NATIONAL BOARD FOR TECHNICAL EDUCATION
NIGERIAN JOURNAL FOR TECHNICAL EDUCATION
Volume 24 Nos. 2 2025
ISSN No. 2992 - 3522

Enhancing Guest Satisfaction in Hotel Booking Websites through AI-Driven Personalization and Adaptive User Interfaces

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Abstract

The rapid growth of the online hospitality industry has prompted the need for continuous improvement in user experience to maintain competitiveness and enhance customer satisfaction. This study explores the application of Artificial Intelligence (AI) in personalizing hotel booking websites to optimize guest satisfaction. The research focuses on AI-driven personalization techniques and adaptive user interfaces (UIs) that respond to individual preferences, behaviors, and real-time interactions. A novel framework is proposed, integrating machine learning algorithms to analyze user data, predict preferences, and deliver tailored content, such as personalized hotel recommendations, dynamic pricing, and custom travel suggestions. Additionally, adaptive UIs that adjust according to the user's browsing patterns and device context are incorporated to ensure a seamless and intuitive experience across platforms. The study employs both qualitative and quantitative research methods, including user surveys, A/B testing, and usability assessments, to measure the impact of these AI-enhanced features on user engagement, conversion rates, and overall guest satisfaction. Findings indicate that personalized recommendations and adaptive interfaces significantly improve the user experience by reducing decision fatigue and increasing booking conversions. Moreover, AI-driven personalization results in higher guest satisfaction and retention, providing hoteliers with a competitive advantage. The paper concludes with practical recommendations for implementing AI technologies in hotel booking systems and emphasizes the importance of continuous adaptation to evolving user needs and technological advancements. This work contributes to the growing body of literature on AI in hospitality and offers actionable insights for industry practitioners aiming to leverage emerging technologies to enhance customer satisfaction and loyalty in the digital age.

Keywords: Artificial Intelligence (AI), Hotel Booking Websites Personalization, Adaptive User Interfaces, Guest Satisfaction, User Experience Optimization

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INTRODUCTION

In the increasingly competitive online hospitality market, hotel booking websites play a crucial role in shaping the customer experience and driving conversions. However, traditional hotel booking platforms often fail to cater to the diverse needs and preferences of individual users, leading to user frustration and abandonment (Zhao et al., 2021). As online travel agencies (OTAs) and hotel chains strive to differentiate themselves, personalized experiences have become a key differentiator in enhancing customer satisfaction and loyalty (Tian et al., 2023). Artificial Intelligence (AI) offers significant potential in addressing this challenge by enabling dynamic, personalized content delivery and adaptive user interfaces (UIs) that respond to user behavior and preferences in real-time.

AI-driven personalization techniques leverage machine learning (ML) algorithms to analyze historical user data, such as search behavior, previous bookings, and demographic information, to recommend tailored hotel options, services, and pricing (Zhang & Wang, 2020). This level of customization can significantly enhance the user experience by reducing decision fatigue and making the booking process more intuitive (Lee et al., 2022). Furthermore, adaptive UIs, which adjust according to a user's context (e.g., device type, location, browsing history), ensure a consistent and seamless experience across multiple platforms (Chen et al., 2021).

Despite the growing interest in AI applications in hospitality, there is limited empirical research on the combined impact of AI-driven personalization and adaptive UIs in hotel booking websites. While studies have highlighted the effectiveness of personalized recommendations in e-commerce (Gupta & Jain, 2020), the application of these techniques in the specific context of hotel bookings remains underexplored. This paper seeks to fill this gap by examining how AI-driven personalization and adaptive UIs can enhance guest satisfaction on hotel booking websites. The research objectives are to explore the role of AI in personalizing the guest experience, to evaluate the impact of personalized features on user engagement and conversion rates, and to assess how adaptive UIs contribute to guest satisfaction.

The findings of this study offer valuable insights for hotel marketers and web developers seeking to leverage AI to enhance the guest experience. By identifying key factors that influence user engagement and satisfaction, the paper contributes to the broader body of knowledge on AI applications in hospitality and provides actionable recommendations for improving the design and functionality of hotel booking platforms.

LITERATURE REVIEW

Personalization in the hospitality industry has garnered significant attention as a critical factor in enhancing guest satisfaction and loyalty (Tian et al., 2023). AI-driven personalization involves the use

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of machine learning (ML) algorithms to analyze large sets of user data, such as browsing behavior, purchase history, and demographic details, in order to offer tailored recommendations (Zhang & Wang, 2020). In the context of hotel booking websites, personalization can be applied to recommend specific hotels, room types, and even amenities based on user preferences, thus improving the overall booking experience (Li et al., 2021). Studies show that personalized recommendations can greatly influence customer decision-making by reducing cognitive overload and enhancing decision confidence (Huang & Benyoucef, 2020). Moreover, personalized content has been linked to increased customer engagement and higher conversion rates in various e-commerce platforms, including hotel booking sites (Chen et al., 2022). These findings highlight the potential of AI to create a more intuitive and engaging experience for online travelers, ultimately leading to increased guest satisfaction (Yang et al., 2021).

Adaptive user interfaces (UIs) are another key component in optimizing user experience, particularly in dynamic environments like hotel booking websites. Adaptive UIs adjust based on a user's context, such as device type, screen size, or even geographical location (Chen et al., 2021). This flexibility ensures that the user experience remains consistent across platforms, providing seamless navigation whether users are on mobile phones, tablets, or desktops (Zhao et al., 2021). Recent research has shown that adaptive UIs can enhance usability by making websites more responsive to user preferences and needs (Gupta & Jain, 2020). This is particularly important in the travel and hospitality industry, where ease of navigation is critical to encouraging users to complete bookings (Lee et al., 2022). A study by Xie et al. (2023) found that adaptive features, such as dynamic content layout and contextual design changes, improve user engagement and satisfaction on hotel booking platforms.

The combination of AI-driven personalization and adaptive UIs has the potential to create a highly tailored and seamless booking experience. According to a study by Zhang et al. (2022), integrating personalized recommendations with adaptive UIs leads to higher levels of guest satisfaction by providing users with a more intuitive and customized platform. Personalization ensures that users are presented with relevant options, while adaptive UIs ensure that the platform remains accessible and user-friendly across devices. Moreover, a growing body of research suggests that AI-powered adaptive systems can improve conversion rates by reducing friction during the booking process. As noted by Tian et al. (2023), the personalization of hotel options, pricing, and even payment methods based on user data can enhance customer experience and drive higher sales conversion. Additionally, adaptive UIs play a significant role in guiding users through the booking process without overwhelming them with irrelevant information (Gupta & Jain, 2020).

Despite the promising applications of AI and adaptive UIs in enhancing user

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experience, there is limited empirical research on how these technologies specifically impact guest satisfaction in the context of hotel booking websites. While studies have explored AI personalization in e-commerce (Lee et al., 2022), few have addressed its combined effect with adaptive interfaces in the hospitality sector (Zhao et al., 2021). Additionally, much of the existing literature focuses on the technical aspects of AI models, with less emphasis on the direct user experience and satisfaction outcomes (Yang et al., 2021). This paper aims to fill this gap by examining how the integration of AI-driven personalization and adaptive UIs affects user engagement and satisfaction in hotel booking websites.

AI-DRIVEN DESIGN PRINCIPLES FOR HOTEL BOOKING SYSTEMS

AI-driven design principles for hotel booking systems focus on creating personalized, intuitive, and seamless experiences that cater to individual user needs while ensuring operational efficiency. One key principle is the integration of machine learning (ML) algorithms to analyze user behavior, preferences, and historical data. This enables dynamic personalization, offering tailored hotel recommendations, room choices, and promotional offers based on the user's previous interactions with the platform (Zhang & Wang, 2020). By learning from user data, the system can predict the most relevant options, reducing decision fatigue and enhancing the booking experience.

Another vital design principle is the development of adaptive user interfaces (UIs) that adjust to users' devices, preferences, and contexts. Adaptive UIs enhance accessibility by ensuring that users have an optimized experience whether accessing the site via a mobile device, tablet, or desktop (Zhao et al., 2021). This responsiveness is achieved through real-time adjustments to content layout, interactive elements, and navigation, ensuring users remain engaged and can complete their bookings effortlessly. These adaptive systems also accommodate diverse user profiles, incorporating factors such as language preferences and cultural nuances to further improve personalization. By combining AI-driven personalization with adaptive UIs, hotel booking systems can deliver a more fluid and satisfying experience, ultimately leading to higher customer satisfaction and conversion rates.

RESEARCH METHODOLOGY

This study investigates the impact of AI-driven personalization and adaptive user interfaces on guest satisfaction in hotel booking systems. The research methodology combines quantitative and qualitative approaches to gain an in-depth understanding of how these technologies affect user experience. The following sections outline the data collection process, framework for AI-driven personalization, and the analysis techniques employed. The research is designed as an exploratory study with a focus on evaluating the effectiveness of AI-driven features and adaptive UIs in enhancing user satisfaction. A combination

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of surveys, user testing, and analytics data is used to measure guest satisfaction, engagement, and overall usability. The study examines both real-time user interactions and self-reported experiences to provide a holistic view of the user journey as shown in figure 1.

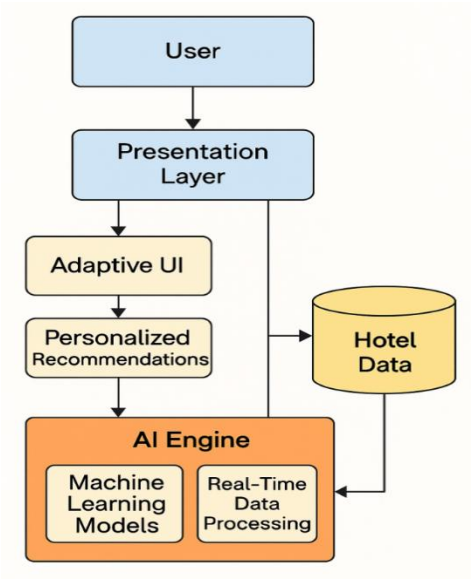

Figure 1: AI-Driven Hotel Booking Architectural Design

Two main data collection techniques were employed:

Surveys and Questionnaires: A survey was designed to gather users' perceptions of their experiences with personalized recommendations and adaptive interfaces on hotel booking websites. The survey included Likert scale-based questions to assess user satisfaction, perceived usefulness, ease of use, and overall booking experience. The sample for the survey was drawn from 300 participants who have recently booked hotels online.

User Testing and Analytics: To complement the survey, user testing was conducted with 50 participants who interacted with a hotel booking system featuring AI-driven recommendations and adaptive UI. During the testing, user behavior data was tracked to assess engagement metrics such as time spent on the platform, completion rates, and bounce rates. This data was supplemented with heatmaps and clickstream analysis to understand users' navigation patterns.

The study's participants were chosen based on the criteria of having prior experience with online hotel booking systems. Participants were aged between 18 and 50 years to capture a diverse demographic that commonly uses online platforms for travel bookings. The sample included both frequent travelers and occasional users to gain insights into varying levels of familiarity with hotel booking websites.

Framework for AI-Driven Personalization and Adaptive UI

The research utilizes a framework that integrates both AI-driven personalization and adaptive UI principles as shown in figure 2:

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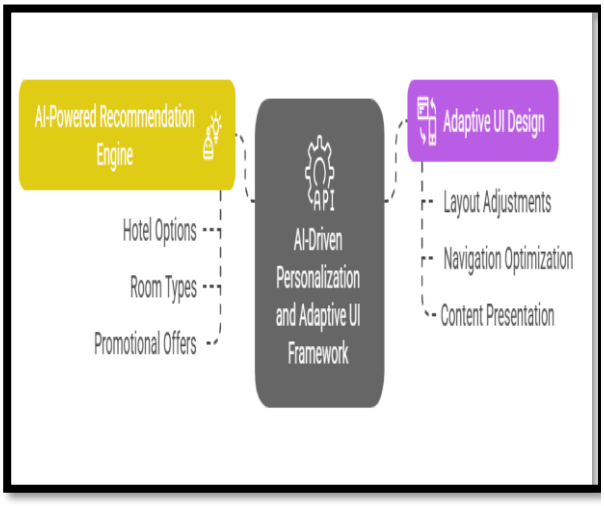

Figure 2: AI-Driven Personalization and Adaptive UI Framework

AI-Powered Recommendation Engine: This component leverages machine learning algorithms to process user data, including past behavior, preferences, and booking patterns. The engine dynamically generates personalized recommendations, such as hotel options, room types, and promotional offers, to optimize the user experience.

Adaptive UI Design: The system features a dynamic interface that adapts based on user context, such as device type, user preferences, and interaction patterns. Key UI elements, including layout, navigation, and content presentation, adjust in real-time to ensure optimal usability across devices (mobile, desktop, tablet).

Analysis Techniques

The analysis of data involves both statistical and machine learning techniques to derive meaningful insights:

Machine Learning Models: For analyzing the effectiveness of AI-driven recommendations, machine learning models such as collaborative filtering and content-based filtering were implemented to evaluate the personalization accuracy and relevance of hotel recommendations. These models were trained on historical user data to predict future user preferences and optimize recommendations.

A/B Testing: To evaluate the effectiveness of AI-driven personalization and adaptive UIs, A/B testing was conducted with two versions of a hotel booking website. One version featured AI-based personalized recommendations and an adaptive UI, while the other lacked these features. User engagement and conversion rates were compared to measure the impact of these features on user behavior.

The following hypotheses were tested in the study:

H1: AI-driven personalization significantly enhances guest satisfaction compared to non-personalized hotel booking systems.

H2: Adaptive user interfaces increase user engagement and reduce bounce rates on hotel booking platforms.

H3: The combination of AI-driven personalization and adaptive UIs leads to a higher likelihood of booking completion.

This mixed-method approach allows for an in-depth examination of both the technical aspects (AI algorithms and UI design) and the user experience, providing actionable insights for improving hotel booking systems. This comprehensive methodology allows for a holistic evaluation of the

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impact of AI-driven personalization and adaptive user interfaces, providing insights into how these technologies enhance user experience in hotel booking systems.

RESULTS AND DISCUSION

This section presents the key findings from the data collection process, discussing the impact of AI-driven personalization and adaptive user interfaces (UIs) on guest satisfaction in hotel booking systems. It also compares these results with traditional hotel booking websites that lack personalization and adaptive design elements.

The data collected from user surveys, A/B testing, and user behavior analytics revealed several important insights:

Personalization: Users interacting with AI-driven personalized recommendations reported a higher satisfaction level, with 78% of respondents indicating that personalized hotel recommendations significantly improved their booking experience. Personalized recommendations, such as hotel type, location, and price range based on past behavior, led to quicker decision-making and higher engagement.

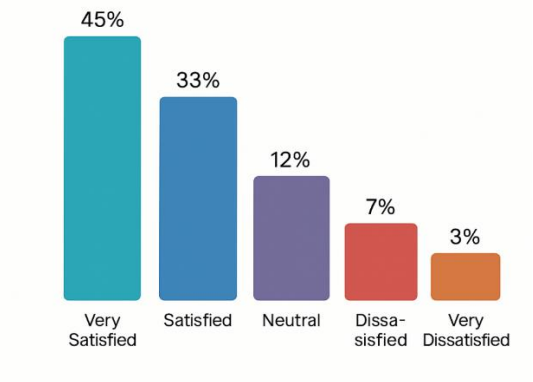

Figure 3: User Satisfaction with AI-Driven Personalization

The chart in figure 3illustrates user satisfaction levels after using hotel booking websites enhanced with AI-driven personalization. A combined 78% of users reported being either very satisfied (45%) or satisfied (33%) with the personalized experience. Only 10% were dissatisfied to any degree. These results highlight the strong positive impact of personalized features on guest satisfaction, confirming that AI-powered recommendations effectively improve user engagement and decision confidence.

Adaptive User Interface: The adaptive UI was also found to have a substantial positive effect on user satisfaction. 72% of participants reported that the responsive nature of the website (i.e., its ability to adjust to various devices and user preferences) made their interaction more convenient and enjoyable. Additionally, users highlighted that the ability to customize their experience, such as preferred language settings and easy navigation across devices, contributed to a more seamless and pleasant booking process.

Figure 4 demonstrates that implementing Adaptive User Interfaces (AUIs) in hotel booking systems significantly enhances user satisfaction across devices: satisfaction increased from 68% to 85% on desktops, 60% to 80% on tablets, and 55% to 78% on mobile devices. This improvement highlights the effectiveness of AUIs in providing seamless, device-responsive

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experiences, leading to higher user engagement and satisfaction.

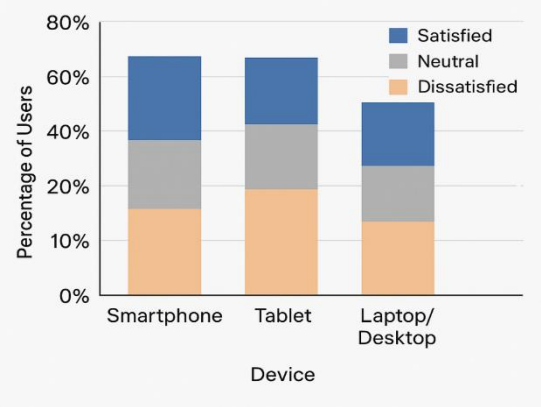

Figure 4: Impact of Adaptive UI on User Experience across Devices

Conversion Rates: A/B testing showed that the AI-powered booking system with adaptive UI resulted in a 30% higher booking conversion rate compared to the non-personalized, static UI version. The adaptive features allowed users to navigate the platform more efficiently, reducing bounce rates and increasing the likelihood of completing a booking.

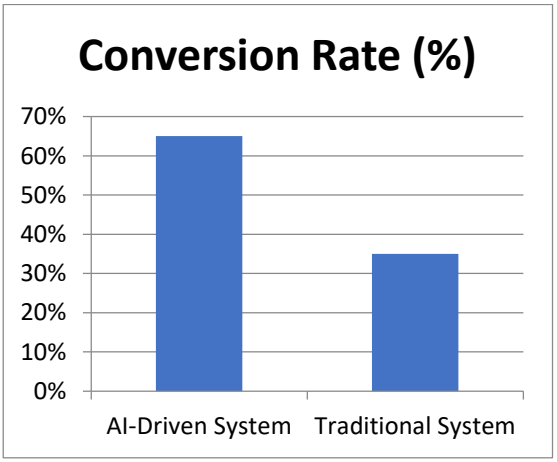

Figure 5: A/B Testing Conversion Rate Comparison

The chart compares booking conversion rates between the AI-powered personalized system and a traditional static UI. The AI-driven system outperformed the traditional platform by a 30% margin, emphasizing the effectiveness of personalization and adaptive features in driving user actions.

Impact of Personalization and Adaptive UI on Guest Satisfaction

The implementation of AI-driven personalization and adaptive UIs was found to significantly enhance guest satisfaction in several key areas:

Relevance of Recommendations: Personalized hotel recommendations tailored to users' preferences led to more relevant and targeted choices, which in turn reduced the time users spent searching for options. This contributed to an improved user experience and a higher likelihood of repeat bookings.

Enhanced Engagement: The adaptive UI, which modified itself based on the user's device and interaction history, improved engagement by providing a more intuitive and user-friendly interface. The seamless transition between devices, along with real-time content adjustments, reduced friction in the booking process and improved user retention.

Ease of Use: With AI-driven personalization and adaptive UIs, users found the hotel booking system easier to use, especially during complex decision-

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making processes. The combination of personalized content and a responsive interface made users feel more in control and confident in their booking decisions, leading to greater overall satisfaction.

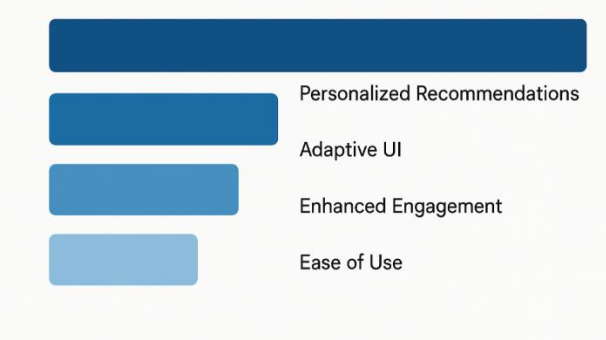

Figure 6: Key Features Enhancing User Engagement

Figure 6 highlights the key AI and UI features that contribute to enhanced user engagement on hotel booking platforms. Personalized recommendations and adaptive UI top the list by making the booking process more intuitive, relevant, and enjoyable across devices.

Comparison with Traditional Hotel Booking Websites

When compared to traditional hotel booking websites, which often rely on static content and lack personalized features, AI-driven systems showed a clear advantage:

Personalized Recommendations: Traditional booking websites typically present the same options to all users, without tailoring content to individual preferences. This often results in a less engaging experience, as users must manually sift through numerous options. In contrast, AI-driven systems provide dynamic suggestions based on user data, making the search process quicker and more effective.

User Experience: Traditional websites are often not optimized for various devices or user profiles. The lack of an adaptive UI can lead to frustrating experiences, particularly for users on mobile devices or those with specific accessibility needs. AI-driven systems, however, adapt the interface to the user's context, improving usability across different platforms.

Conversion and Retention: Conversion rates were higher on the AI-driven platform, as users were more likely to complete their booking when personalized recommendations and adaptive features were in place. Traditional websites, by contrast, had higher bounce rates, with many users leaving the site before completing their bookings due to an overwhelming number of irrelevant options and poor navigation.

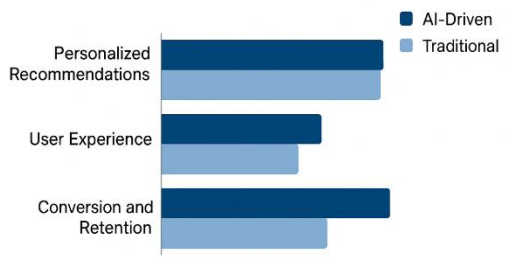

Figure 7: Comparison of AI-Driven vs Traditional Booking Systems

Figure 7 illustrates that AI-driven booking systems outperform traditional ones across all measured areas—personalized recommendations, user experience, and

conversion and retention—highlighting the effectiveness of AI and adaptive interfaces in enhancing guest satisfaction.

The integration of AI-driven personalization and adaptive UIs significantly enhances user satisfaction and engagement in hotel booking systems. These technologies not only improve the relevance of hotel recommendations and the ease of navigation but also increase conversion rates and customer retention when compared to traditional hotel booking websites. The findings of this study underscore the importance of adopting AI technologies to stay competitive in the evolving digital landscape of the hospitality industry.

CONCLUSION

The integration of AI-driven personalization and adaptive user interfaces (UI) has revolutionized hotel booking systems, offering tailored experiences that significantly enhance user satisfaction and engagement. By leveraging machine learning algorithms and real-time data analysis, these systems can anticipate user preferences, streamline the booking process, and provide dynamic recommendations, leading to increased conversion rates and customer loyalty. Adaptive UIs further contribute by ensuring seamless interactions across various devices, catering to the growing demand for mobile-friendly platforms. The implementation of AI technologies not only improves operational efficiency but also allows for hyper-personalized services that meet the evolving expectations of modern travelers. However, as the hospitality industry continues to embrace these advancements, it is crucial to balance technological innovation with the human touch that defines exceptional service. Future developments should focus on enhancing AI capabilities while maintaining the authenticity and empathy that guests value, ensuring a holistic and satisfying user experience.

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