



A TOKENIZED FRAMEWORK FOR ENHANCING THE INTEGRITY AND AUTHENTICITY OF TOURISM REVIEWS

Abstract

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Purpose – This study explores the application of blockchain technology in smart tourism and presents a model for reducing fake reviews.

Methodology/Design/Approach – By utilizing the transparency and immutability features of blockchain technology, this paper illustrates how artificial intelligence (AI) can be employed to address and mitigate fraudulent practices within the tourism sector. A prevalent issue today, particularly in the tourism sector, is the proliferation of fake reviews, undermining trust, and reliability. The proposed model focuses on reducing fake reviews, thereby bolstering trust in online reviews through blockchain and AI technology.

Findings – To encourage user participation in submitting reviews, the authors suggest the implementation of a loyalty token system, whereby users are rewarded with tokens for each review submitted. Furthermore, the study systematically compares the proposed model with relevant research, highlighting loyalty tokens as a blockchain-derived incentive feature that enhances the validity of reviews.

Originality of the research – Proposing a loyalty token-based model and utilizing blockchain technology in order to reduce fraudulent practices in the tourism industry.

Keywords Blockchain, Smart tourism, Fake reviews, Artificial Intelligence, Loyalty token.

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INTRODUCTION

Since the emergence of Bitcoin in 2008 and the advent of blockchain technology (BCT), these innovations have garnered considerable attention from both academia and industry (Li et al., 2020). Initially, Bitcoin was relatively unknown and undervalued, but over time, its features and applications have made it one of the most recognizable currencies worldwide. As the largest blockchain-based currency, Bitcoin has opened numerous opportunities for leveraging BCT in various domains. The real-time traceability, non-repudiation, immutability, and data integrity offered by BCT have resulted in its adoption in sectors such as finance, e-voting, healthcare, insurance, logistics, entertainment, government, and even the tourism industry (Nam et al., 2021). However, despite the growing utilization of BCT, practical implementation faces challenges, and many BCT applications remain in their early stages (Aghaei et al., 2021) due to the lack of appropriate theoretical examination and investigation. Nevertheless, due to its remarkable properties, BCT holds immense potential to revolutionize the tourism industry. The transparency, availability, and immutability of information in distributed ledgers ensure the trustworthiness of the blockchain mechanism (Treiblmaier & Önder, 2019). In the context of smart tourism, which aims to enhance the quality of life through the integration of information and communication technology (ICT) and efficient integrated services, BCT can play a pivotal role (Bhushan et al., 2020). According to (Rashideh, 2020), BCT holds the potential to assist organizations in establishing secure digital records and facilitating secure data storage. However, the emergence of new technologies like blockchain presents both opportunities and threats to businesses and prompting companies to adapt to maintain competitiveness in the ever-evolving landscape (Perelygina et al., 2022).

The tourism industry is a main economic component for many nations, particularly in developing countries. With the increasing number of travelers and destinations, tourists seek reliable and comprehensive information about transportation, accommodation, sightseeing, and on-trip services. Additionally, tourist satisfaction across the three stages of the experience layer: pre-trip, on-trip, and post-trip, becomes a crucial competitive factor in tourism marketing (Balasubramanian et al., 2022). The tourism industry and intermediaries must engage in each layer and monitor tourist requirements to enhance the overall experience and establish greater reliability. During the pre-trip stage, tourists make choices regarding destinations, accommodations, and transportation options. On the trip, they decide on entertainment, food supply chains (restaurants), and sightseeing activities. During the post-trip stage, tourists aspire to share their experiences without constraints or modifications and receive rewards. They also seek feedback and recommendations for their next trip based on shared experiences through blogs, social media, and reviews. In recent years, BCT has emerged as a transformative force in the travel and tourism industry, impacting different phases. Blockchain provides a decentralized and secure infrastructure that offers several advantages to tourists, such as eliminating intermediaries, enabling authenticated participation, traceability of fraudulent activities, promoting

economic prosperity, filtering out invalid inputs (comments, reviews, etc.), and facilitating peer-to-peer validation. Essentially, BCT facilitates the peer-to-peer trade model in tourism.

In the contemporary landscape, tourism faces significant challenges stemming from a myriad of social concerns, including but not limited to security issues, fraudulent activities, and the scarcity of accessible resource information (Rhee, 2016). Reviews play an essential role in the post-layer of the tourism industry. Reviews play an essential role in the post-layer of the tourism industry. As review data management is centralized and companies have full control over them, they have the ability to selectively display specific reviews to users, thereby potentially influencing users' decisions. Another type of fraud that can influence users' decisions is the writing of fake reviews, which can either boost or lower the ratings of hotels and hospitality services (Bulchand-Gidumal & Melián-González, 2024).

The existing literature extensively explores blockchain applications in tourism, but most studies focus on transaction security, identity verification, and supply chain management (Rashideh, 2020; Treiblmaier & Önder, 2019). Few studies have specifically addressed the issue of fraudulent reviews (Tripathi et al., 2025; Tuomi, 2021) and the role of BCT in ensuring transparency and credibility in online tourism platforms (Mountije et al., 2025; Rodríguez Bolívar et al., 2024). This study addresses a critical gap by proposing a blockchain-based model that enhances the reliability and integrity of online tourism reviews. Many existing models use blockchain to build trust, but they fall short when it comes to real-time review verification due to the lack of AI-driven mechanisms. Unlike studies that focus primarily on transaction security and decentralization, this research directly tackles review manipulation by removing centralized control and strengthening trust in user-generated content. AI enhances blockchain's capabilities by introducing intelligent review validation, an area that remains largely unexplored in tourism research. Additionally, the proposed loyalty token system not only encourages genuine reviews but also ensures that only verified users can contribute, further boosting transparency and credibility. By merging blockchain's immutability with AI-powered fraud detection, this approach goes beyond traditional models that rely on just one technology, delivering a more effective solution for combating fake reviews.

Beyond its practical impact, this study also makes meaningful theoretical contributions. It expands the role of blockchain beyond financial applications, demonstrating its potential to transform the tourism industry. The introduction of an AI-assisted blockchain model lays the groundwork for decentralized review systems, ensuring both security and reliability. More importantly, the research sheds light on the complex relationship between blockchain, AI, and user trust in tourism decision-making, adding to the broader conversation on how digital transformation is reshaping service industries.

This paper introduces a blockchain-based model for reviews and referrals in the post-trip phase, examining its impact from multiple perspectives. The primary goal of the proposed model is to reduce fraudulent reviews by leveraging blockchain and AI technologies. Specifically, it explores how blockchain can enhance the tourism industry, the added value it provides for users, hotels, and online travel agencies (OTAs), and the role of AI in strengthening reliability. By integrating these elements, the model aims to create a more transparent and trustworthy review system, ensuring authenticity while fostering greater confidence among travellers and service providers. To sum up, this research introduces a novel AI-assisted blockchain framework that integrates real-time review authentication with a tokenized incentive system, further strengthening the integrity of online tourism reviews. While previous studies, such as that of (Shukla & Goh, 2024), have explored the potential of AI and blockchain in combating fake reviews, our work extends this concept specifically to the tourism ecosystem, offering a more holistic approach to detecting and mitigating review fraud. Unlike earlier blockchain-based models that emphasize decentralization but overlook content verification (Bulchand-Gidumal & Melián-González, 2024), our framework incorporates AI-driven fraud detection, enabling the dynamic identification of manipulated reviews. Furthermore, by introducing a loyalty token system, this study not only incentivizes genuine user participation but also discourages fraudulent activities—an area that remains insufficiently addressed in prior research. Taken together, these contributions position our model as a more robust and adaptive solution, bridging existing gaps and setting a new standard for transparency and trust in tourism review systems. The rest of the paper is organized as follows. Section 2 is devoted to literature review in blockchain-based tourism industry. In section 3 proposed model is presented in detail and finally, the discussion and a conclusion of the proposed model is shown in section 4 and 5 respectively.

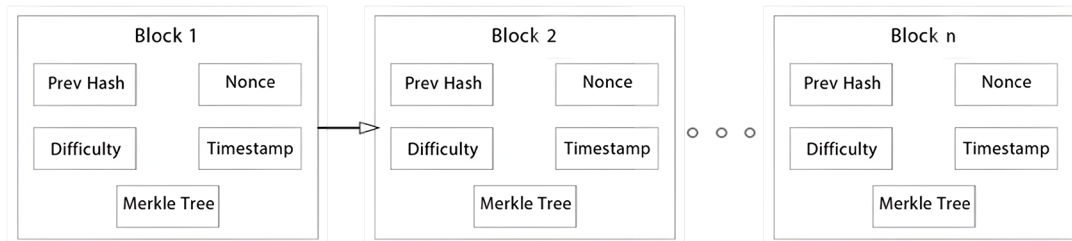
1. LITERATURE REVIEW

1.1. Blockchain

Blockchain is one of the latest technologies that has been making waves across various industries. Blockchain and other distributed ledger technologies (DLTs) are revolutionizing how companies manage both tangible and digital assets. Bitcoin, an electronic payment method that operates without intermediaries or central authorities, introduced blockchain as a distributed ledger that ensures transparency, immutability, anonymity, and integrity. Blockchain networks can be public, consortium, or private. Public blockchains allow any user to read and write data without relying on a central authority. Private blockchains require user authorization and are typically utilized for confidential data within organizations. Consortium blockchains are employed to share data among organizations or individuals (Ghosh et al., 2020; Li et al., 2020). The evolution of BCT can be categorized into three eras: Blockchain 1.0, Blockchain 2.0, and Blockchain 3.0. In Blockchain 1.0, the primary focus

was on cryptocurrencies such as Bitcoin and Dogecoin. Blockchain 2.0 introduced smart contracts, enabling the creation of decentralized autonomous organizations (DAOs) through programmable contracts. Ethereum was the first cryptocurrency to support smart contracts. At the time of writing this paper, Blockchain 3.0 represents the latest stage, allowing developers to create decentralized applications (DApps) beyond the financial aspects of blockchain (Maesa & Mori, 2020). Each block in the blockchain consists of a header and body. The header comprises five parts: Nonce, Previous Hash, Timestamp, and Merkle tree. Figure 1 illustrates the structure of a block.

Figure 1: **Block components of Blockchain (Valeri & Baggio, 2021)**



1. **Nonce:** A counter used for a proof-of-work puzzle.
2. **Previous Hash:** A reference to the previous block hash.
3. **Difficulty:** The proof-of-work algorithm difficulty for a specific block.
4. **Timestamp:** The approximate time to create a block.
5. **Merkle Root:** A hash of Merkle tree root.

As previously mentioned, BCT is a disruptive innovation that can be applied to various areas of the tourism industry. It has the potential to revolutionize medical tourism, review immutability, airlines, payment systems, authentication, and secure data sharing. Blockchain enables cost savings and convenient token usage across different countries without the need for currency conversion (Irannezhad & Mahadevan, 2020; Parekh et al., 2021). By utilizing BCT and smart contracts, users can voluntarily share their data and receive tokens or cryptocurrency in return, while ensuring the prevention of unauthorized data leakage. Blockchain also helps in detecting and preventing false reviews by leveraging its security properties (Banerji et al., 2021).

However, despite the numerous advantages of BCT, several critical challenges must be addressed, including a lack of expertise in blockchain implementation, legal barriers associated with implementing blockchain platforms and token usage for payment, and the need for a user-friendly blockchain platform to enhance customer experience.

In the third era of blockchain, with the emergence of Dapps, numerous applications have been developed across various industries, including the tourism sector. These Dapps leverage blockchain's transparency, security, and decentralized nature to transform processes and enhance user experiences. Table 1 shows some Dapps example.

Table 1: **Some Examples of Dapps**

Example	Characteristic
TravelChain	A platform with decentralized architecture, where users enter their personal information and receive benefit for it (Erceg et al., 2020).
WebJet	Via smart contract help users in the hotel reservation process (Erceg et al., 2020).
SmartTrip	This platform Allows users to find the most appropriate trip plan with the use of smart contract and distribute peer-to-peer blockchain (Ozdemir et al., 2020).
GOEureka	This platform with the use of Ethereum blockchain and smart contract helps users to book hotels in different countries, the main feature of this platform is transparency by connecting hotel and users to each other's (Ozdemir et al., 2020).

1.2. Blockchain and smart tourism

Smart tourism is a key component of smart cities, which leverage information technology and innovative technologies to enhance citizen experiences. The primary goal of smart tourism is to improve customer satisfaction through the use of ICT. By leveraging ICT, businesses can make data-driven decisions and enhance the quality of their services. The tourism industry, given its nature, is particularly vulnerable to health crises, which can have a significant impact on economic growth, businesses, workers, and overall tourism demand. During the COVID-19 pandemic, ICT played a crucial role in enabling OTAs to connect with customers through social media, enhance brand awareness, and attract new followers. Despite experiencing a sharp decline in demand, businesses should continue to prioritize customer attention (Arbulú et al., 2021; González et al., 2021).

Smart tourism enhances the travel experience by leveraging advanced technologies to meet user expectations more effectively (Gretzel et al., 2015). It helps travellers by anticipating and fulfilling their needs based on individual preferences, ensuring a more seamless and tailored journey. Additionally, smart tourism personalizes experiences by utilizing location-based services, allowing for real-time recommendations that enhance satisfaction. Another key benefit is its ability to facilitate experience-sharing among travellers, enabling them to provide feedback, reviews, and insights that contribute to a more informed and connected travel community. By integrating these aspects, smart tourism not only improves service efficiency but also fosters greater engagement and trust among users.

Several studies have explored the role of blockchain in addressing persistent challenges such as data privacy, fake reviews, and fraud. For instance, blockchain's inherent features—transparency, immutability, and decentralization—make it a powerful tool for ensuring the integrity and trustworthiness of data, including customer reviews (Himeur et al., 2022; Singh et al., 2025). The framework proposed by (Ozdemir et al., 2020) compared distributed blockchain applications like Nocturus, SmartTrip, Further, and GOeuroka in the tourism sector. They proposed criteria such as governance model, blockchain platforms, consensus mechanisms, cryptocurrency, smart contracts, and tokens to evaluate different Daaps. The study emphasized that BCT can address challenges related to customer experience exchange, fake reviews, fraud, and data privacy, thanks to its inherent characteristics of transparency, privacy, anonymity, integrity, trustworthiness, immutability, and security. The choice of blockchain platform and consensus mechanism was found to impact performance indicators such as scalability, transaction speed, and energy consumption.

The future of intermediaries in the tourism industry with the advent of blockchain is investigated (Rashideh, 2020). This study conducted a qualitative experiment using questionnaires to assess the feasibility of blockchain adoption. Expert opinions from various fields, including consultants, university professors, developers, business analysts, and industry advisors, were collected. The results indicated that intermediaries' role in the tourism industry gradually diminishes after the adoption of BCT. Another study conducted a systematic literature review to explore blockchain applications and advantages in the tourism and travel industry (Banerji et al., 2021). The review of 30 studies highlighted several benefits of blockchain, such as disintermediation, digital currencies, real customer reviews, loyalty programs, and food chain supply management. Balasubramanian and co-authors (Balasubramanian et al., 2022), proposed a blockchain-enabled framework for different stages of a trip, including the pre-trip, during the trip, and post-trip phases. The framework leveraged blockchain attributes like digitalization, automation, disintermediation, and intelligent environments to facilitate processes such as insurance claims, data ownership, smart contracts, fraud detection, transparent reviews, rewards, and discounts. The framework consisted of three layers: the application layer for blockchain characteristics, the experience layer for travel requirements, and the user layer for blockchain-enabled services for tourists. The contribution of blockchain to the smart tourism industry during the COVID-19 pandemic was analyzed in (Messori & Escobar, 2021) using the PRISMA method. They reviewed 47 articles out of 1134, which focused on automation technology, social media, and application development to enhance the customer experience, support destination rebranding, and aid stakeholder's post-pandemic. In another study, important issues in the tourism industry, such as data privacy, security, and management are investigated (Yadav et al., 2021). They highlighted that BCT, with its Merkle tree algorithm and decentralized ledger, offers simple solutions and provides higher efficiency, transparency, and certainty. The study described the blockchain ecosystem in the tourism industry, involving processes such as customer authentication and delivery of smart tourism products after payment confirmation. An IAD-based framework was employed to analyze the interactions between different organizations, key factors, and institutions in the tourism industry. The integration of blockchain with smart technology was found to enable tourism but also increase complexity, which could be mitigated through disintermediation. These studies collectively demonstrate the potential of blockchain in addressing challenges and improving various aspects of the tourism industry, including customer experience, intermediation, trust, security, and efficiency. The role of blockchain in revolutionizing smart tourism is evident across various applications, such as Enabling decentralized review systems to mitigate fake reviews, Improving transparency in loyalty programs through smart contracts, Enhancing trust by ensuring that only authenticated users contribute reviews, and Mitigating the need for intermediaries in the tourism supply chain (Banerji et al., 2021; Rashideh, 2020). Thus, blockchain offers a robust framework for addressing the trust-related issues that plague online review systems, thereby enabling greater reliability and fostering trust in tourism services.

1.3. Online reviews: A critical component of smart tourism

Consumer trust and business credibility are increasingly undermined by fake online reviews, while traditional detection methods have proven ineffective. The rise of generative AI has further complicated fraud detection, making it more challenging to identify manipulated content. To address this issue, authenticated anonymous reviews can be implemented through digital identity verification and blockchain-based systems, ensuring authenticity while preserving user anonymity. However, an effective solution requires a multi-stakeholder approach. As noted by (Shukla & Goh, 2024), regulatory frameworks, platform-driven initiatives, and consumer education are essential in mitigating the impact of fraudulent reviews and enhancing trust in online review systems. Online reviews play a pivotal role in the tourism industry by influencing customer perceptions, decision-making, and trust. They provide customers with insights into the quality, reliability, and reputation of tourism services and products (Wu et al., 2024). Consumers often spend a significant amount of time reading reviews to understand a product better. The important role reviews play in providing consumers with information and reducing uncertainty when they are researching potential purchases. They emphasize that consumers use reviews to evaluate products and sellers by considering factors such as product features, brand reputation, pricing, and customer service. In the context of smart tourism, reviews serve as an essential mechanism for sharing experiences and helping consumers reduce uncertainty during their decision-making process (Kutabish et al., 2023). Online reputation, driven by electronic word of mouth (eWOM) through ratings and reviews, plays a crucial role in signalling quality and trustworthiness by enabling consumers to share experiences and perceptions of products and services (Amblee & Bui, 2011). Blockchain technology presents an innovative solution to these challenges by offering a decentralized, secure, and tamper-proof system for managing online reviews. With its key features—decentralized ledgers, smart contracts, and tokenization—blockchain enhances transparency and trust in review platforms (Bulchand-Gidumal & Melián-González, 2024). By eliminating central control, it prevents the manipulation or censorship of reviews, ensuring that all submitted feedback remains unbiased and unaltered. Additionally, blockchain-based authentication mechanisms verify users before they can post reviews, significantly reducing the risk of fake entries. Its transparency and immutability further ensure that once a review is recorded, it cannot be altered or removed without traceability, strengthening the integrity and credibility of online tourism reviews.

Online reviews and social media influencers can affect user decisions for their destination (Gao et al., 2020). A latest research proposed a blockchain-based model that restricts review posting to authenticated users (Bulchand-Gidumal & Melián-González, 2024). However, a key challenge remains, as the authenticity of these reviews cannot be reliably verified by other users, raising concerns about trust and transparency. In another study, a deep hybrid model for fake review detection was introduced, utilizing review text, overall ratings, and aspect ratings. Experimental results demonstrate the effectiveness of this approach in surpassing existing techniques, offering both improved accuracy and efficiency (Duma et al., 2023).

The integration of AI into blockchain systems further enhances the reliability of reviews by enabling advanced fraud detection mechanisms. AI algorithms can analyze textual patterns, ratings, and user behavior to identify and flag potentially fraudulent activities (Rajaguru, 2024). This integration addresses a critical gap in the tourism industry: the need for a trustworthy online review system that enhances consumer trust while fostering a reliable platform for sharing experiences. By connecting blockchain's capabilities with the critical role of online reviews, our study lays the foundation for a transformative approach to smart tourism. The integration of blockchain and AI to enhance the credibility and reliability of online reviews in the tourism industry (Kim et al., 2023). Blockchain ensures transparency, immutability, and decentralized control, enabling only verified users to post reviews, thereby reducing manipulation and fostering trust. AI complements this by detecting fraudulent reviews through advanced text analysis, distinguishing credible content from fake or superficial information. This integration not only enhances consumer trust in online platforms but also supports informed decision-making, ultimately benefiting businesses by improving their reputation and driving genuine customer engagement. The proposed framework offers a novel solution to persistent issues of fraud and credibility in tourism reviews, with significant implications for both consumers and industry stakeholders.

2. METHODOLOGY

This study employs a conceptual approach to propose a blockchain- and AI-based framework for mitigating fake reviews in the tourism industry. The model is designed to ensure transparency, authenticity, and scalability by integrating blockchain's immutability and token-based authentication with AI's fraud detection capabilities. The framework uses blockchain to issue unique tokens to verified users, allowing them to submit reviews securely and anonymously while preventing duplicate submissions. AI algorithms then analyze the review content to identify fraudulent patterns, enhancing the reliability of the system. This methodology synthesizes insights from the literature and existing technologies to develop a theoretical model that addresses gaps in fraud prevention and trust enhancement in tourism reviews. While empirical testing and implementation are outside the scope of this paper, the conceptual model lays the groundwork for future research and practical validation.

3. PROPOSED MODEL

The proposed model in this paper aims to mitigate the risk of fake reviews in the smart tourism industry using blockchain and AI technology. By integrating both AI and blockchain, we aim to create a model that employs transparent fake review detection to determine the validity of reviews and assign reviewer scores, helping users identify trustworthy reviews to make informed decisions about their trips. Based on the literature review, social media influencers and reviews significantly influence user decisions when choosing destinations and hotels (Gao et al., 2020), as these reviews are widely shared across media platforms. By leveraging blockchain technology, the proposed model ensures transparency and immutability of transactions, which significantly reduces the risk of fraud. The authenticity of reviews is confirmed only for authenticated users who have verifiably experienced the related travel, eliminating the influence of fake accounts and unreliable submissions. This initiative establishes a decentralized system that prevents companies from altering or selectively displaying reviews, ensuring transparency and integrity in the review process (Bulchand-Gidumal & Melián-González, 2024). Furthermore, blockchain records the origin and destination of travelers while maintaining user anonymity through hash functions, paired keys, and addresses. The tokenized system introduces an additional layer of trust and accountability by linking review submissions to unique, verified travel experiences, thereby advancing the application of blockchain technology in smart tourism and filling critical gaps in fraud prevention and trust enhancement within the industry. In addition to blockchain, the integration of AI significantly enhances the model by introducing an automated mechanism for detecting fake reviews. AI employs machine learning algorithms to analyze review content, metadata, and user behavior patterns, effectively distinguishing genuine reviews from fraudulent ones. This approach addresses limitations in blockchain-only systems, which can prevent duplicate reviews but lack the ability to evaluate the content's authenticity. By combining blockchain's transparency with AI's dynamic validation capabilities, the model creates a robust framework for ensuring the reliability of reviews. Moreover, the interplay between blockchain and AI fills a critical theoretical gap by offering a hybrid solution that not only guarantees data integrity but also provides an intelligent layer for fraud detection. The proposed model introduces two types of accounts for travelers: Type 1, which is a view-only account, and Type 2, which allows users to view and submit review. Both types of accounts require an email address and user ID, but the submission of review is only allowed for users who provide their passport number (passportNO). All account information, including email addresses, user IDs, and passport numbers, are displayed in hash form for other users. This ensures that users remain anonymous and unique within the proposed model. Figures 2 and 3 illustrate the depiction of both types of accounts in the model, showcasing the use of hash functions to protect user anonymity and ensure the security of their personal information.

The proposed model focusing on fake reviews detection. Figure 4 provides a detailed flowchart of the first part of the model, which is explained below.

Figure 2: View Only Account (source: own elaboration)

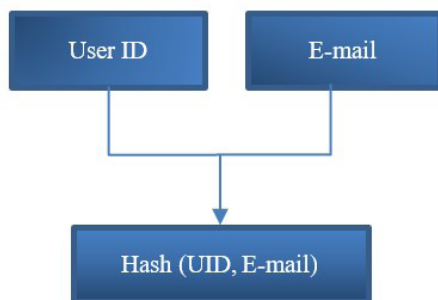


Figure 3: View and Submit Review Account (source: own elaboration)

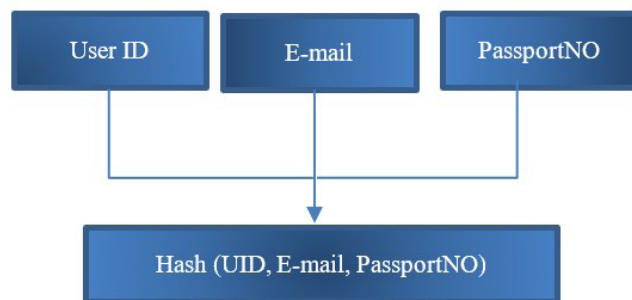
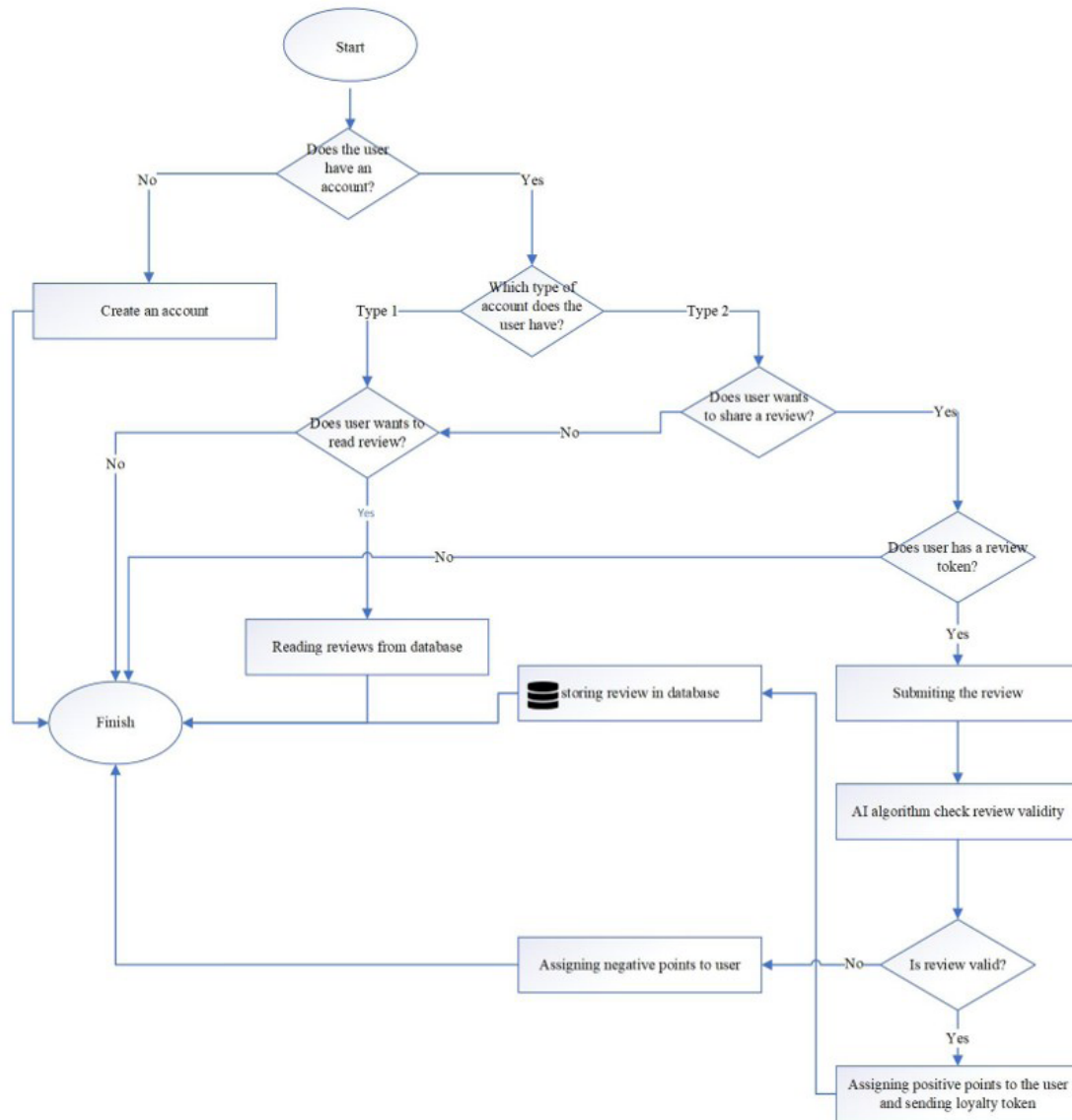


Figure 4: Flowchart of The Proposed Model (source: own elaboration)

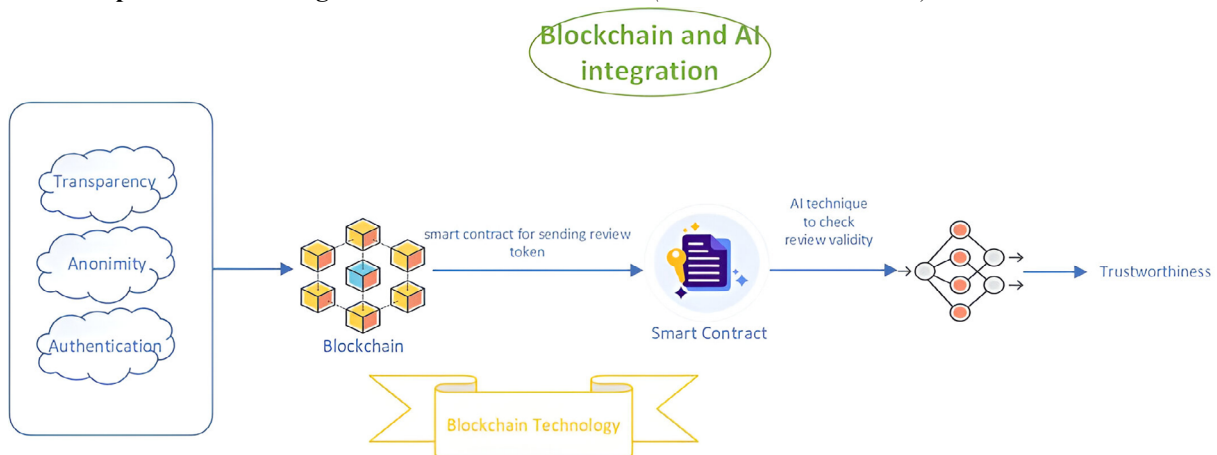


To submit a review, users must meet several conditions to ensure authenticity and prevent fraudulent entries. First, they need a unique identification code, which includes a hashed combination of their user ID, email, and passport number (Fig. 3). Additionally, the blockchain ledger must contain a record of their trip, known as a review token, verifying their travel history. The review submission process also requires specifying the traveller's destination and the associated travel agency. Upon arrival at the hotel, users receive a unique token, randomly generated and stored as a hash in the central database for authentication and confirmation. When a review is submitted, the review token is processed through a smart contract, ensuring that users cannot submit multiple reviews for the same trip. If the review is validated as genuine, it is stored in the database, and the user is rewarded with a loyalty token and a positive score if other users accept the review as valid. Conversely, if the review is identified as fake, the user receives a negative point, reinforcing the integrity of the review system.

The proposed model stores reviews in a centralized database as off-chain storage because of increased scalability over a decentralized storage. Even though reviews are store in a centralized system, there is no concern about companies influence on them why so the hash of information is store in blockchain and user can access to all reviews and cannot companies hide them. User authentication is performed during the pre-trip phase, where the hash of the user's identity is stored on the blockchain. The blockchain provides advantages such as improved transparency, elimination of paper-based communications, and disintermediation in the pre-trip phase. When the user makes a hotel reservation, a request is sent to the agencies to receive a unique token that is exclusive to the user. The hash form of the token is stored in the central system. The token is provided to the user upon their arrival at the hotel. The user can utilize services and submit reviews by scanning the QR code at the hotel. The agency plays a role in the authentication process and sends the token to the traveler. Data integrity and validation are maintained by verifying the user's documents after the authentication phase. Validated users can then share reviews during the post-trip phase using the token (Balasubramanian et al., 2022). In the initial phase of the proposed model, review submission, an AI algorithm meticulously evaluates the authenticity of the content, distinguishing between genuine and

fabricated reviews (Rajaguru, 2024). This stringent authentication process ensures the integrity of the system, providing a solid foundation for the implementation of the loyalty token reward system. Figure 5 shows conceptual model of blockchain and AI integration. These loyalty tokens serve as incentives for users to submit valid reviews and can be used for various purposes such as discounts on hotels and airlines. Implementing a loyalty program through BCT enhances competitiveness and reduces malfunctions. Blockchain networks require a governance model to accept or reject transactions. Blockchain networks can be broadly categorized into three types, each offering different levels of decentralization and control (Ozdemir et al., 2020). Public blockchains operate in a fully decentralized manner, allowing all nodes equal access rights to create new blocks and validate data. These networks are permissionless, meaning anyone can participate without restrictions. In contrast, private blockchains are centralized systems where access and node functions are strictly managed by a single authority. These permissioned networks are commonly used in business-to-business (B2B) environments where data privacy and controlled participation are essential. Sitting between these two extremes, consortium blockchains are governed by a group of organizations rather than a single entity. This model allows the consortium to determine which data is publicly accessible and which remains private, offering a balance between transparency and security. Depending on the specific use case, read operations in consortium blockchains can be either restricted or unrestricted, making them a versatile option for industries requiring shared but controlled access.

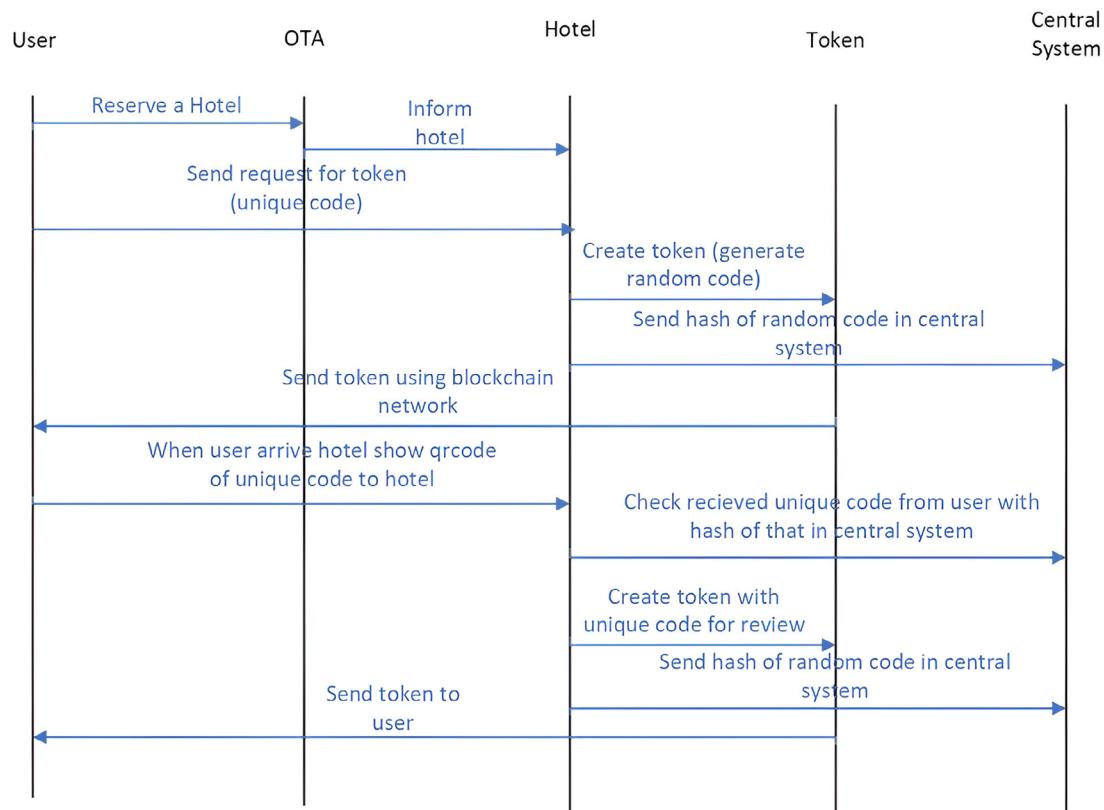
Figure 5: **Conceptual Model: Integration of Blockchain and AI** (source: own elaboration)



For the tourism industry, a consortium model is considered in this research to facilitate decision-making among different intermediaries and provide efficient services in financial, shipping, supply chain, and accommodation sectors. Due to the involvement of multiple intermediaries in the tourism industry, a private model is not suitable as it is centralized and controlled by a single organization. In contrast to the private model, the consortium model allows all nodes to have equal power, and node identification can be determined by a group of authorities. Only selected nodes can participate in the network. The public governance model, where anyone can participate as nodes, is not suitable for non-financial networks in the tourism industry.

Figure 6 illustrates the token generation process for users within the proposed model, ensuring secure and authenticated review submissions. The process begins when a traveller makes a hotel reservation through an online OTA. Once the booking is confirmed, the hotel sends a request for token assignment, initiating the authentication process. The generated token is then hashed and stored in the central system to maintain security and prevent duplication. Following this, the actual token is transmitted to the user via the blockchain network, ensuring transparency and traceability. Upon arrival at the destination, the tourist undergoes authentication by the hotel using a unique code. Once verified, a specific token for review submission and service utilization is generated and securely transferred to both the user and the central system, reinforcing the integrity of the review process.

Figure 6: Sequence Diagram of Proposed Model – Giving User Token to Submit Review (source: own elaboration)



This process ensures that users receive a unique token for their stay and allows for the authentication of reviews and services through the generated tokens. In the proposed model, BCT is leveraged to address the challenge of fake reviews in the tourism industry. By utilizing the inherent characteristics of blockchain, such as transparency and immutability, the model aims to decrease fraud in reviews and provide an efficient solution for tackling fake reviews. The immutability of the blockchain ensures that once a review is submitted and recorded on the blockchain network, it cannot be altered or tampered with. This helps to maintain the integrity of reviews and prevents the submission of fraudulent or fake reviews. Overall, the utilization of blockchain features in the proposed model enhances the reliability of reviews, mitigates fraud, and improves user satisfaction in the tourism industry.

4. DISCUSSION

4.1. Theoretical Implications

In recent years, BCT has been widely explored across various domains due to its unique characteristics, such as decentralization, transparency, integrity, immutability, and anonymity. In the context of tourism, our proposed model integrates blockchain and AI to address challenges related to review authenticity and fraudulent activities. Unlike traditional systems, the proposed approach ensures that reviews are resistant to spam and modification through a robust registration mechanism. Additionally, unique identification mechanisms mitigate common attacks, such as DDoS, by allowing only one review per person per trip. One of the key contributions of this study is the introduction of a token-based authentication system, which enhances blockchain's advantages while mitigating threats in the tourism industry. This approach fosters a sense of trust and confidentiality, as users can submit valid reviews anonymously while being authenticated through a personal token. Furthermore, AI-driven validation techniques, including machine learning and deep learning models, are integrated into the system to assess whether a review is genuine or fraudulent.

Table 2 presents a comparative analysis of our proposed model alongside existing conceptual frameworks in blockchain and AI-driven tourism review systems. While previous studies primarily focus on isolated aspects of blockchain or AI, empirical validation of these models remains scarce. Our research bridges this gap by introducing a novel loyalty token system that strengthens the integrity and reliability of online reviews. This system serves multiple purposes, starting with incentivizing user participation by rewarding genuine review submissions, thereby enriching the platform with diverse and valuable insights. Additionally, it plays a crucial role in fraud prevention by ensuring that only authenticated users—those who have verifiably experienced a service—can contribute, significantly reducing the risk of fake reviews. Furthermore, by increasing the volume of verified reviews, the system enhances AI-driven validation, allowing machine learning models to improve accuracy in detecting fraudulent patterns. This integrated approach not only fosters a more trustworthy review ecosystem but also advances the effectiveness of AI in maintaining platform credibility. Moreover, blockchain-based tourism models offer disintermediation

and decentralization, reducing reliance on intermediaries and minimizing single points of failure (Rashideh, 2020). This aligns with the growing shift towards trustless systems, where interactions occur directly between participants without third-party intervention. However, despite these advantages, blockchain is not inherently capable of verifying the content authenticity of reviews. While it can prevent duplicate or spam entries, malicious users could still submit fabricated reviews. To address this, AI models are employed to assess review credibility, though these models must be carefully designed to mitigate potential biases (Kardaras et al., 2024). Beyond technical limitations, challenges such as scalability, cost, and regulatory uncertainty pose barriers to blockchain adoption in tourism. The increasing number of nodes in a blockchain network leads to exponential cost growth (Fusco et al., 2020). Additionally, security concerns, including the 51% attack, remain critical issues, where an entity controlling the majority of network nodes could manipulate the system. These challenges highlight the need for ongoing research to refine blockchain-based tourism models and ensure their feasibility in real-world applications. The proposed model makes several key theoretical contributions that advance the role of blockchain and AI in the tourism industry. First, it extends the application of blockchain beyond its traditional use in financial transactions (Treiblmaier & Önder, 2019) and identity verification (Rashideh, 2020), by demonstrating its effectiveness in decentralized review systems, thereby enhancing transparency and trust. Additionally, this study introduces AI as a fraud detection mechanism, bridging the gap left by existing blockchain-based models that lack content verification. By incorporating AI-driven analysis, the model ensures greater authenticity in reviews, addressing a critical limitation of blockchain-only frameworks. Furthermore, it develops a hybrid trust model that integrates a dual-layer verification system, leveraging blockchain for authentication and AI for fraud detection, to offer a more comprehensive approach to online review credibility. Finally, by exploring blockchain's transformative potential in reshaping online review platforms, this research contributes to the broader discourse on digital transformation in service industries, providing valuable insights for future studies on technology adoption in smart tourism.

Table 2: Comparison analysis

	Proposed model	(Bulchand-Gidumal & Melián-González, 2024)	(Duma et al., 2023)	(Rajaguru, 2024)
Technology	Blockchain & AI	Blockchain	AI	Blockchain & AI
validity of review text	Yes	No	Yes	Yes
Unique review per trip	Yes	Yes	No	Yes
Incentive for submit review	Yes	No	No	No
Authentication	Yes	Yes	No	Yes

4.2. Managerial Implications

The adoption of blockchain and AI in tourism review systems presents significant implications for industry stakeholders, including businesses, policymakers, and consumers. Tokenization in tourism remains underutilized due to a lack of awareness and misconceptions about blockchain's role beyond cryptocurrency. Many businesses continue to rely on traditional review systems, making the transition to decentralized, tokenized frameworks a complex process.

From an operational perspective, blockchain implementation requires substantial investment in infrastructure, cybersecurity, and staff training. Small and medium-sized enterprises (SMEs), which constitute a large portion of the tourism sector, may find it difficult to allocate the necessary financial and technical resources for such a transition. Additionally, certain blockchain mechanisms, particularly proof-of-work-based consensus models, are energy-intensive, raising concerns regarding sustainability and compliance with environmental regulations. Therefore, scalable and energy-efficient blockchain solutions are essential for widespread industry adoption (Acikgoz et al., 2024; Mountije et al., 2025).

From a regulatory standpoint, the absence of well-defined legal frameworks governing blockchain-based tourism applications presents another significant challenge. Regulations such as GDPR impose strict data privacy laws, which may conflict with blockchain's immutable nature. Unlike traditional databases, where user data can be modified or erased upon request, blockchain records transactions permanently, posing potential legal risks. Additionally, in decentralized ecosystems, accountability and enforcement mechanisms remain unclear (Mountije et al., 2025). For businesses and tourism platforms, successfully implementing a blockchain-based review system requires careful strategic planning and collaboration among stakeholders. One of the key considerations is consumer education, as tourists must understand how token-based authentication enhances review transparency and reliability. Clear communication about the benefits of blockchain-driven reviews can help build trust and encourage user participation. Additionally, business incentives play a crucial role, as tourism organizations must evaluate how blockchain adoption impacts customer engagement and fraud reduction before committing to large-scale implementation.

Beyond business considerations, regulatory compliance is essential, requiring policymakers to establish clear legal frameworks that ensure blockchain integration aligns with existing tourism regulations. Without well-defined guidelines, businesses may face uncertainties that hinder adoption. Lastly, technology scalability must be prioritized by blockchain developers, who should focus on creating user-friendly and efficient solutions tailored to the tourism industry's specific needs. Rather than developing overly complex architectures, ensuring seamless usability will be critical to widespread adoption and long-term success.

Furthermore, the tourism industry has been historically slow in adopting emerging technologies, with many stakeholders hesitant to disrupt existing business models (Kivimaa et al., 2021). Unlike sectors such as finance and supply chain management, where blockchain adoption has progressed rapidly, tourism remains relatively inert in digital transformation (Erol et al., 2022; Gomes et al., 2024). Overcoming this resistance requires a collaborative effort from businesses, regulatory bodies, and technology providers to create a sustainable and scalable blockchain-based tourism ecosystem. The adoption of blockchain and AI in tourism review systems carries significant implications for various industry stakeholders, including hotels, OTAs, policymakers, and consumers. Hotels and hospitality businesses stand to gain a powerful solution to combat fake reviews, a persistent issue that can damage reputations and erode customer trust. By implementing a blockchain-based review system, hotels can ensure that only verified guests who have actually stayed at their properties can submit reviews, enhancing the credibility of online ratings. This increased transparency can lead to stronger customer trust and, ultimately, higher booking rates. For OTAs, AI-driven fraud detection mechanisms provide an effective way to minimize the risk of fake reviews, which are often used to manipulate rankings and ratings. By analyzing review content and user behavior, AI can help OTAs identify and remove fraudulent reviews more efficiently, improving the overall integrity of their platforms. Additionally, the proposed loyalty token system offers a valuable marketing tool, encouraging users to submit authentic reviews while fostering greater engagement with the platform. Regulatory bodies and policymakers also play a crucial role in ensuring the effectiveness of blockchain-based review systems. By establishing standardized guidelines for online review verification, governments and industry regulators can help prevent consumer deception and promote ethical business practices within the tourism industry. Finally, consumers and tourists benefit from a more reliable and transparent review system, allowing them to make well-informed travel decisions based on genuine user experiences. By integrating blockchain and AI technologies, this approach enhances trust in online reviews, ultimately improving the overall quality of tourism services.

CONCLUSION

BCT offers significant potential for the H&T sector by enhancing security, transparency, and traceability. However, the constraints related to technology, organization, and the environment must be addressed for successful implementation. While the proposed framework offers a conceptual solution to fraud detection in the tourism industry, we recognize the practical challenges associated with implementing blockchain and AI systems. These include regulatory uncertainties, legal compliance with privacy laws such as GDPR, and infrastructural hurdles like scalability and high implementation costs. To address these issues, future research should focus on scalable blockchain solutions, legal enforceability of smart contracts, and pilot implementations in collaboration with industry stakeholders. By acknowledging these challenges and proposing strategies to overcome them, the framework bridges the gap between theoretical innovation and practical application. According to the importance of the blockchain network and the influence of blockchain technologies in different areas, in this paper, theoretical research on the tourism industry based on BCT and AI investigated. To overcome the security challenges and minimize fraud and fake reviews in the blockchain-based tourism industry, the token-based authentication approach is investigated and proposed which generates value for customers, travel agencies, and hotels. To improve user incentive to submit a review, the proposed model suggests giving a loyalty token to the user after every successful review. With the loyalty program, participant users in reviews will increase and help other users to know about hotels and services better, and for this reason, competence between sectors will increase and motivates different part of the tourism industry to improve their service quality for a better rate in. While blockchain presents a promising solution for mitigating fraudulent reviews, several challenges must be addressed before it can be widely implemented. High initial costs remain a major barrier, as the technical and financial investment required for blockchain integration can be prohibitive, particularly for SMEs. Additionally, energy consumption is a concern, as certain blockchain models require significant computational power, raising sustainability issues. Regulatory barriers also complicate adoption, with a lack of clear legal frameworks—especially regarding data privacy laws like GDPR—creating uncertainty for businesses. Moreover, adoption resistance is prevalent, as many organizations hesitate to transition due to potential operational disruptions and uncertainty about blockchain's long-term benefits. To overcome these challenges, a multi-stakeholder approach is necessary, involving collaboration between businesses, policymakers, consumers, and technology providers. By addressing the limitations of existing conceptual models and introducing novel token-based incentives, this study lays the groundwork for future empirical research and real-world implementation. Moving forward, practical deployment of the proposed model is essential to assess its usability, efficiency, and impact on fraud prevention in tourism reviews. Additionally, further exploration of machine learning techniques could enhance the model's ability to identify legitimate activity and detect deviations, refining fraud detection mechanisms. These future research directions will help bridge the gap between theoretical advancements and real-world applications, ensuring blockchain and AI-driven solutions are both effective and scalable in the tourism industry.

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