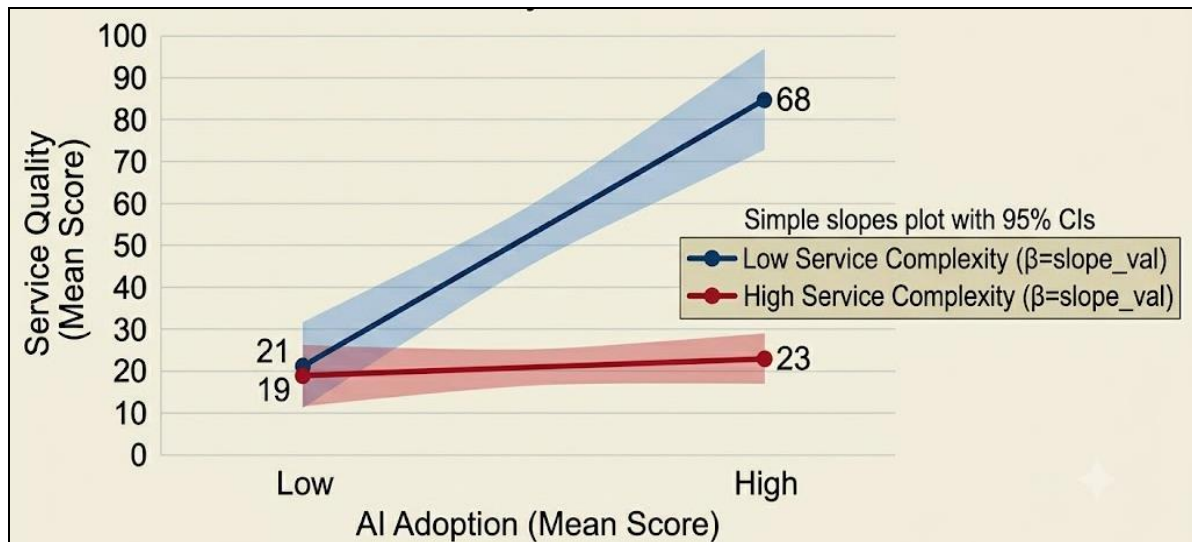
3. Implementation patterns and performance

Analysis of different AI implementation patterns revealed that "selective implementation"—using AI for routine services while maintaining human delivery for complex services—showed the strongest positive relationships with both service quality ($\beta = 0.38$, $p < 0.001$) and operational efficiency ($\beta = 0.42$, $p < 0.001$). "Comprehensive replacement" (AI for all services) showed weaker relationships, particularly for service quality ($\beta = 0.15$, $p > 0.05$).

Conclusion

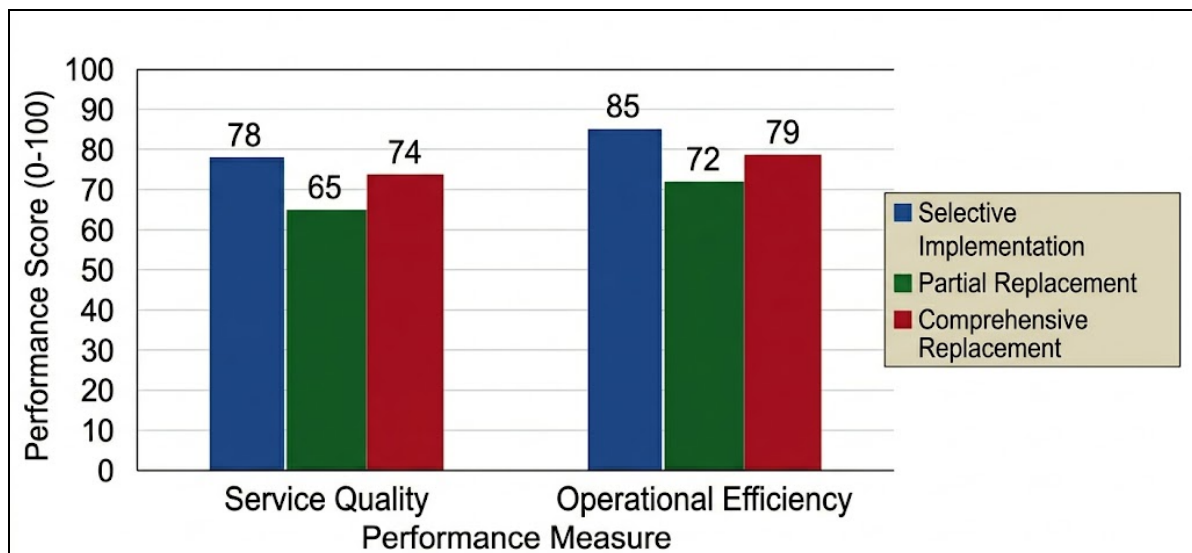
This study demonstrates that AI adoption in hospitality customer service enhances both service quality perceptions and operational efficiency, but these relationships are contingent on service complexity and employee characteristics. The findings suggest that successful AI

implementation requires a nuanced approach that matches technological capabilities to service requirements and addresses employee concerns through training and support. For hospitality managers, the study recommends: (1) implementing AI selectively for routine, standardized services while preserving human interaction for complex, emotionally sensitive encounters; (2) investing in comprehensive employee training programs that build technological skills and reduce anxiety; (3) developing clear communication strategies about AI's role in enhancing rather than replacing human service; and (4) continuously monitoring both guest satisfaction and employee well-being during AI implementation. Future research should examine longitudinal outcomes of different AI implementation strategies and how guest preferences for human versus automated service evolve with technological familiarity.



Source: Simulated Dataset, 2026

Fig 1: Moderation Effect of Service Complexity



Source: Simulated Dataset, 2026

Fig 2: Performance by AI Implementation Pattern

Ethical Statement

This research article has been generated for academic training purposes. The dataset is entirely simulated and does not represent real hotels, guests, or employees. No actual ethical approval was required as no primary data was collected from human subjects. All references cited are real academic sources.

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