Artificial intelligence adoption in tourism: A systematic literature review of customer experience

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Abstract   This study systematically reviews the current state of artificial intelligence (AI) applications in the tourism sector and their role in enhancing customer experience. It examines how AI is used to optimize operations and personalize services and explores factors that drive or hinder AI adoption. Following PRISMA guidelines, the review covers 57 articles published from 2000 to 2024, sourced from Web of Science and Scopus, based on defined inclusion criteria. The review also includes a bibliometric analysis of publication patterns and keyword co-occurrence using VOSviewer to identify prominent research themes and gaps. The analysis reveals eight thematic clusters: AI applications (e.g., demand forecasting, dynamic pricing, service automation, personalization) and associated challenges (technical, financial, socio-ethical). While AI offers significant opportunities to enhance tourism operations and customer experience, issues of data privacy, ethics, and workforce displacement remain prominent. These findings are synthesized into an integrative conceptual framework that links technological, ethical, and contextual factors influencing AI adoption. The study provides practical insights for tourism managers, highlighting the need to balance technological innovation with ethical considerations and to adapt AI strategies to diverse cultural contexts.

Keywords   artificial intelligence, tourism, customer experience, sustainable tourism, technology adoption, systematic literature review, bibliometric analysis

1. Introduction

Artificial Intelligence (AI) has rapidly emerged as a transformative force in the tourism and hospitality industry, reshaping how services are delivered and how customers interact with tourism providers [1]. Recent advances in AI have accelerated its diffusion into tourism services, especially in customer-facing and data-driven applications. In tourism, travelers now demand seamless, personalized experiences, and AI offers innovative tools to meet these expectations by optimizing customer interactions and back-end operations. For example, hotels employ AI chatbots and virtual assistants to provide instant 24/7 customer service, and airlines use predictive analytics to forecast demand and tailor offerings [3]. These technologies promise enhanced customer satisfaction through faster responses, personalization, and data-driven decision-making. At the same time, the integration of AI raises significant challenges from ethical concerns and data privacy issues to cultural acceptance and the potential displacement of human jobs. Tourism is fundamentally a "people industry," and there is an ongoing debate about the extent to which AI can augment or replace the human touch that is central to memorable travel experiences [4].

Despite growing research on "smart tourism" and technology acceptance, the scholarly understanding of AI adoption in tourism remains fragmented. Notably, much existing work relies on generic technology acceptance

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models (e.g. Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT)) to explain usage intentions. While valuable, these frameworks may not fully capture the evolving complexity of AI-enabled services, which involve not only functional utility but also emotional, cultural, and ethical dimensions [5]. Furthermore, prior reviews have not integrated the diverse factors, from technological attributes to contextual challenges, that influence AI adoption outcomes in tourism. There is a need for a comprehensive framework that links (a) the spectrum of AI applications in tourism, (b) the drivers and barriers affecting their adoption, (c) the contextual challenges (such as ethical and cultural factors) unique to tourism settings, and (d) the outcomes of AI implementation on customer experience.

To address these gaps, this paper presents a systematic literature review (SLR) of AI applications in tourism with a special focus on customer experience outcomes. We seek to synthesize current knowledge and propose an integrative conceptual model that connects AI applications, adoption factors, contextual challenges, and customer experience results. In particular, we aim to answer the following research questions:

- **RQ1:** What are the current applications of AI in the tourism sector, and how do they improve customer satisfaction, service personalization, and operational efficiency?
- **RQ2:** What factors drive or hinder the adoption of AI in tourism, particularly with regard to customer experience?
- **RQ3:** How can AI be leveraged to balance technological advancement with sustainable and ethical tourism practices, and what outcomes does AI adoption yield for the customer experience?

This study provides a holistic understanding of AI's transformative potential in tourism by systematically reviewing recent literature (primarily 2018 – 2024) while highlighting critical challenges and research gaps. We contribute an original conceptual framework to guide future research and practice, integrating technological, managerial, cultural, and ethical perspectives on AI adoption in tourism. The findings offer insights for tourism managers on developing AI adoption strategies that enhance customer experience in a responsible and context-aware manner.

2. Theoretical Framework: A Conceptual Model of AI Adoption in Tourism

To perform the review, we propose an integrative conceptual framework (Figure 1) that describes how AI applications in tourism are adopted and how they influence customer experience. This model synthesizes insights from technology adoption theories and tourism context specifics.
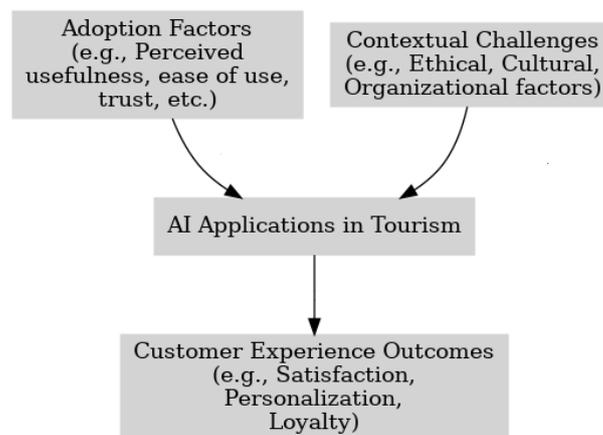

Figure 1. Conceptual model linking AI applications, adoption factors, contextual challenges, and customer experience outcomes (Source: Figure by authors).

2.1. AI Applications in Tourism

AI applications in tourism refer to the range of AI-driven technologies and use-cases deployed in the sector, such as chatbots, robotics, recommendation algorithms, predictive analytics, and personalization engines. These applications form the central focus of adoption: organizations decide to implement them, and customers decide to use or accept them. Prior studies show that the most prominent AI technologies in tourism include natural language processing (for chatbots/voice assistants) and machine learning models (e.g. neural networks for predictions), which enable automation of interactions and data-driven personalization [1]. For instance, AI chatbots are used to handle customer inquiries and bookings, while machine learning recommendations tailor travel offers to user preferences [4].

2.2. Adoption Factors (Drivers and Barriers)

These are the antecedent variables that influence whether and how AI applications are adopted by end-users (tourists) and organizations. Many adoption factors identified in the literature align with classic technology acceptance constructs, as well as unique factors for AI:

- **Perceived usefulness and ease of use:** Users are more inclined to adopt AI services that they find useful for enhancing their travel experience and that are easy to interact with [6, 7]. For example, a chatbot that quickly resolves customer issues or a recommendation system that yields relevant suggestions will be viewed favorably [8].
- **Perceived personalization:** The ability of AI to offer customized recommendations and responses can drive adoption, as customers value services tailored to their interests [7]. Increased personalization is noted as a growing expectation among tech-savvy travelers.
- **Trust:** Trust is repeatedly identified as a cornerstone of AI adoption in tourism [9]. Customers must trust the AI's reliability, accuracy, and data security before they are willing to rely on it. Trust can be built by demonstrating the AI's information quality (e.g. accurate information, relevant recommendations) and transparency in how it operates [10].
- **Anthropomorphism and social presence:** Especially for AI that interacts directly with customers (robots, chatbots), human-like design elements can influence adoption. Studies show that anthropomorphic cues (e.g. a "cute" or human-like chatbot persona) can increase user engagement and even tolerance for service failures [11]. A more humanized AI tends to evoke feelings of social presence and empathy, improving user comfort with the technology.
- **Perceived risk and anxiety:** On the flip side, concerns about privacy and security of personal data, as well as general anxiety about interacting with autonomous systems, serve as barriers to adoption. If users fear that an AI could misuse their data or make errors, they may resist using it. For example, research indicates that privacy concerns and technology anxiety can significantly inhibit travelers' willingness to use AI-based services [12].
- **Previous experience and innovativeness:** Individuals who have prior positive experience with AI or who are inherently more innovative tend to be more open to adopting AI in new contexts [12, 14, 13]. Familiarity breeds confidence. A traveler who has used AI assistants or smart systems elsewhere is more likely to try an AI service during a trip.

All these factors collectively influence the adoption of AI applications (as illustrated by the left arrow into the AI Applications box in Figure 1). They determine the initial acceptance and ongoing use by customers and employees.

2.3. Contextual Challenges

Even if an AI technology is useful and usable, broader contextual forces affect its adoption in tourism. We identify several key contextual factors (the right arrow in Figure 1) that can facilitate or hinder AI adoption in this sector:

- **Ethical and Legal Considerations:** The deployment of AI raises ethical issues like privacy, consent, and fairness. Tourism services often handle sensitive personal data (identity information, travel plans,

preferences), so AI systems must ensure data protection and ethical use of information. A hotel implementing AI-based facial recognition for guest check-in must navigate privacy regulations and guest consent. Scholars emphasize the need for clear guidelines on data use and transparency in algorithmic decisions to maintain user trust [15]. If these issues are not addressed, they become significant barriers; customers may reject AI that they perceive as invasive or biased.

- **Cultural Factors:** The acceptance of AI can vary greatly across cultural and regional contexts. Tourism is a global industry, and what is welcomed in one culture might be resisted in another. In cultures where high-touch, personalized human service is integral to hospitality, customers might be less enthusiastic about impersonal AI kiosks or robot staff [4]. On the other hand, some countries (such as Japan or South Korea) have shown high public openness to service robots in hotels, possibly due to cultural attitudes that normalize robots in daily life. The local context, including language, customs, and service expectations, must therefore be considered when adopting AI. Culturally adaptive AI interfaces (e.g. chatbots that understand local idioms or robots that follow local social etiquette) may alleviate some cultural frictions.

- **Organizational and Infrastructural Constraints:** The successful implementation of AI in tourism businesses also depends on organizational readiness and resources. High upfront costs for AI systems, the need for robust IT infrastructure, and the availability of skilled staff to maintain the systems are practical challenges frequently noted in the literature [1]. Smaller tourism enterprises might lack the capital or expertise to invest in sophisticated AI, leading to a gap where only larger firms benefit from AI innovations. Additionally, employee attitudes within the organization form a contextual factor; if staff fear AI as a threat to their jobs or do not receive training to work alongside AI, adoption will face internal resistance. For example, [16] found that hotel employees' awareness of AI and robotics could increase their turnover intention unless accompanied by strong organizational support and a positive workplace climate, highlighting the importance of managing human resources during AI adoption.

- **Sustainability and Social Impact:** In the broader context of sustainable tourism, AI adoption comes with the challenge of ensuring positive social and environmental outcomes, not just business benefits. There is a concern that AI-driven automation could displace jobs in hospitality, affecting local employment. Responsible adoption requires strategies to augment human labor (letting AI handle repetitive tasks while humans focus on personalizing guest interactions) rather than wholesale replacing it. Moreover, AI can be leveraged for sustainability (e.g. optimizing energy use in hotels, reducing waste through demand forecasting), and contextual pressure from global sustainability goals can influence adoption choices (for instance, prioritizing AI applications that help meet environmental targets) [17].

The contextual factors act as moderators or boundary conditions in our framework. They shape how and to what extent the adoption factors translate into actual AI implementation and use. For example, even if travelers find an AI booking system useful, strict data privacy laws (ethical context) or low internet penetration in a destination (infrastructural context) could impede its uptake. Conversely, in contexts supportive of innovation (e.g. tech-forward cultures, strong legal frameworks for AI governance), adoption drivers can operate more strongly.

2.4. Customer Experience Outcomes

Our model also looks at the outcomes of AI adoption on customer experience in tourism (Figure 1). "Customer experience" here means customers' holistic perceptions and reactions during their journey, including satisfaction, emotional responses, loyalty behaviors, and overall service quality evaluations. The literature indicates several key outcomes when AI is effectively implemented:

- **Enhanced Satisfaction:** Many studies report that AI-based improvements in service speed, accuracy, and personalization lead to higher customer satisfaction [17]. A traveler who gets quick answers from a chatbot or personalized tour recommendations from an AI is likely to feel more satisfied with the service. AI can contribute to more seamless service experiences (e.g. frictionless check-ins, instant problem resolution), which are the foundation of satisfaction in hospitality.

- **Greater Loyalty and Intention to Reuse:** Positive experiences with AI-driven services can translate into behavioral intentions like willingness to reuse the AI service on future trips or to recommend it to others [18].

In the model, this is represented as outcomes such as intention to continue using the AI (e.g. a guest deciding to use the hotel's AI concierge regularly) and intention to recommend (guests telling their friends about a great AI-enabled service). These intentions are proxies for customer loyalty. Some research specifically notes that a good AI-enabled experience can boost word-of-mouth marketing for the company, as impressed customers share their stories.

- **Improved Emotional Experience:** Customer experience is not only about functional satisfaction but also about emotions. AI interactions can evoke emotions ranging from delight and excitement to frustration or anxiety. For instance, an anthropomorphic robot bartender might delight customers and create a memorable, fun experience, whereas a poorly functioning booking AI could frustrate customers. Several studies include emotional responses as an outcome, finding that positive emotions (enjoyment, excitement) during AI interactions enhance overall experience, while negative emotions (confusion, anxiety) detract from it [10]. Designing AI to be user-friendly and emotionally intelligent (e.g. using empathetic language in a chatbot) can therefore improve these experiential outcomes.

- **Service Performance and Quality Perception:** An indirect but important aspect is that AI adoption often improves objective service performance (e.g. fewer errors, faster service), which in turn elevates customers' perception of service quality. For example, AI-enabled dynamic pricing can ensure guests feel they paid a fair price relative to the service delivered, supporting quality perceptions. AI's consistency (robots don't have "bad days") can lead to more reliable service delivery, which customers notice as improved quality. However, it is noteworthy that some aspects of quality, like empathy and warmth, are traditionally associated with human service; the challenge for AI is to approximate these qualities or operate in tandem with humans to maintain high perceived service quality [4].

- **Negative Outcomes and Limitations:** Our framework also acknowledges that outcomes are not automatically positive. If adoption is mishandled, AI can lead to customer dissatisfaction or alienation. For instance, travelers may become frustrated with an AI that cannot handle complex queries or annoyed if the use of AI feels too impersonal for a hospitality context. Some studies documented instances where a lack of human contact due to AI resulted in a diminished experience for certain customer segments (e.g. luxury travelers expecting high-touch personal service)[4]. Thus, measuring outcomes involves gauging not just the presence of benefits but also any emergent issues in the customer experience journey.

In summary, the conceptual model shows that AI applications in tourism are adopted under the influence of various drivers and barriers, and within the constraints of contextual challenges, and that successful adoption leads to significant outcomes on customer experience (improving satisfaction, loyalty, etc., while also posing new considerations for emotional and service quality aspects). This original framework integrates the multi-dimensional nature of AI adoption: it is at once a technological innovation decision, a human behavioral change, and a context-dependent phenomenon. By framing the literature in this way, we set the stage for a structured analysis in the following sections, where we review empirical findings on each component of the model and identify patterns and gaps.

3. Methodology

3.1. Systematic Literature Review approach

This study employed a Systematic Literature Review (SLR) methodology to collect, screen, and synthesize relevant research on AI adoption in tourism. The SLR was designed following established guidelines (PRISMA and SPAR-4-SLR protocols) to ensure a transparent and reproducible process [20, 19]. In line with best practices for evidence-based reviews [21], we defined clear inclusion criteria, developed a search strategy for our databases, and performed iterative screening of results.

3.2. Data sources

We focused on high-quality academic databases **Scopus** and **Web of Science (WoS)** as our sources of literature. These databases are well-regarded for comprehensive coverage of peer-reviewed journal articles and for providing robust bibliometric information [21]. The search was limited to journal articles (excluding books, dissertations, etc.) published in English to ensure consistency and academic rigor. We initially did not restrict by publication date, but given the nature of AI, most retrieved studies were from roughly the last decade (2010s onwards), with a particular concentration in the past 5-6 years, as AI in tourism is a recent topic. Notably, a large-scale adoption of AI in tourism has been observed primarily from the mid-2010s onward.

3.3. Search strategy

A comprehensive search query was formulated to capture the intersection of AI and tourism, as well as the customer experience aspect. After preliminary testing, the following search strings were used (tailored to each database's syntax):

- **Scopus:** TITLE-ABS-KEY(("artificial intelligence" OR "AI" OR "machine learning" OR "chatbot*" OR "service robot*") AND (tourism OR hospitality OR travel) AND (experience* OR satisfaction OR service OR adoption))
- **Web of Science:** TS=(("artificial intelligence" OR AI OR "intelligent system*" OR chatbot* OR robot*) AND (tourism OR hospitality) AND (experience OR customer OR consumer))

These queries targeted keywords in titles, abstracts, and keywords. We included synonyms and related terms to ensure broad coverage (e.g. including "chatbot" and "robot" to fetch studies focusing on specific AI technologies). We also included terms like "adoption", "acceptance", "satisfaction", and "experience" to hone in on studies relevant to customer experience and usage in tourism. The search strategy thus captured both technical-focused papers (e.g. specific AI applications in tourism) and user-focused papers (e.g. studies on acceptance and experience).

3.4. Inclusion and exclusion criteria

The following criteria were applied to screen the studies:

- **Inclusion Criteria:**

  - **Relevance:** Studies explicitly addressing AI applications in tourism, hospitality, or travel and discussing aspects of customer experience, customer satisfaction, service quality, or adoption/acceptance factors. We included both consumer-facing AI (e.g. chatbots used by tourists) and back-end AI if it had implications for customer experience (e.g. AI in revenue management improving service availability).
  - **Publication Type:** Peer-reviewed journal articles (empirical studies, reviews, conceptual frameworks). We included a few high-quality conference papers only if they provided unique insights not found in journals, but the vast majority are journal articles.
  - **Language:** English.
  - **Time Frame:** Primarily 2000-2024, with no strict start date but effectively capturing the modern AI era. Classic earlier works (e.g. foundational AI concepts) were included for background when needed, but our core data set of empirical studies fell in this range.
  - **Discipline Scope:** Tourism, hospitality, and closely related fields (e.g. leisure, travel tech). We included interdisciplinary studies (e.g. marketing or information systems papers) if they had a clear tourism/hospitality context (for instance, a marketing study on AI in hotel services was included).

- **Exclusion Criteria:**

  - Studies not focused on tourism or hospitality contexts (e.g. AI in general marketing or aviation operations without linkage to tourist experience) were excluded to maintain domain specificity.

- Studies dealing with AI in tourism but without a customer experience or adoption angle (for example, a technical paper on an AI algorithm for tourism demand forecasting with no discussion of user impact) were excluded, as our review centers on adoption and experience.
- Non-academic and non-peer-reviewed literature (trade magazine articles, opinion pieces) and grey literature were excluded to ensure reliability, except where noted below for complementary searches.
- Duplicates from the two databases were removed.
- Papers in languages other than English were excluded from this review.

We initially retrieved a total of **N = 2170** records from Scopus and WoS combined, before de-duplication (this high number reflects the broad initial search). After removing duplicates across the databases (about 200+ overlaps) and filtering by title/abstract relevance, we had approximately ≈ 300 candidate articles. These were then screened in detail against the inclusion criteria (reading full abstracts and, when necessary, full texts). At this stage, we excluded studies that were not actually about tourism (some appeared due to overlapping keywords like "travel" in computer science contexts) and those not provide substantive insight into AI's role in customer experience (e.g. technical simulation papers). We did not conduct a formal study-level quality appraisal using a standardized checklist. We instead applied baseline quality restrictions at the selection stage by focusing on peer-reviewed journal articles indexed in Scopus and Web of Science. We treat this as a limitation because study quality was not assessed in a systematic and comparable way across designs. This process yielded **57 core articles** that met all criteria from the two databases.

3.5. PRISMA Flow

Figure 2 outlines the study selection process in a PRISMA flow diagram format.
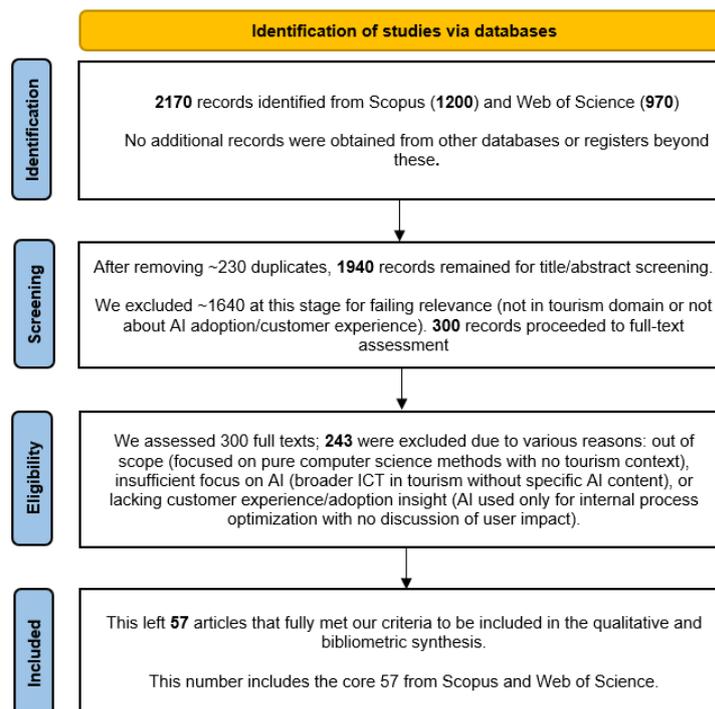

Figure 2. PRISMA flowchart (Source: Figure by authors).

Each included article was then carefully reviewed and coded. We created a data extraction sheet capturing key information: bibliographic details, research context (e.g. hotel, airline, destination), AI application type

(e.g. chatbot, robot, recommendation system), methodological approach (survey, experiment, case study, etc.), theoretical frameworks used, and main findings regarding adoption factors, challenges, and outcomes. This coding process was done by two researchers independently for a subset of papers to ensure reliability, with disagreements resolved through discussion. The use of a structured coding scheme helped in aggregating findings across studies and identifying thematic clusters.

4. Bibliometric Analysis

To complement the qualitative synthesis, we conducted a bibliometric analysis of the included literature, leveraging quantitative indicators to map the intellectual structure of research on AI and customer experience in tourism. Bibliometric analysis provides an objective lens by examining patterns in publication metadata (keywords, citations, authorship, etc.). Using tools such as VOSviewer and BibExcel, we analyzed the co-occurrence of keywords, citation counts, and network relationships among the publications.

4.1. Publication trends

We first observed the distribution of the 57 studies over time. The volume of publications on AI in tourism has grown markedly in the last few years. In fact, few papers were found before 2015, and a slow uptick from 2016 to 2019 was noted, followed by a surge around 2020 to 2023 (Figure 3). This aligns with external events: the disruptive impact of the COVID-19 pandemic in 2020 to 2021 prompted greater interest in contactless technologies (like robots and chatbots) in tourism, which likely accelerated research in this area [22, 5]. Our dataset reflects this trend, with a cluster of highly cited papers in 2020 to 2021 addressing AI adoption during the pandemic (as discussed later).
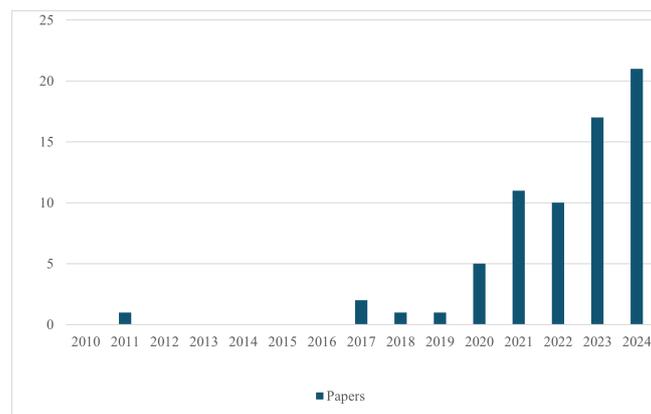

Figure 3. Number of published papers per year (Source: Figure by authors).

4.2. Leading journals and domains

The research is spread across a range of tourism and hospitality journals, indicating interdisciplinary appeal. However, certain journals emerged as key outlets:

- Current Issues in Tourism (Taylor & Francis), contributed the highest number of relevant articles in our review, reflecting its focus on cutting-edge issues in tourism (including technology).
- International Journal of Contemporary Hospitality Management (Emerald), another top outlet, with several studies on AI in hotel settings.
- Tourism Management and Annals of Tourism Research (Elsevier), premier tourism journals that have published influential works on AI (often conceptual or empirical pieces on technology trends).

- Journal of Hospitality and Tourism Management, Journal of Travel Research, Tourism Review, and Asia Pacific Journal of Tourism Research also hosted multiple studies in our sample.

These journals, many of which are rated A or $A^\star$ in academic rankings, underline that AI in tourism is recognized as a high-impact research area. The concentration in these outlets also suggests a developing knowledge base with common scholarly conversations. In terms of academic domains, while most papers are in tourism/hospitality management, some appeared in information systems or marketing journals, indicating cross-pollination (especially for topics like AI in service encounters or digital customer experience).

4.3. Authorship and influential authors

The field is relatively new and lacks a singular dominant author, but several researchers appear frequently or have high-impact contributions. For example, **Dimitrios Buhalis** (a known scholar in smart tourism) co-authored multiple pieces (including a highly cited 2019 paper on technological disruptions and a 2023 paper on AI in marketing), making him one of the notable contributors. **Ulrike Gretzel** is another influential name, having earlier laid foundations on smart tourism and now cited in AI & tourism contexts. Authors like **Rajesh Pillai, Brijesh Sivathanu, M. A. Bonn, Jaume Guide** and others each contributed significant studies on specific subtopics (such as chatbots or robotics). Rather than one group dominating, the research involves a global array of scholars from **Asia, Europe, and the Americas**, consistent with the worldwide relevance of tourism. It is worth noting that many highly cited studies are collaborative works, often bridging academics from technology and management backgrounds. For instance, [16] combined hospitality and organizational behavior expertise, and [22] blended consumer behavior with technology acceptance expertise. This interdisciplinarity is a strength of the emerging field.

4.4. Keyword co-occurrence and thematic clusters

We extracted author keywords and performed a co-occurrence analysis to identify major themes. Figure 4 (keywords co-occurrence map) reveals the most frequent keywords and their interconnections. The most common keywords across studies included "Artificial Intelligence," "Tourism," "Customer Experience," "Hospitality," "Chatbots," "Service Robots," "Personalization," and "Big Data", among others. Several insights emerge from the keyword network:

- **AI and Customer Experience are central nodes:** "Artificial Intelligence" and "Customer Experience" appeared together frequently, underscoring that enhancing customer experience is a central motivation for AI adoption in tourism research. This strong linkage (high co-occurrence frequency) suggests that improving personalization and seamless customer journeys via AI is a core theme.
- **Key Technology Clusters:** We observe two prominent technology-focused clusters. One cluster revolves around **conversational agents** (keywords like chatbots, voice assistants, conversational AI). These studies examine how chatbots and voice-based AI improve service convenience, and also bring up issues like interaction quality and privacy concerns [4]. Another cluster centers on **machine learning and data analytics** (keywords such as big data, recommendation systems, prediction). These pertain to AI uses in analyzing customer data for demand forecasting, personalized recommendations, segmentation, etc., aimed at elevating service personalization and operational efficiency.
- **Service Robots and Automation:** A distinct set of studies (reflected by keywords like service robots, robotics, automation) forms a cluster dealing with physical AI entities in tourism (like hotel lobby robots, automated check-in kiosks). This cluster often intersects with topics of customer-robot interaction, trust, anthropomorphism, and service quality. For example, terms like "human-robot interaction" and "social robots" appear in some papers, linking to research that investigates how customers perceive and trust robots in service roles.
- **Related Concepts:** We also see peripheral but important concepts such as "User Experience (UX)", "Smart Tourism," and "Augmented/Virtual Reality (AR/VR)". While not AI in the strictest sense, AR/VR often comes up in tandem as part of the technology suite enhancing experiences (sometimes driven by AI in the

background). "Smart tourism" appears as an umbrella concept connecting IoT, AI, and big data in creating intelligent tourist systems.
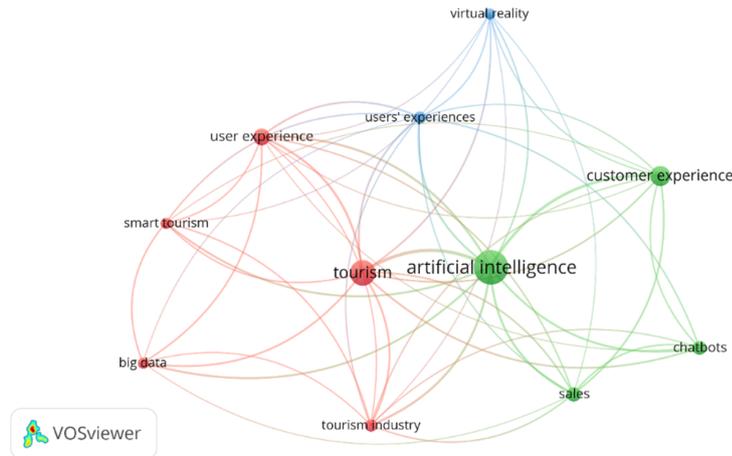

Figure 4. Keywords Co-Occurrence Frequency Map (Source: Figure by authors).

The network analysis measures such as centrality indicate that **"Artificial Intelligence"**, **"Tourism"**, **"Customer Experience"**, and **"Chatbots"** are among the most central terms; meaning these topics are well-connected with others and lie at the heart of discussions (high centrality suggests these are bridging concepts across many studies). On the other hand, terms like **"Virtual Reality"** or **"Sentiment Analysis"** have high density within their small clusters but lower centrality, implying they are specialized niches being developed by a subset of researchers (e.g. a niche of studies looking at AI analyzing social media sentiment for tourism, which is somewhat self-contained). For instance, **VR** is a dense node in a cluster about immersive experience tech, but it's less connected to the main adoption discourse, indicating an emerging theme that is still somewhat separate from the core AI-adoption conversation.

4.5. Citation Analysis

We analyzed citation counts to identify which works are most influential. The top-cited articles in our review (as of 2024) are presented in Table 1 (next section). Notably, the most cited papers tend to be from 2019-2021, illustrating how recent the literature is, yet they have amassed substantial citations in a short time, reflecting the keen interest in this topic. For example, a 2020 study on chatbot adoption [11] by Pillai & Sivathanu is a citation leader, indicating it has quickly become foundational for subsequent work. We also see that papers dealing with **service robots** and the **COVID-19 pandemic** are heavily cited, highlighting these as high-impact subtopics.

In summary, the bibliometric analysis shows a dynamic and growing research landscape. The field is characterized by a strong convergence on certain themes (AI for personalization and service automation) while also branching into emerging areas (e.g. ethics, AR/VR, sentiment analytics). The combination of citation analysis and co-word mapping provides a roadmap of the intellectual territory, which we use to guide our synthesis of findings in the next section.

5. Results

Having mapped the literature landscape, we now present the substantive findings of the reviewed studies. The Results section follows the structure of Figure 1. Section 5.1 synthesizes evidence on AI applications. Section 5.2 synthesizes adoption drivers and barriers. Section 5.3 synthesizes contextual challenges. Section 5.4 synthesizes

customer experience outcomes. In each subsection, we synthesize evidence from multiple studies, highlighting representative examples. Table 1 at the end of this section provides a summary of the ten most influential studies (by citation count) and their contributions.

5.1. AI Applications and use cases in tourism

The literature reveals a broad array of AI applications implemented across various tourism and hospitality contexts, all with the aim of improving efficiency and enhancing the customer experience. We summarize the major types of AI use cases:

- **Chatbots and conversational agents:** One of the most widespread applications of AI in tourism is the use of chatbots or virtual assistants on websites, messaging platforms, and mobile apps. These AI-driven agents handle customer inquiries, provide travel information, assist in bookings/reservations, and even offer destination advice through natural language conversations. For example, many hotels and airlines have deployed chatbot assistants that can answer FAQs, modify reservations, or upsell services. [23] found that chatbot responsiveness and usability significantly influence online customer experience in retail and are being similarly leveraged in tourism. Chatbots operate 24/7, offering instant responses and reducing customer waiting time, which is linked to higher satisfaction [24]. That said, studies note that early-generation chatbots often provided only basic, scripted responses and lacked human-like conversational ability. This has been improving with advances in AI (like more sophisticated NLP and even generative AI integration). One study highlighted by our review is [11], which specifically examined chatbot adoption in Indian tourism and hospitality; their results showed that customers appreciated the convenience and quick service of AI chatbots, which in turn boosted their satisfaction, provided the chatbot was capable of natural, helpful interactions.

- **Service Robots:** Physical robots providing services have emerged particularly in hospitality (hotels, restaurants, airports). Examples include robot concierges, front-desk reception robots, automated luggage handlers, and robotic waiters. These robots combine AI for navigation, speech or facial recognition, and service tasks. A well-cited example is Japan's Henn-na Hotel, which famously employed robots for front-desk and porter duties. [24] studied visitors' intentions to use social robots in a hospitality setting, finding that when robots delivered perceived value (usefulness in service) and empathy (through social interaction features), guests were more inclined to accept them. Robots can enhance customer experience by offering novelty, consistency, and contactless service (a particularly valued feature during pandemics). In 2021, [22] demonstrated through experiments that consumers had more positive attitudes toward robot-staffed hotels (versus human-staffed) when COVID-19 risks were salient, indicating that robots alleviated health safety concerns during the pandemic. Apart from front-of-house roles, robots are also used behind the scenes (cleaning robots, kitchen robots), which indirectly benefit customers by improving efficiency and hygiene.

- **Recommendation systems and personalization:** Many travel companies use AI-driven recommendation algorithms to personalize customer offerings; for instance, suggesting destinations, attractions, or hotels based on a user's past behavior or profile. These typically use machine learning (collaborative filtering, content-based filtering) on large datasets of customer preferences. For example, online travel agencies deploy AI to recommend hotels or vacation packages ("People who booked X also liked Y"), and destination marketing organizations use AI to tailor content to visitor segments. Ho & Chow [26] explored how AI-based recommendation systems affect brand experience and purchase intentions in an online travel context, finding that effective personalization via recommender algorithms can strengthen customers' brand preference and repurchase intentions. This ties into the idea that customization of the experience (one of AI's strengths) is pivotal for modern e-service quality. Personalization extends beyond products to communication. AI can personalize marketing messages, travel itineraries, and even adaptive pricing (discussed next), making each customer's journey more unique and relevant [25].

- **Predictive analytics and demand forecasting:** Another significant use of AI is analyzing big data to predict tourist demand patterns, booking curves, and customer behaviors. Machine learning models (including neural networks, decision trees, etc.) are used to forecast metrics such as hotel occupancy, flight demand, tourist arrivals, or even customer lifetime value. Several review papers indicate that incorporating AI for forecasting has improved accuracy over traditional methods, which in turn helps businesses prepare resources and tailor

services proactively. For instance, [27] utilized a deep learning model (convolutional neural network) to analyze millions of tourist photos on social media to infer tourist preferences and perceptions of a destination. This novel application of image recognition AI provided destination managers with insights into tourist behaviors that surveys might miss (e.g. what types of attractions or experiences are most photographed and positively perceived). On a more operational level, AI predictions allow hotels to optimize staffing and inventory. If an AI predicts high occupancy next weekend, managers can ensure enough staff and amenities, directly impacting the customers' on-site experience by avoiding service shortfalls.

- **Dynamic pricing and revenue management:** AI systems are used to adjust prices for hotel rooms, airline tickets, and travel products in real-time, based on supply-demand dynamics and customer data. This is akin to yield management but powered by AI algorithms that can factor in many variables (beyond what traditional rule-based systems did). Studies show that such dynamic pricing models can maximize revenue while maintaining customer satisfaction by offering personalized deals or optimal pricing points. For example, AI can identify a customer segment that is price-sensitive and offer them timely discounts, while charging higher rates to less price-sensitive segments, ideally without upsetting either group. However, researchers caution that transparent communication is key. Customers may react poorly if pricing AI is perceived as unfair or opaque. Implementing dynamic pricing AI thus requires ensuring it doesn't violate customers' sense of fairness. A study by [29] found that some hotels using AI pricing saw increased guest satisfaction because prices were adjusted to match demand; e.g., lowering prices in low demand periods improved value perceptions. But high initial costs and the need to demonstrate return on investment (ROI) are challenges for adopting such systems, especially in smaller firms.

- **Augmented and Virtual Reality (AR/VR):** While AR/VR are often treated as separate emerging technologies, some studies in our review discuss AI's role in enabling or enhancing these experiences. For instance, AI can personalize VR tour content to a user's interests or use computer vision to augment real-world tours (like AR-powered museum guides recognizing art and telling a tailored story). One systematic literature review by Yung & Khoo-Lattimore [28] cited in multiple sources, highlighted how AI, combined with VR, can create immersive customer experiences that are highly engaging. AI helps in these contexts by dynamically adjusting the experience. For example, an AI in a VR environment might observe that a user lingers on certain virtual exhibits and then provide extra information or modify the tour path accordingly. Although still a nascent area, the convergence of AI with AR/VR holds promise for experiential marketing in tourism (virtual try-before-you-travel experiences, etc.) and is noted as an opportunity for future innovation.

In summary, AI applications in tourism span **frontline service enhancements** (chatbots, robots, AR/VR guides), **back-office intelligence** (forecasting, pricing, analytics), and **personalization engines** (recommenders, personalized marketing). They collectively contribute to a smarter tourism ecosystem where services can be more responsive, tailored, and efficient. Crucially, these applications are not siloed: for example, a service robot in a hotel might use both conversational AI (chatbot functionality) and predictive AI (to anticipate guest needs) and feed data into the hotel's analytics. This integration is aligned with the concept of smart tourism, where AI is one of several technologies creating interconnected, data-driven service systems.

The degree to which these technologies improve customer experience depends on how well they are implemented and accepted, which leads to the next topic: the factors influencing their adoption and use.

5.2. Drivers and barriers to AI adoption in tourism

Even when useful AI applications exist, their success in tourism hinges on user adoption and acceptance by both customers and employees. Our review finds a range of factors that drive or hinder the uptake of AI-based services, many of which parallel general technology acceptance factors but also include tourism-specific nuances. We categorize these into **user-centric factors, technology-centric factors, and organization-centric factors**. Many of these were introduced in our conceptual framework. Here, we provide supporting evidence from the literature.

Beyond listing drivers and barriers, the reviewed studies suggest that these factors often operate jointly. In several settings, adoption is shaped by trade-offs rather than by single variables. Personalization can raise perceived usefulness, but it can also increase privacy-related concerns because it requires data collection. Ease of use can

support trial, yet perceived risk can still limit reliance. In this interplay, trust appears as a key mechanism that reduces uncertainty and helps users accept AI-mediated service encounters.

- **Perceived usefulness and performance expectancy:** As expected, one of the strongest drivers of adoption is the belief that the AI will benefit the user, making some tasks easier or improving the service experience. In tourism, this often translates to saving time, reducing hassle, or providing better information. For instance, if travelers perceive that using an AI chatbot significantly simplifies their booking process or quickly resolves issues, they regard it as useful and are more likely to use it [8]. Several studies grounded in the Technology Acceptance Model (TAM) confirm that perceived usefulness of AI applications (like smart itinerary planning tools or AI concierge services) is a consistent predictor of tourists' intention to use them [5]. Tussyadiah [30] found that travelers were inclined to adopt AI concierge apps that aggregated personalized recommendations because they found them more useful than manually searching for travel information. In our review, 16 studies explicitly noted performance-related benefits of AI (accuracy, speed, availability) as key adoption motivators. Several drivers and barriers are discussed as separate constructs in prior studies, but they often operate jointly. Personalization can increase perceived value, yet it may also amplify privacy concerns. Trust can reduce perceived risk, but trust itself depends on transparency and reliable system performance. These interactions help explain why adoption outcomes differ across settings and customer segments.
- **Perceived ease of use & convenience:** If an AI system is easy to interact with (intuitive interface, simple commands, minimal effort), users are more likely to try and continue using it. Tourism consumers are heterogeneous (varying in tech-savviness), so ease of use is crucial to appeal to a broad user base. Multiple papers, especially those deploying TAM or UTAUT frameworks, report effort expectancy or ease of use as significant. For example, [8] showed that the ease of using AI based travel apps influenced travelers' acceptance, apps with clunky interfaces or complex steps saw drop-off in usage. Ease of use in tourism also relates to language and communication: an AI that can understand natural tourist queries (including possibly broken language or slang) and respond clearly will have an edge. Conversational AI studies note that interaction naturalness (how human-like and smooth the conversation is) is an important facet of ease of use in chatbots [31, 33]. If the interaction feels cumbersome or confusing, users will revert to human agents.
- **Trust and risk perception:** Trust (both in the technology and in the service provider deploying it) emerged as a critical factor in nearly every study dealing with customer attitudes [9]. Using AI involves ceding some control (trusting the AI's recommendations, letting it handle personal data or transactions), so customers must believe that the AI is reliable, accurate, and secure. Across the reviewed studies, trust is directed at two related targets. The first is trust in the AI system itself (its competence and reliability). The second is trust in the provider deploying the AI (its data governance, accountability, and service recovery). This distinction matters because a system may be easy to use but still avoided if users doubt how their data will be handled. Conversely, strong confidence in the provider can encourage trial even when the interface is not yet familiar. Trust is built through multiple dimensions:
  - Competence/Ability: Does the AI perform its task well (e.g., does a recommendation engine actually give good suggestions)? If yes, functional trust increases.
  - Integrity: Is the AI (and the firm behind it) honest and transparent? For example, disclosing that "this price was set by an algorithm analyzing demand" might affect trust differently than if dynamic pricing is unexplained. Transparent AI that explains its suggestions or actions can bolster user trust by reducing the "black box" fear.
  - Benevolence: Especially in hospitality, users need to feel the AI has their best interests at heart (or at least the company does). This ties to privacy – will the AI protect user data and not misuse it? Data privacy concerns are a major inhibitor; if an AI system is perceived to gather too much personal data or if there have been scandals (e.g., data leaks), users' trust plummets, and they may refuse to use it. One study in our review by S. Yang & Lee found that travelers' trust in an AI tour guide was strongly associated with the guide's transparency about data use and the presence of security guarantees [7].

Conversely, perceived risk, whether financial (will this AI mess up my booking?), privacy-related, or even social (will I look foolish using a robot?), is a barrier. Christensen et al [13] noted that prior interactions shape

expectations; if travelers hear of AI failures (like a chatbot giving wrong info or a robot malfunctioning), their perceived risk goes up, dampening adoption. Our review concurs that mitigating perceived risks (through user education, trialability, and reliable design) is crucial to improving trust.

- **Personalization and privacy-related risk:** Personalization is often presented as a value driver because it can reduce search costs and increase relevance. At the same time, it amplifies privacy concerns because it depends on personal data. The reviewed studies suggest that transparency and user control can shift this balance, but evidence remains uneven on which design choices are most effective across contexts.
- **Usability and perceived risk:** Ease of use supports adoption, but it does not eliminate uncertainty about automated decisions. When perceived risk is salient, users may require trust cues beyond usability, such as clear disclosure, consistent performance, and a credible provider. In this sense, trust may buffer the gap between "I can use it" and "I am willing to rely on it."
- **Anthropomorphism over time:** Anthropomorphic cues can reduce social distance and make first interactions smoother. Yet repeated use tends to depend more on functional performance than on novelty. If the system fails to deliver reliable help, anthropomorphic design is unlikely to compensate. It may even increase disappointment by raising expectations.
- **Anthropomorphism and social presence cues:** Several studies discovered interesting psychological drivers unique to AI. One is the effect of anthropomorphic design, giving AI human-like attributes (a name, an avatar, a human voice, or even a physical humanoid form in the case of robots). This can make interactions more comfortable and engaging, as users subconsciously respond to the AI more like a social entity. Lv et al [32] provided evidence that a "cute" anthropomorphic AI assistant led to higher tolerance of service failures by customers, essentially because users emotionally connected with it as they would with a friendly human. It implies that anthropomorphism can soften negative reactions and build a kind of rapport or familiarity, thereby encouraging continued use. On the other hand, if done poorly, anthropomorphism can backfire (the "uncanny valley" effect, where robots that look almost human but not quite can feel creepy). So the design must hit the right level. Service robot acceptance studies often emphasize the robot's appearance and social behavior as key to customer comfort.

Social influence (or subjective norms in TPB terms) also plays a role: if people see others using and approving an AI service, they are more likely to adopt it. In tourism, this could mean positive reviews about an AI concierge or simply observing fellow travelers using self-service kiosks. Particularly in collective cultures or for innovations not yet mainstream, social proof can be powerful. One paper noted that tech-savvy tourists can become opinion leaders who sway others to try an AI-based service. Additionally, younger travelers (Gen Z, millennials) who grew up with tech may influence older companions by normalizing AI use during trips.

- **User characteristics:** Individual differences matter too. Studies have found that innovativeness or a traveler's personal propensity to try new technology correlates with AI adoption. Tourists who identify as "early adopters" or are enthusiastic about new gadgets were naturally more inclined to experiment with AI tools (like AI itinerary planners, smart hotel rooms). Similarly, prior experience with AI reduces uncertainty. For example, someone who already uses Alexa or Siri regularly will find a hotel voice assistant less intimidating. Christensen, Hansen & Wilson [13] empirically showed that prior AI usage experience significantly shapes expectations and openness to using AI during travel. Another characteristic is technology readiness, a concept capturing people's optimism or discomfort with technology. Some hospitality studies applied the Technology Readiness Index (TRI) and noted that customers scoring high on optimism and innovativeness were more accepting of hotel AI services, whereas those high on discomfort or insecurity were hesitant [34, 36, 35].

Interestingly, **demographic factors** like age, education, and cultural background can intersect with these user traits. Older tourists might have lower adoption partly due to less familiarity or more technophobia, though this is not universal. Also, cultural values (e.g., uncertainty avoidance) can moderate individual readiness. Consumers in high uncertainty avoidance cultures might require more assurances and trials before accepting AI.

- **Service-specific factors:** The nature of the tourism service itself can influence adoption. Research suggests that in hedonic tourism scenarios (vacation experiences aimed at enjoyment), customers might be more open

to playful or novel AI (like a robot butler as a fun gimmick) but also more critical if it detracts from the experience. In contrast, in utilitarian scenarios (business travel, functional tasks like ticketing), efficiency gains from AI are highly valued [12, 18]. One study by Park [37] (multifaceted trust in service robots) implied that in leisure contexts, emotional and social factors of robot design had a stronger effect, whereas in utilitarian contexts, functional reliability was paramount. This suggests managers need to calibrate AI offerings to the service context. A family holiday resort might introduce fun conversational robots to enhance guest experience, while an airport focuses on reliable self-service AI kiosks for speed.

- **Employee and organizational adoption:** Although our focus is on customer experience, it's worth noting that an AI service's success also depends on frontline employee acceptance (for AI that works in tandem with staff, like decision-support systems or robots assisting staff). [38] (the hotel employee study) found that employees who feel threatened by AI (thinking it will replace them) may either consciously or unconsciously sabotage or underutilize the technology, which can lead to poorer customer service outcomes. Conversely, if employees are trained and see AI as a helpful tool that improves their work (augmenting, not replacing them), they will champion it. Therefore, organizational factors like perceived organizational support (POS) and management encouragement can indirectly shape customer-facing AI adoption. When employees embrace the AI tools, customers get a smoother experience; if employees resist, the implementation can be rocky (for instance, not assisting customers with a self-service system). Li et al. [16] noted that with strong perceived organizational support and a positive climate, the negative impact of AI awareness on turnover intention was mitigated; i.e., staff didn't fear losing jobs and were more willing to work with AI. This highlights the need for change management and internal marketing of AI within tourism organizations.

In summary, the adoption of AI in tourism is a socio-technical phenomenon: it's not just about the technology's capabilities, but about human perceptions, emotions, and trust. Drivers like usefulness, ease of use, and novelty push adoption forward, whereas barriers like privacy concerns, lack of trust, and complexity pull it back. A key insight from the literature is that **managing perception is as important as managing the technology**. For example, an AI might objectively work well, but if users think it's untrustworthy or hard to use, they won't use it. Thus, many studies suggest strategies such as providing trial periods, improving AI transparency (explainable AI outputs), leveraging social influence positively (testimonials, ratings), and humanizing the technology (to a comfortable degree) to encourage adoption.

5.3. Contextual challenges in AI adoption

Beyond individual and technological factors, the literature underscores that the success of AI in tourism is deeply affected by contextual and environmental factors. These challenges often operate at an industry or societal level, framing the conditions under which AI is adopted. We focus here on **ethical, cultural, and broader implementation challenges** that recur in the discourse:

- **Ethical and privacy concerns:** Almost every discussion of AI in customer experience touches on ethical issues, with data privacy being the foremost. Tourism services collect extensive personal data (passport info, preferences, biometric data for some AI). AI's hunger for data amplifies privacy concerns. For instance, AI-driven personalization might require tracking a guest's behavior across different services. Travelers are increasingly aware and concerned about how their data is used. The reviewed studies frequently cite privacy as a critical barrier [40, 39, 1]. For example, a smart hotel room assistant that learns a guest's preferences might raise the question: who has access to this data and for what purpose? If not transparently addressed, guests may opt out or feel uncomfortable (hurting their experience rather than helping). There are also regulatory implications: regulations like GDPR in Europe impose strict requirements on data handling, which AI systems must comply with. Several papers argue that tourism firms must implement robust data security measures and give users control (opt-ins, privacy settings) to alleviate these concerns [1]. Ethical issues also extend to bias and fairness. An AI pricing system could inadvertently discriminate (e.g. offering higher prices to users from certain locations perceived as wealthier); such bias, if discovered, can cause reputational damage and customer backlash. Ensuring AI algorithms are fair and nondiscriminatory is a challenge; some authors call for algorithmic audits and ethical AI frameworks in tourism.

- **Transparency and explainability:** Linked to ethics, but deserving a separate note, is the challenge of AI explainability. Customers might trust AI more if they understand how it works or why it made a recommendation. However, many AI models (like deep learning) are black boxes. The concept of AI transparency appears in a few studies, suggesting that making AI decisions interpretable improves user acceptance. For instance, a travel recommendation AI could show "We recommended this hotel because it matches your past preferences in location and is within your budget." This kind of explanation can make the user feel in control and informed, addressing the often-cited discomfort with AI's opacity [41]. The challenge is balancing simplicity of explanation with not overwhelming the user. Designers are exploring UI cues to indicate AI confidence levels or the basis for suggestions. Transparency is also important in mitigating the effects of errors. If an AI can't find a perfect answer but conveys its uncertainty or reasoning, users might be more forgiving.

- **Cultural and regional differences:** Tourism is inherently cross-cultural, and what works in one locale may not in another. Our review notes that the adoption and effectiveness of AI can be strongly influenced by cultural context [4]. For example, in cultures with a high preference for human interaction and hospitality warmth (perhaps some Middle Eastern or Latin cultures), customers might view an AI kiosk as cold or indicative of poor service, whereas in cultures more accustomed to self-service and technology (perhaps Northern Europe or East Asia), the same kiosk is appreciated. One interesting cultural dimension is language. AI chatbots or voice assistants need to handle multiple languages and dialects in tourism. If an AI doesn't support a traveler's language well, that traveler will not use it. This has been noted as a challenge: ensuring multilingual and culturally attuned AI services. A study on Chinese tourists (a huge outbound market) indicated they are more likely to use AI services abroad if those services "speak" Chinese and understand Chinese cultural references. Another cultural factor is power distance: in high power-distance cultures, customers might expect more deference and formality (which a polite AI could potentially provide if programmed well), whereas in low power-distance cultures, a casual AI is fine. So cultural tailoring of AI behavior is a nuanced challenge, seldom solved by a one-size global solution.

Additionally, **regional infrastructure disparities** are an issue. In developing destinations, a lack of reliable internet or smartphones can limit AI service use by tourists. Also, varying levels of digital literacy across regions mean roll-out strategies must differ. Our bibliometric data showed that a large portion of AI tourism research comes from a few countries (China, USA, etc.), which suggests many contexts (e.g., African or small island nations) are understudied in this regard. This could mean that insights on adoption factors are biased towards certain cultural settings. Researchers point out that more cross-cultural studies are needed, and that tourism businesses should pilot AI solutions with local cultural feedback.

- **Human touch vs. Automation dilemma:** A thematic challenge specific to tourism/hospitality is balancing automation with the "human touch" that defines hospitality. Several papers take a critical stance: if everything becomes automated, from check-in to tour guiding, do we lose something essential in the experience? Tourism is about creating memorable, often emotion-rich experiences, and human service has traditionally been key in doing so (a warm welcome at a hotel, a tour guide's personal stories, etc.). For instance, conducted interviews suggesting that while AI and robots will increase, they cannot fully replace the human element, which many tourists still crave [42]. Some customers specifically choose destinations or hotels known for exceptional human service, and might avoid highly automated alternatives. This presents a strategic challenge: figuring out which touchpoints should remain human for maximum experience value and which can be safely automated. A hybrid approach is often advocated in the literature: use AI for efficiency and consistency in background tasks or simple interactions, but ensure human staff is present for high-empathy, complex interactions, or when things go wrong.
  - Another aspect is customer segmentation: some segments (e.g., millennials, business travelers in a hurry) might prefer automation, while others (elderly travelers, luxury segment) might find it off-putting. So the adoption of AI in a tourism business might need to be segmented, offering both options. For example, some hotels now have both a staffed front desk and a self-service kiosk, letting guests choose

- **Implementation and cost issues:** The practical side of adopting AI can be challenging, especially for smaller tourism enterprises. High initial costs of AI systems (hardware for robots, software development, integration with existing systems) can be prohibitive. Also, many tourism businesses are SMEs with limited tech expertise; they may not have IT departments to maintain AI solutions, which can lead to implementation failures. Even for larger organizations, retrofitting legacy systems to work with AI (e.g. integrating an AI chatbot with an old reservation system) can be non-trivial. A couple of studies reported that some hotels abandoned AI concierge trials because of technical glitches and difficulty integrating with property management systems. Moreover, training staff to work alongside AI and reengineering processes takes time and resources. The literature suggests that some companies underestimate these aspects and face internal resistance or poor ROI realization initially. Another point raised is the lack of industry standards or best practices for AI in tourism. Many are experimenting in silos, meaning knowledge transfer is limited, and everyone is "learning by doing," which can be inefficient at an industry level.

The flip side is that AI providers (tech companies) are increasingly offering ready-made solutions tuned for hospitality (for example, cloud-based AI concierge services that a hotel can subscribe to). This might mitigate some cost and skill barriers, but then raises dependency issues and data sharing concerns (if using third-party AI platforms).

- **Pandemic and health safety context:** A very contemporary context (as of 2020–2022) is how the COVID-19 pandemic acted both as a catalyst and a challenge. On one hand, it accelerated the adoption of contactless AI solutions (to reduce human contact), as evidenced by the quick rise in robot and kiosk deployments. On the other hand, it also changed customer expectations: hygiene became paramount, and any tech that could help deliver a safe experience was valued. However, some observed that once the immediate pandemic fears recede, will customers still prefer robots over humans? It's an open question whether the changes in preference will stick. [22] found initial evidence that people who experienced robot service during COVID were more willing to use it post-pandemic, too, having overcome initial barriers.

In essence, **context matters immensely:** ethical norms, cultural values, regulatory environments, and situational factors (like a pandemic) can all moderate the relationship between AI capabilities and successful outcomes. If context is ignored, an AI initiative might falter despite solid tech (e.g., a fantastically engineered robot might sit unused in a hotel lobby because guests feel it's culturally out of place or are uneasy about it). Therefore, academics often stress incorporating ethical design principles and cultural co-creation when developing AI for tourism. Also, engaging stakeholders (customers, employees, regulators) early can help address contextual concerns proactively.

5.4. Outcomes of AI adoption on customer experience

Finally, we consider what the literature reports as the observed or expected outcomes when AI is adopted in tourism, specifically on customer experience (CX) dimensions. By and large, researchers document a mix of positive outcomes (improved service performance, increased satisfaction) and also note potential negative consequences or limitations.

- **Customer satisfaction and service quality:** Many empirical studies provide evidence that appropriately implemented AI can lead to higher customer satisfaction ratings. For instance,[43] found that the use of AI-based chatbots in hotels is positively associated with guest satisfaction, mainly due to faster response times and continuous service availability. AI can reduce common pain points (wait times, information search effort), thus smoothing the customer journey. Additionally, personalization through AI (recommending the perfect activity or remembering customer preferences) often delights customers and makes them feel valued, contributing to satisfaction. Several papers highlight that AI enables a degree of service personalization at scale that was previously impossible, e.g., every customer getting tailored suggestions, which is linked to perceptions of high service quality. Huang et al. [44] in their study on service robots and customer experience, noted that when robots efficiently handled requests and provided accurate info, guests rated the service quality highly, similar to or sometimes even above human-provided service in those tasks. On the flip side,

quality issues with AI (like a chatbot misunderstanding a query) can quickly cause dissatisfaction. So the impact on satisfaction is positive only if the AI performs reliably. Quality consistency is an AI strength (no variation due to human mood or fatigue), and that consistency itself can bolster perceived quality. Guests know what to expect.

- **Emotions and experience dimensions:** Customer experience is multi-dimensional (cognitive, emotional, sensory, social). AI can affect these sub-dimensions:

    - Emotional Response: A smooth AI service can lead to positive emotions like relief (avoiding a queue), enjoyment (a fun interaction with a robot), or excitement (novelty factor). Some papers even talk about AI-enabled delight, where exceeding expectations with innovative service creates a strong positive emotional response. For example, a theme park robot that interacts playfully with visitors can generate joy that enhances the overall experience. Conversely, frustrations can arise if AI fails, e.g., repeated "I'm sorry, I didn't get that" from a voice assistant might lead to annoyance or anger. Emotional outcomes were measured in studies like Chi et al.[45], which looked at tourists' emotional reactions to AI devices and how those feed into their attitudes and usage intentions. They found both positive emotions (e.g., feeling "cool" using an AI device) and negative ones (anxiety about errors or privacy) directly influence satisfaction and acceptance.
    - Cognitive Perceptions: Successfully adopted AI can change how customers think about the service. For instance, they might perceive the company as innovative, cutting-edge, or customer-oriented because it offers AI services. One outcome mentioned in a few marketing-oriented papers is brand image enhancement. AI usage can signal a modern, efficient brand, potentially attracting a tech-savvy market segment [44]. However, if AI usage is seen as gimmicky or cost-cutting at the expense of service, it could hurt brand perception for some (e.g., "this airline replaced gate agents with machines because they don't care about customers").
    - Behavioral Intentions: Several studies link AI-driven improvements in experience to loyalty indicators: intention to reuse the service, to choose the AI-equipped provider again, and to recommend to others. As noted earlier, when customers are satisfied and even delighted, they are more likely to come back and spread positive word-of-mouth. Pillai & Sivathanu [11], besides measuring intention to use chatbots, also touched on actual use behavior and found that positive intention did translate into real usage of the chatbot service over time (based on usage data). Recommending behavior (telling friends/family about the AI service) was reported in some case studies, particularly when the AI was novel and impressive, it became a talking point, effectively generating free marketing for the service provider [46, 13].
    - Personalization and Value Co-creation: One outcome in tourism experiences is that AI can enable customers to co-create value in new ways. For example, an AI itinerary planner that allows customers to customize their own trip easily can lead to a feeling of empowerment, as the customer actively designs their experience with the AI as a tool. This can make the experience more engaging and personal. [47] proposed a framework where connectedness and interactivity (through AI and other tech) enhance online customer experience by involving customers in the process. Essentially, AI can shift customers from passive recipients of service to active participants (e.g., using a destination app with AI to discover hidden attractions they then go explore).

- **Operational efficiency gains:** While not a direct customer psychological outcome, improved operations due to AI often lead to better customer experiences. The literature notes outcomes like faster service delivery, fewer errors, and around-the-clock availability as tangible benefits customers experience[17]. For instance, because AI automation reduces reliance on human labor for routine tasks, the service can be available 24/7 without fatigue [24]. A guest arriving at midnight can still be served by an AI kiosk or chatbot with the same efficiency as at noon. This contributes greatly to convenience, a component of CX. Furthermore, efficiency gains like reduced waiting lines (thanks to self-service kiosks or better demand prediction) directly improve customer mood and satisfaction. From the company's perspective, these efficiencies can also lower costs, which in ideal cases can be passed as value to customers (e.g., lower prices or more investments in other experience areas). However, none of the reviewed studies explicitly showed a case of cost savings translating

to lower prices for customers, yet it's more of a theoretical outcome that if AI saves money, it could be beneficial to customers through better resource allocation or price competitiveness.

- **Negative outcomes and customer concerns:** A few studies take a cautionary tone, pointing out that not all outcomes are rosy [10]. For example, over-automation can lead to customer alienation, where customers feel the service is too impersonal or that they are not being cared for by humans. There have been real-world reports (like some guests at automated hotels missing the personal greeting or assistance in special situations). If a customer has an issue outside the AI's capability and no human is readily available, it can cause frustration and a feeling of being "abandoned" by the service provider. Another possible negative outcome is technology-induced stress: some users may find interacting with AI stressful, especially if they are not comfortable with technology or if the AI malfunctions. This stress can obviously detract from their enjoyment of the trip. One concept, "technostress," albeit mostly studied in workplace IT, could be relevant for some tourists forced to use unfamiliar automated systems.

Additionally, if an AI fails publicly (like a robot making a mistake in front of other customers), it could cause embarrassment for users or employees and degrade the perceived atmosphere of the service environment. For example, a robot waiter spilling something or a voice assistant loudly misinterpreting a request can create awkward situations. While these might be one-off incidents, they show that with new tech comes new kinds of service failures to manage. Some researchers call for developing proper service recovery strategies for AI-driven services (e.g., having a human override ready, or apologetic recovery scripts from the AI).

- **Long-term relationship effects:** There is an open question about how AI affects long-term customer relationships and loyalty. Some evidence suggests that if AI consistently provides value, it could strengthen loyalty because the customer gets used to the convenience and personalization, switching to a competitor without those capabilities might then feel like a downgrade. On the flip side, if everyone has similar AI, it might reduce differentiation between services, potentially making customers more fickle (loyal to convenience, not to brand). Our review didn't find longitudinal studies on this yet (the field is too new to have observed multi-year loyalty trends), but it's been raised in conceptual discussions. One notable angle: Does the lack of human connection impede the formation of emotional loyalty bonds? In hospitality, employees often create emotional connections that lead to loyalty (knowing a regular guest's needs, etc.). If AI takes over, will loyalty be more shallow? Or can AI simulate that personal touch well enough? [44] indicates that robots can generate a form of rapport and even memorability if programmed to recognize repeat customers and personalize interactions, which might foster loyalty in its own way. It's a domain ripe for further research.
- **Impact on employees (and indirectly on CX):** While focusing on customers, it's worth noting that outcomes on employees (job satisfaction, role changes) indirectly affect customer experience. Some reviewed articles (especially those with a sustainable tourism angle) suggest that AI taking over drudge work could free employees to focus on higher-level customer care, thereby improving the human aspect of CX where it matters [48, 33]. For example, if reception staff no longer need to do routine check-in paperwork (because a kiosk handles it), they can spend that time welcoming guests or handling special requests more attentively. In the best-case scenario, AI-human teamwork yields augmentation where the sum is better service. There's evidence of this in cases like airline agents using AI to instantly rebook passengers during disruptions – the AI handles the rebooking logic, while the agent conveys empathy and help to the passenger; result: faster resolution and human care. Outcomes from such augmented service models can be very positive, combining efficiency with empathy. However, if AI simply replaces staff and there's no one to provide the human touch when needed, then those outcomes can be negative as discussed above.

To illustrate and support many of these points, we present Table 1, summarizing ten of the most cited empirical studies in our review, which collectively encapsulate key findings about AI adoption and its impact on customer experience in tourism.

Study (Year)	Authors & Journal	Context & AI Application	Methodology	Key Findings (Relevant to Customer Experience)
Adoption of AI-based Chatbots for Hospitality and Tourism (2020)	Pillai & Sivathanu [11], International Journal of Contemporary Hospitality Management (662 citations)	Hotel industry (India); AI-powered **chatbots** for customer service and bookings	Survey of hotel customers; Structural Equation Modeling (TAM-based)	**Anthropomorphism and usefulness drive adoption:** Customers' behavioral intention and actual usage of chatbots were high when chatbots were perceived as useful and easy to use. Notably, giving the chatbot human-like qualities (a name, conversational style) significantly increased intention to use [11]. Satisfied users cited 24/7 availability and quick issue resolution as reasons, leading to higher **customer satisfaction** with service. Chatbot use also shortened service response times, improving overall service quality perception.
Hotel Employee's Artificial Intelligence and Robotics Awareness and Its Impact on Turnover Intention: The Moderating Roles of Perceived Organizational Support and Competitive Psychological Climate (2019)	Li et al. [16], Tourism Management (544 citations)	Hotels (China); **AI and robotics awareness among employees** and its effect on service and staff outcomes	Survey of hotel employees; Regression analysis (moderation model)	**Organizational support moderates AI impact:** Employees aware of AI/robotics tended to have higher turnover intention (fear of job displacement), which could negatively affect service delivery. However, with strong perceived organizational support and a positive workplace climate, employees became more accepting of AI. Outcomes: Hotels that managed this well saw employees collaborating with AI (e.g., using robots as assistants), leading to more **consistent service** and improved customer experiences (since employees were not resistant to the AI). Emphasizes the need to train and assure staff during AI adoption to maintain service quality.
Leveraging Human-Robot Interaction in Hospitality Services: Incorporating the Role of Perceived Value, Empathy, and Information Sharing into Visitors' Intentions to Use Social Robots (2020)	de Kervenoael et al. [24], Tourism Management (443 citations)	Museum/Attraction context; **social robots** interacting with visitors (guide robots)	Field experiment with visitors; Surveys measuring intentions; Mediation analysis	**Human–Robot Interaction (HRI) quality is crucial:** The study found that perceived value of using the robot (usefulness of info) and perceived empathy (robot's ability to engage socially) positively influenced visitors' **intention to use** the robot guide. Importantly, HRI quality (e.g., natural communication, the robot's social presence) **mediated** the effect – visitors only derived value if the interaction felt smooth. When HRI was high, visitors reported the robot tour enhanced their experience and willingness to recommend the attraction. Suggests social design of robots (e.g., friendliness, ability to listen/respond) directly affects customer experience outcomes.
Preference for Robot Service or Human Service in Hotels? Impacts of the COVID-19 Pandemic (2021)	Kim et al. [22], International Journal of Hospitality Management (423 citations)	Hotels (global sample); customer **preference for robot vs. human service** under pandemic conditions	Series of 4 experiments manipulating service type and COVID-19 salience; ANOVA and attitude measures	**Pandemic shifted preferences to robots:** When COVID-19 risk was salient, consumers showed a more positive attitude and preference for robot-staffed hotels over human-staffed ones. They perceived robots as safer (contactless), which led to greater **satisfaction and comfort** in those scenarios. The effect was pronounced for consumers who felt at high risk. However, without the pandemic context, many still preferred human service for its personal touch. This indicates that context (health safety) can flip customer experience preferences, and that robots delivered a better experience under specific conditions.

Discovering the Tourists' Behaviors and Perceptions in a Tourism Destination by Analyzing Photos' Visual Content with a Computer Deep Learning Model: The Case of Beijing (2019)	Zhang et al. [27], Tourism Management (267 citations)	Destination analysis (Beijing); AI-based **photo content analysis** to understand tourist perceptions	Big data approach: deep learning (CNN) applied to social media photos; Qualitative analysis of patterns	**Insights into tourist experience via AI:** By analyzing tourists' photos with AI, the study uncovered what experiences and features tourists valued (e.g., popular spots, emotions captured). Outcomes: Destinations can use such AI to gauge satisfaction drivers. While not a customer-facing AI, this application leads to **indirect CX improvement** – by understanding tourist preferences (e.g., seeing many smiling photos at a new exhibit), managers can enhance those aspects. It demonstrates AI's potential in capturing authentic tourist emotions and behaviors, offering feedback to improve experiences.
Does a Cute Artificial Intelligence Assistant Soften the Blow? The Impact of Cuteness on Customer Tolerance of Assistant Service Failure (2021)	Lv et al. [32], Annals of Tourism Research (257 citations)	Online travel assistants; **Anthropomorphic "cute" AI assistants** and customer reactions to service failures	Laboratory experiment with scenarios (cute vs. non-cute AI, success vs. failure); Survey for tolerance level	**Cuteness increases tolerance:** A humanized, cute AI assistant (with a fun avatar and emotive language) made customers more forgiving when it made a mistake. Customers experienced more positive emotion and attributed the failure less negatively, compared to a plain AI. This suggests anthropomorphic design can improve service recovery in AI contexts by softening negative experiences. It also led to greater re-use intention of the assistant after a failure. However, the effect had limits; if failures were severe, cuteness helped but did not fully compensate for lost satisfaction.
Multifaceted Trust in Tourism Service Robots (2020)	Park [37], Annals of Tourism Research (219 citations)	Restaurants (Korea); customer trust in **service robots** (dine-in robot servers)	Survey of restaurant customers; Structural equation modeling (trust as multifaceted)	**Multidimensional trust influences acceptance:** The study identified components of trust in robots, technical competence, physical safety, and benevolence. It found that higher trust on all dimensions led to higher **acceptance and satisfaction** with robot service. For example, if customers trust that the robot will not spill food (safety) and can handle orders accurately (competence), they rate the experience positively. Trust was bolstered by the restaurant providing clear instructions and having staff oversee the robots (contextual assurance). The outcome is that building trust (through design and policy) is critical to ensuring positive CX with robots.
Tourists' Attitudes toward the Use of Artificially Intelligent (AI) Devices in Tourism Service Delivery: Moderating Role of Service Value Seeking (2022)	Chi et al. [45], Journal of Travel Research (178 citations)	General tourism services; tourist **attitudes toward AI devices** (like smart kiosks, digital assistants) and role of personal values	Survey of tourists; Moderated regression (service value seeking as moderator)	**Service-value seeking moderates AI attitude → use:** Tourists with positive attitudes towards AI showed higher **intention to use** AI services, and this link was strongest for those high in service value seeking (i.e., tourists who actively seek efficiency and value in service). Those people derived more benefit from AI's speed/personalization, thus translating attitude into use. Conversely, tourists less focused on value didn't strongly act on a positive attitude. This implies segment-specific outcomes: AI dramatically improves experience for value-seekers (they report high satisfaction due to efficiency), whereas more experience-focused tourists might not be as impressed by AI's functional gains.

Customer-Robot Interactions: Understanding Customer Experience with Service Robots (2021)	Huang et al. [44], International Journal of Hospitality Management (174 citations)	Hotels; **Customer-robot interactions** and how they shape overall experience	Interviews and surveys with hotel guests who experienced robot service; Thematic analysis	**Key experience dimensions with robots:** Guests reported that novelty and entertainment from interacting with robots added to their experience (a "fun factor"). They also noted convenience (robots were quick for tasks like room delivery). The study found that a positive robot interaction led to high overall **customer experience ratings**, especially on dimensions of **sensory novelty** and **emotional enjoyment**. However, guests still valued human staff for empathy. The outcome is that robots can elevate certain CX aspects (speed, novelty) but cannot fully replace human warmth. The best experiences occurred when robots handled routine tasks, and humans were available for complex needs, creating a balanced, enhanced journey.
Attitudes toward Service Robots: Analyses of Explicit and Implicit Attitudes Based on Anthropomorphism and Construal Level Theory (2023)	Akdim et al. [49], International Journal of Contemporary Hospitality Management (120 citations)	Hotels (Europe); **Explicit vs. implicit customer attitudes** to service robots (anthropomorphism & construal level theory)	Implicit Association Test (IAT) for unconscious attitudes + explicit surveys; Experiment varying robot human-likeness and psychological distance	**Hidden ambivalence in attitudes:** The study revealed that even if customers explicitly say they accept service robots (positive attitude), implicit tests showed some harbored unconscious reservations or discomfort. Anthropomorphic robots tended to improve explicit attitudes (seen as more approachable), but implicitly, some found them eerie. When psychological distance was high (e.g., thinking of using robots in a distant future or another country), attitudes were more positive; when imagining immediate use, some anxiety surfaced. This suggests that on the surface, AI might be well-received, but deeper experience might uncover issues, important for managers to address through gradual exposure and design tweaks. Ultimately, customers with aligned positive implicit and explicit attitudes reported the best **experience outcomes**, indicating genuine comfort with the AI.

Table 1. Ten most cited articles on AI adoption in tourism (customer experience focus)

From the above synthesis and the representative studies, it's evident that the introduction of AI in tourism is reshaping customer experiences in both promising and challenging ways. Overall, the literature paints a picture where, if well-implemented, AI can lead to **more efficient, personalized, and novel experiences** that enhance customer satisfaction and engagement. At the same time, the success of AI is **contingent on human factors** – trust, cultural alignment, and maintaining a human touch where it matters. These nuances are further explored in the discussion section, where we critically analyze the trends, contradictions, and future directions emerging from this body of work.

6. Discussion

In reviewing the current state of AI adoption in tourism vis-à-vis customer experience, several cross-cutting themes and tensions become apparent. In this section, we provide a critical analysis of the findings, discussing contradictions in the literature, areas of consensus, methodological limitations, and emerging considerations (such as cultural and ethical dimensions) that warrant deeper reflection. We use Figure 1 as an interpretive lens to connect applications, adoption factors, contextual challenges, and customer experience outcomes. This helps explain why strong drivers (such as usefulness) do not always translate into positive experience outcomes when trust, privacy concerns, or cultural norms remain unresolved. It also helps identify where evidence is concentrated and where relationships are underdeveloped or inconsistent.

6.1. Contradictions and divergent findings

One striking observation is that while many studies report generally positive effects of AI on customer experience, a few highlight opposing outcomes under certain conditions. This reveals that context and implementation specifics greatly influence results, leading to seemingly divergent findings. Several contradictions can be read as recurring paradoxes rather than as isolated disagreements. The first is the personalization–privacy paradox, where perceived relevance depends on data use that may also raise vulnerability. The second is the efficiency–human touch dilemma, where automation can reduce friction but may weaken the social and emotional value of service encounters. A third tension concerns time: design features that trigger early engagement, including anthropomorphic cues, may have weaker effects once novelty fades. These paradoxes help explain why adoption drivers do not produce uniform customer experience outcomes across settings.

- **AI vs. Human service preference:** A prime example is the difference in findings between studies like Kim et al. [22] and those that emphasize the irreplaceability of human touch. Kim et al. [22] showed a clear preference shift towards robots in a pandemic context, suggesting that in some cases, customers may prefer AI over humans for safety or efficiency. Yet, other research ([42] as mentioned earlier) argues that AI cannot surpass the human touch in tourism. These are not direct contradictions so much as contextual differences, under a health crisis, utilitarian factors (safety, hygiene) trump the emotional/social benefits of human service, whereas in normal times, many customers still value human interaction for empathy and personal connection. This contradiction implies that customer preferences are malleable and context-dependent. It also suggests a possible segmentation: some travelers (perhaps business or during high health-risk periods) lean toward AI for practicality, while others (leisure travelers seeking hospitality warmth) lean toward human service. The industry may thus need a dual approach to service: offering both high-tech and high-touch options to cater to different needs and contexts.
- **Personalization vs. Privacy trade-off:** Another tension lies in personalization benefits versus privacy concerns. Numerous studies tout personalization as a key benefit of AI (improving satisfaction), yet the same body of literature often raises privacy as a major concern (a potential dissatisfaction or adoption barrier)[40, 39]. This duality is sometimes evident even within the same study: customers love that a service knows their preferences (leading to delight when the hotel AI suggests a favorite drink), but hate thinking about how the data was obtained or fear misuse of that data. This reflects an unresolved contradiction in customer attitudes, a phenomenon known in consumer research as the "personalization-privacy paradox." In practice, it means tourism providers must carefully navigate data collection and usage: how to deliver

tailored experiences without spooking customers. Strategies like transparent data policies, opt-in consent, and visible security measures are recommended to resolve this tension, but empirical evidence on which strategies effectively balance this paradox is still scant. Future research could experiment with different consent and personalization approaches to find that sweet spot where customers feel both cared for and safe.

- **Efficiency gains vs. Experience quality:** Many studies highlight efficiency gains (speed, reduced errors) from AI, leading to improved experience. However, a few raise concerns that too much efficiency or automation might make an experience feel transactional and soulless. For instance, a luxury hotel could automate every touchpoint for maximum efficiency, but if the luxury clientele expects pampering by humans, the experience quality perception might drop despite flawless efficiency. Some qualitative feedback in studies suggests that guests sometimes equate being served by a person as part of high quality (especially in upscale contexts), a robot might be efficient but can come off as cheap or uninviting. This is somewhat contradictory to the notion that faster = better. It implies a non-linear relationship: up to a point, removing friction via AI improves experience, but beyond that, the absence of any human element can diminish perceived quality in services that traditionally emphasize human service (like fine dining, boutique hotels). The type of service and customer expectations are critical here. Future research could examine where that tipping point is: How far can automation go in different segments before it hurts perceived service quality? Already, some mid-range hotels have gone almost fully automated with good feedback, while some luxury hotels use AI in supporting roles only.
- **User reactions over time:** There is a potential divergence in short-term novelty effects versus long-term acceptance. Early studies often capture immediate reactions (e.g., first-time use of a robot might elicit delight due to novelty). There's a risk that such findings might not hold once the novelty wears off and AI becomes commonplace. For example, a first encounter with a chatbot might wow a customer in 2018, but by 2025, chatbots are expected, and only their quality will matter, not their mere existence. This means some positive responses observed could diminish over time, which might be seen as a contradiction in a longitudinal perspective. Unfortunately, our review found little longitudinal data to confirm this, but it's a known consideration. It suggests that researchers should be careful in attributing positive outcomes to AI itself versus the novelty of AI. Once baseline expectations shift (e.g., everyone expects a hotel to have a chatbot, the absence becomes a negative rather than the presence being a big positive), the conversation changes. The field will need to update findings continuously as consumer familiarity with AI grows.
- **Methodological variances leading to different conclusions:** We noticed that studies using different methods sometimes come to different emphases. Qualitative studies (interviews, focus groups) often highlight emotional and social nuances; for example, guests mentioning feeling uneasy with too much tech or missing human warmth. Quantitative studies, especially surveys with structured models, often emphasize what's measurable (speed, ease, etc.) and might downplay those harder-to-quantify feelings. This can lead to a kind of contradiction where one line of research says "AI improves satisfaction by X%" and another says "customers expressed longing for human help." Both can be true; they're just capturing different dimensions. This underscores a methodological limitation: over-reliance on self-reported intention or satisfaction scales might not capture the full experience, whereas pure qualitative insight can't generalize easily. Mixed-method approaches could reconcile these by providing both breadth and depth.

6.2. Methodological and research gaps

Building on the above, it's important to address limitations in the current literature that we observed:

- **Lack of longitudinal studies:** As mentioned, most research is cross-sectional or short-term experiments. We lack longitudinal studies tracking, for example, a cohort of travelers' acceptance of AI over multiple trips or a hotel's guest satisfaction before and after AI implementation over a year. This is understandable given the newness of AI in tourism, but it's a gap to fill. Longitudinal data could reveal adaptation effects, evolving attitudes, or how the novelty effect decays. It could also track actual behavior changes (do intentions translate into sustained usage?).
- **Limited cultural diversity in samples:** Many studies have focused on a few regions (Asia, Europe, North America). The concentration in China-related research is notable, reflecting China's quick adoption of service

AI (and indeed many of the top cited works come from or involve Chinese contexts) [5]. This raises the question of generalizability. For instance, results from Chinese hotel guests (who might be more accustomed to cashless, tech-driven services domestically) may not apply to, say, guests in markets where digital adoption is lower. The exclusion of Google Scholar in our revised approach meant focusing on more formal sources, but some potentially interesting case studies from diverse regions might be missed. There is a call in the literature for more studies in developing nations, cross-cultural comparisons (e.g., how do Western vs. Eastern tourists differ in robot acceptance?). Without these, our understanding remains somewhat culturally skewed. We tried to incorporate the cultural dimension conceptually, but empirical evidence is thin beyond noting differences in context coverage.

- **Scope of AI definitions:** Another issue is definitional – some studies included under "AI in tourism" are actually about related tech (AR/VR, analytics) and might not involve AI in the strict sense. Our review tried to keep focus on AI, but the lines can blur. If future research doesn't clearly define what aspect of AI they're studying (e.g., machine learning algorithm vs. embodied AI like a robot), it can cause confusion. Each type (robot, chatbot, analytics) might have different issues, yet some papers discuss them collectively. This is improving with more specialized studies, but a reader must be careful to note which facet of AI a given study addresses.
- **SLR methodology limitations:** In conducting this systematic review, some limitations should be acknowledged. There is potential selection bias despite broad searches; it's possible that relevant works were missed, especially given the fast pace of publications in 2023–2024. We mitigated this by updating references to include very recent studies (as of late 2024) and by cross-referencing bibliographies of key papers. However, as AI in tourism is an evolving field, new findings could alter conclusions.

6.3. Cultural and ethical dimensions

We summarize and expand the discussion of cultural and ethical dimensions of AI adoption in tourism here.

- **Cultural Tailoring of AI:** One emergent idea is that AI in tourism may need to be culturally intelligent. There's an opportunity for AI systems to be culturally adaptive. For instance, an AI concierge could switch its communication style depending on the guest's cultural background (more formal vs. informal, certain gestures or references). This goes beyond simple language translation to understanding cultural etiquette. It raises both design challenges and ethical ones (ensuring the AI does not perpetuate cultural stereotypes but truly adapts respectfully). Currently, most AI interfaces are one-size-fits-all, which could inadvertently cause cultural frictions or fail to engage certain groups. We recommend that future research and development consider frameworks from cross-cultural consumer behavior in designing AI. Perhaps integrating cultural intelligence modules in AI (a sort of cultural sensitivity filter) could be beneficial. There is little evidence of such implementation yet, representing a future direction.
- **Ethical frameworks and governance:** The ethical issues (privacy, bias, transparency) we identified suggest a need for frameworks and possibly industry guidelines. Some scholars have begun calling for an AI ethics charter in tourism [15]. This could include principles like:
  - Transparency: informing customers when they are interacting with AI (e.g., a chatbot should disclose it's a bot, not pretend to be human, as that honesty fosters trust and respects the user's right to know).
  - Privacy by design: minimizing data collection to only what's needed for the experience, securing data robustly, and giving users control. For example, an AI travel app might default to anonymizing data after use unless the user opts in to saving their profile for convenience.
  - Non-Maleficence: ensuring AI will not harm or unduly manipulate customers. This is subtle – e.g., dynamic pricing AI shouldn't exploit vulnerable consumers. Similarly, recommendation AI should not dark-pattern users into overconsumption (an ethical line between helpful upselling and manipulation).
  - Accountability: having human oversight and a clear process for addressing AI errors or missteps (like a human manager accountable if the AI causes a customer issue, as well as recourse for the customer).

The discussion of such frameworks is still nascent in tourism, but borrowing from AI governance in other fields (like healthcare's principles of AI) could inform tourism industry practices.

- **Inclusivity and access:** An ethical dimension not yet touched on is ensuring AI in tourism is inclusive. If older or disabled travelers struggle with new tech interfaces, how do we accommodate them? For instance, touchscreen kiosks might be challenging for visually impaired travelers. Ethically, the industry should ensure alternative options or accessible design (voice control, physical staff backup). Another facet is avoiding a digital divide where those who can afford tech or are tech-savvy get better service (e.g., an app that gives VIP treatment to those who use it, vs those who don't use smartphones get less attention). Tourism, ideally, should remain welcoming to all, so while AI can elevate experiences, it shouldn't create a two-tier service quality system. This is a challenge: how to implement cutting-edge tech without alienating non-users. Some solutions include maintaining parallel service channels or actively assisting customers in using the tech (e.g., airport staff roaming to help people use check-in kiosks).
- **Sustainability and ethical use cases:** A broader ethical lens is the impact of AI on sustainable tourism. A couple of references note that AI can help in sustainability (optimizing resources, reducing waste) [1], which is ethically positive in terms of environmental responsibility. However, increased automation could lead to job losses in communities that rely on tourism employment, raising social sustainability issues. Ethical adoption should consider retraining or new roles for displaced workers (some tourism companies have started using robots for menial tasks and elevating employees to more guest-centric roles). The literature agrees that AI adoption should be accompanied by human resource development to mitigate negative social effects [15]. The concept of augmented workers is relevant. Using AI to augment rather than replace staff could yield both efficiency and preserve employment, arguably an ethical balancing act.
- **Tourist data and surveillance concerns:** There's a fine line between great personalization and a Big Brother vibe. Some advanced applications, like facial recognition for personalized greetings or emotion detection (one study we cited noted using facial expression analysis to predict satisfaction [**?**]), while beneficial, may feel invasive. Cultural differences play a role here too. Some cultures are more sensitive about constant monitoring. The ethics of using such AI (even if legally allowed) should be debated in tourism: do customers want to be continuously monitored for optimizing their experience, or do they prefer privacy over a slight improvement in service? These questions lack straightforward answers and likely vary by person. One suggestion is to make such features opt-in (e.g., ask a guest if they want the "full smart experience" or a more private stay).

In sum, cultural and ethical dimensions underscore that AI adoption is not just a technical or economic decision, but a social one. Tourism businesses are part of communities and deal with diverse global customers; they have a duty to deploy AI responsibly, inclusively, and in tune with human values. The research so far has identified the problems, but concrete guidelines and evidence on how to solve them are still being developed. We encourage more interdisciplinary work combining tourism management with ethics, law, and cultural studies to address these dimensions.

7. Implications

The practical implications of this review for industry practitioners are multifaceted. For tourism and hospitality managers, the findings of this review offer several concrete insights and strategies for implementing AI in a manner that truly enhances customer experience.

- **Design AI services around customer needs:** Managers should start with clear use-cases where AI can solve customer pain points or add value. For example, if guests frequently complain about slow check-ins, investing in a user-friendly kiosk or mobile check-in AI system would directly address that, leading to faster service and higher satisfaction. However, it's crucial to involve customer feedback in the design. Conduct small-scale pilots of a chatbot or robot and gather guest reactions. Are they finding it useful? Is anything confusing? Use this input to refine the AI interface. Remember that perceived ease of use drives adoption, so simplicity and clarity in AI interactions are key [8]. A managerial tip is to employ UX/UI best practices: clear prompts, fail-safe options (e.g., "Did you mean X?" suggestions if AI is unsure), and multi-language support if serving international guests.

- **Enhance (Don't replace) the human touch:** The consensus is that a hybrid model often works best. Managers should view AI as augmenting their staff, not outright replacing the human element that many customers still desire. For instance:

  – Deploy AI for routine, time-consuming tasks: answering common questions (chatbot), processing transactions, and data analysis for personalized offers.
  – Free up employees to focus on high-touch tasks: greeting guests, resolving complex problems, adding creative personal touches (like a surprise for a returning guest). By doing so, customers get the efficiency of AI plus the warmth of human hospitality, which research suggests yields the highest overall experience ratings.
  As a decision rule, automate low-empathy and high-frequency tasks, and keep human support for exceptions, complaints, and situations where emotional reassurance is expected. This aligns with a broader point seen in service literature that AI can support efficiency, while human interaction remains important in emotionally complex service encounters.
  – It's also worth communicating this approach to customers: e.g., "Our chatbot can handle your quick questions anytime, and our team is here for anything else." This sets expectations that both AI and humans are at service, reassuring those who might worry that asking for a human is undesirable.

- **Build trust through transparency and privacy Safeguards:** To overcome the prevalent trust and privacy concerns, managers should implement strong data protection measures and be open about AI usage. Concretely:

  – Privacy Policy & Communication: Clearly inform customers what data the AI collects and why (e.g., "We ask for your preferences so our AI concierge can tailor recommendations for you. Your data is stored securely and deleted after your stay"). Such transparency can reduce suspicion.
  – Explanation at the point of interaction: Provide short user-facing explanations for recommendations and automated actions (e.g., "This is suggested because you selected X" or "This was prioritized due to your time constraint"). This reduces black-box perceptions and supports informed use.
  – User control interface: Offer a simple control panel where customers can adjust personalization levels, review key preferences used by the system, and switch to a low-data mode. When feasible, allow users to delete or reset personalization.
  – Opt-in Personalization: Allow guests to choose the level of personalization. Some might opt-in to share more data for a highly personalized experience, while others might choose a basic mode. Respect those choices, it can actually build loyalty when customers feel their preferences (even for privacy) are honored.
  – Visible Security: For instance, if using AI kiosks for payments or facial recognition for access, display signs or info that these systems are secure and perhaps even certified by third parties. Much like putting a lock icon on a website checkout, giving reassurance in physical settings helps.
  – AI Identity: Always make it clear when customers are interacting with AI vs. a human. Many appreciate knowing; it can even set the right expectations (customers might be more patient with a bot's limitations if they know it's a bot). This honesty can bolster trust; no one likes to feel tricked (and passing off a bot as human is generally not wise for brand image).
  – Human escalation path: Ensure a clear option to reach a human agent, especially for exceptions, complaints, or emotionally sensitive issues. Make this option visible, not hidden. This fits established guidance that people should be informed when they interact with AI and should have the option to choose human interaction where needed.

- **Cultural sensitivity and localization:** For businesses serving international or diverse clientele, managers should ensure the AI is culturally and linguistically adapted:

  – Provide support for multiple languages if relevant. Nothing frustrates a traveler more than a mandatory self-service that doesn't operate in any language they speak.

- Train AI on cultural etiquette differences. For example, in some cultures using first names is too informal, a voice assistant might need to address a guest as "Sir/Madam" vs. first name. Similarly, tonal differences (some languages require polite forms).
- Consider offering a mix of service styles. For instance, in a resort with guests from around the world, some may want high-tech experiences (like AR/AI guided tours), others might prefer human-guided tours. Offering both can cater to varied tastes.
- Solicit feedback from guests of different backgrounds regarding the AI experience; use that to refine the service. Perhaps an AI activity planner that worked well for Western tourists misses the mark for Asian tourists because it doesn't consider certain preferences; you won't know unless you ask and analyze by segment.

- **Employee training and engagement:** Employees are stakeholders in AI adoption, too. Managers should:

  - Involve staff early when introducing AI tools. Explain the purpose: not that the robot is there to watch them or replace them, but to help with certain tasks so they can concentrate on others. Emphasize how this can actually reduce their workload on tedious tasks and give them more time for meaningful customer interactions or upselling (which can even improve their own performance metrics or tips).
  - Provide thorough training on how to work alongside AI. For example, front-desk agents should know how the kiosk works so they can assist guests or resolve issues if the kiosk fails. If using an AI recommendation engine in a travel agency, agents should be trained to interpret and validate those recommendations rather than blindly trust or ignore them. This way, employees feel empowered by AI, not threatened.
  - Create a protocol for AI escalations: when should staff step in if AI is not meeting a customer's need? For instance, a chatbot might escalate to a human agent if it detects anger or repetition. Ensure staff are ready to smoothly take over these handoffs, turning potentially negative moments into positive recoveries.
  - Recognize and reward employees for effectively using AI to enhance service. If a concierge uses the AI system to deliver exceptional personalization that wows a guest, celebrate that. It signals that the company values augmentation – human creativity plus AI capability – as the ideal.

- **Monitor and maintain the AI systems:** AI is not a set-and-forget solution. Managers should treat AI services as they do staff requiring oversight, evaluation, and improvement:

  - Performance Monitoring: Track key metrics such as chatbot resolution rates, average wait times at kiosks, customer usage rates of AI features, and satisfaction scores for interactions involving AI vs. human. Use these to identify shortcomings. For instance, if many chat queries end with "I need human help," examine what the frequent requests are, perhaps the chatbot needs an update to handle those.
  - Customer Feedback Loops: Integrate a quick feedback mechanism after AI interactions. E.g., after a chatbot conversation, ask "Was this helpful? [Yes/No]. If no, please tell us why." This can pinpoint pain points (maybe the chatbot's responses were accurate but too slow, or maybe it didn't understand a certain type of question).
  - Continuous Improvement: Work with AI vendors or in-house developers to update the AI regularly based on feedback and new data. AI that learns is great, but often it requires supervised learning or re-training with new datasets (for example, if tourists start asking about a new attraction that opened, ensure the AI is updated with that info).
  - Maintenance and Redundancy: Ensure the AI services are reliable (downtime of a kiosk or app can frustrate customers more than not having it at all). Have backup options – if a system goes down, have staff cover or have a manual process as a fallback. Make sure IT support is prompt to fix issues.

- **Marketing and managing expectations:** On the marketing front, leveraging AI can be a selling point if done right. For example, some modern hotels market themselves as "smart hotels" and attract a niche of tech-savvy travelers. However, one must deliver on that promise – nothing worse than advertising a cutting-edge experience that then malfunctions. So:

    – If you market AI features, do so accurately and ensure they are robust. It can differentiate your service and appeal to certain segments (like business travelers who appreciate efficiency, or younger travelers excited by novelty).

    – At the same time, manage expectations of those who might be wary. For instance, in pre-arrival emails, mention the new AI self-check-in but also reassure that staff is available 24/7 if they prefer or need assistance. This way, technophiles feel excited to try it, and technophobes know they won't be left alone with it.

- **Focus on experience enhancement, not just cost savings:** It might be tempting to adopt AI mainly for cost reduction (e.g., fewer staff needed). However, the research indicates that to truly reap rewards (customer satisfaction, loyalty, positive WOM), the guiding star should be improving the guest experience. Cost savings can be a bonus, but shouldn't compromise the experience. For example, don't reduce staff to the point that when the single concierge is busy, the robot is the only one greeting new guests, which could degrade the experience. Use savings to perhaps reinvest in training or other guest amenities, thereby completing a virtuous cycle. A concrete implication: pilot AI in areas where it obviously adds customer value (like extending service hours via chatbot), rather than areas that purely cut costs but might hurt service (like removing all reception staff overnight and forcing kiosk use, which could be scary for some guests).

- **Ethical practice as brand value:** Tourism businesses can turn ethical AI usage into a brand advantage. Communicate to customers how you handle their data responsibly and how AI is used to benefit them. For instance: "Our resort uses AI to optimize energy usage, contributing to sustainability (so you can feel good about staying with a low-carbon footprint), and we protect your data with encryption and never share it externally." This kind of messaging can build trust and differentiate your brand as a responsible innovator. Also, showcasing how AI frees your staff to provide more attentive service can be a narrative (e.g., "Thanks to our automated concierge, our human concierges have more time to create special experiences for you").

- **Stay updated and scalable:** Finally, managers should stay abreast of AI advancements. The tech that seems novel today can become standard quickly (as we've seen with mobile check-ins, etc.). Planning for the scalability and upgradability of AI systems is smart. Choose solutions that can integrate new features (for instance, an AI platform that could later incorporate voice if you only use text now, or add sentiment analysis down the line). Also, keep an eye on what competitors and big players do. Sometimes guest expectations are set by industry leaders (e.g., if big hotel chains roll out AI concierges worldwide, travelers might start expecting that level of tech in many places).

    In summary, managers in tourism should approach AI adoption not as a mere tech trend or cost-cutting tool, but as a strategic enhancement to their service design. Those who thoughtfully blend AI capabilities with human hospitality, ensure ethical use of data, and adapt to their customer demographics are likely to see improved satisfaction, streamlined operations, and ultimately stronger customer loyalty. The managerial challenge is to be both innovative and empathetic, implementing cutting-edge solutions while keeping the human-centric essence of hospitality intact.

8. Conclusion and future work

This systematic literature review set out to provide a comprehensive understanding of how artificial intelligence is being adopted in the tourism sector and with what consequences for customer experience. Drawing on 57 studies from 2000 through 2024, we strengthened the theoretical foundation by proposing an integrative conceptual model linking AI applications, adoption factors, contextual challenges, and customer experience outcomes. Our analysis yields several overarching conclusions.

    AI technologies (from chatbots and service robots to recommendation engines) are indeed transforming tourism services by enhancing efficiency, personalization, and accessibility. They hold the potential to significantly improve customer satisfaction by providing faster, tailored, and around-the-clock services. However, their impact is highly context-dependent. The same AI application can be embraced or resisted by customers depending on situational

factors (e.g., a pandemic vs. normal times), cultural norms, and how it is implemented alongside human service. There is no one-size-fits-all: success with AI requires alignment with the service context and customer expectations.

Despite AI being cutting-edge technology, its adoption in tourism is ultimately governed by human psychology and behavior. Core drivers like perceived usefulness, ease of use, and trust are critical; echoing classic technology acceptance theory, but now evidenced in tourism scenarios. Equally, barriers such as privacy concerns, lack of transparency, and technology anxiety can significantly impede acceptance. Our review underscores that building consumer trust (through reliable performance and ethical practices) and ensuring user-friendly design are prerequisites for AI success in tourism.

A key insight is that AI performs best not as a wholesale replacement for human service, but as part of a hybrid service model. Studies consistently showed that combining AI efficiency with human empathy leads to the highest customer experience ratings. For instance, letting AI handle routine queries or transactions frees human staff to deliver more personalized attention in complex or emotional interactions, thereby giving customers the benefits of both. Organizations that leveraged AI to augment (not supplant) their employees saw improved service consistency and customer satisfaction, while those that attempted full automation in contexts requiring personal touch sometimes faced customer pushback. The human element remains a critical differentiator in experiential services like tourism.

When implemented thoughtfully, AI adoption has led to tangible improvements in various dimensions of customer experience: shorter wait times, more personalized recommendations, greater convenience, and often a "wow" factor from innovative encounters (like interacting with a robot concierge). Customers often appreciate the enhanced control and real-time information AI provides during their journey, which can translate into higher satisfaction and loyalty intentions. However, these positive outcomes materialize only if the AI services are reliable, user-centric, and integrated into the service process with fallback options. Poorly executed AI (e.g., clunky interfaces, frequent errors, or lack of human backup) can frustrate customers and detract from the experience; a risk that some studies and anecdotal cases have illuminated. Thus, managerial oversight and continuous improvement of AI systems are essential to maintain the quality of experience.

Our extended analysis of cultural and ethical dimensions reveals that addressing these issues is not just a matter of compliance or corporate social responsibility, but central to customer acceptance and brand reputation. Tourism is global and inherently personal. Misuse of AI or insensitivity to cultural differences can lead to customer alienation or distrust (for example, an AI that appears too surveillance-heavy might scare off privacy-conscious travelers). Meanwhile, respecting privacy, ensuring fairness, and being transparent about AI aligns with the values of many modern consumers and can become a competitive advantage. We conclude that stakeholders in tourism should proactively develop guidelines for ethical AI use (encompassing data protection, transparency, and inclusivity) and consider cultural customization of AI interactions to serve a diverse customer base. This will help sustain customer goodwill and avoid the backlash that can accompany tech missteps.

This review has limitations. First, we did not perform a formal quality appraisal of included studies. Second, the search was restricted to Scopus and Web of Science and to English-language publications. Third, grey literature and most conference proceedings were excluded. These choices may contribute to publication bias and may underrepresent emerging industry work. The findings should therefore be interpreted as a structured synthesis of peer-reviewed evidence rather than as a complete census of all relevant outputs.

The field of AI in tourism is evolving rapidly. We encourage future research to build on this review by exploring longitudinal effects of AI adoption, experimenting with cross-cultural deployments, and assessing the long-term economic impacts on businesses and destinations (e.g., does AI adoption improve profitability through efficiency gains and loyalty, and how are those benefits distributed?). Also, investigating tourists' perspectives on emerging AI like generative AI (ChatGPT trip planners, etc.), which was on the horizon in 2023–2024, will be important as these may change how travelers plan and experience trips. For practitioners, staying agile and customer-focused in AI implementation will be key. The successful cases to emulate are those where AI was introduced with a clear value proposition for guests, employees were carried along in the change, and the service offering was consequently elevated.

In closing, artificial intelligence represents both a great opportunity and a formidable challenge for the tourism industry. It offers tools to enrich the customer journey in ways that were science fiction just a decade ago, from

AI concierges that can converse naturally with guests, to predictive systems that anticipate traveler needs. Yet, as this review has shown, reaping the benefits of AI requires more than installing software or gadgets; it demands a human-centric approach to design, ethical foresight, and an adaptive service culture. Those tourism organizations that integrate AI thoughtfully – enhancing efficiency while preserving the essence of hospitality – are likely to lead the way in customer experience excellence in the coming era. Future research should examine which human–AI configurations produce reliable gains in customer experience across contexts and segments.

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