



Applications of Blockchain in Tourism Industry

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ABSTRACT: Tourism is a rapidly growing industry, even after seeing some drop back during the last few years due to COVID-19. The latest trend shows that it is gaining its position again to become a booming industry of the century, but as the industry gains pace, it faces several challenges that require modern solutions. With the coming up of new technologies, blockchain technology has gained rapid attention not only since it maintains a secure and decentralized record of transactions across the world but also due to its safe access to identifying data while enhancing accessibility for individuals in need in sectors like banking, travel, healthcare, and education. The current tourism industry fails the tourist by not providing a decentralized payment system for advance booking of hotels and vehicles, and the foreign tax required for such transactions increases the further cost for a tourist. With no real-time luggage tracking available, tourists are always on the lookout for their luggage. Blockchain technology improves the accuracy and reliability of baggage mishandling coding by providing a decentralized, tamper-proof record of all baggage handling events. If blockchain technology is incorporated into the tourism industry, many issues in the industry get solved, and it can grow more rapidly, helping economies all over the world by providing smart solutions to difficult problems and thus improving the experience of tourists by providing safety, a decentralized payment system, preventing fraud, and enhancing security by securing the data from unauthorized access. This research helps in further identifying the problem in the tourism industry and solving it by implementing blockchain technology, thus improving economies relying on the tourism industry.

1. INTRODUCTION

Blockchain serves as a collective, unchanging ledger that simplifies the task of documenting transactions and monitoring assets within a corporate network. These assets could encompass various items such as real estate, money, property, or intellectual property, including branding. Virtually any valuable item can be monitored and exchanged through a blockchain network, leading to risk mitigation and cost reduction for all parties involved.

Why blockchain holds significance: Businesses thrive on information. The speed and precision with which

information is acquired greatly influence operations. Blockchain stands out as the ideal solution for delivering this information, as it offers immediate access to shared and entirely transparent data, securely stored on an unalterable ledger, accessible solely to authorized network participants (Yli-Huomo et al., 2016). A blockchain network can monitor a wide array of elements, including orders, payments, accounts, production, and more. Since network members have a unified perspective on the facts, you gain a comprehensive understanding of the entire transaction process, leading to enhanced confidence,

increased efficiencies, and fresh opportunities (Crosby et al., 2016).

Transparency and Traceability: Blockchain technology exhibits three key attributes. First, it offers transparency and traceability (Shuaib et al., 2020). The information stored within a blockchain is immutable and shared among users. Every transaction is permanently recorded on the blockchain, enabling a comprehensive audit trail for all stored data. The system's durability and consistency are maintained through the replication of records across independent computers (nodes) on the network. The transparency and traceability inherent in blockchain technology enhance user confidence (Karagoz & Demirel, 2020).

Additionally, blockchain technology ensures data security. Data entries in the blockchain are safeguarded through cryptographic encryption, authentication, and certification. Furthermore, the data is immutable due to the blocking mechanism, which minimizes errors and reduces the risk of security breaches. The necessity for validation by a network of nodes substantially mitigates the potential for malicious activities, hijacking, or hacking. The mutual oversight among nodes enables this without the need for a central authority. It is also possible to anonymize users for added privacy (Bodkhe et al., 2019).

Another vital feature of blockchain is decentralization. It allows transactions to occur without dependence on a central authority, which typically governs and controls systems. Operations within the blockchain are verified not by a single entity but by a defined set of constraints outlined within the blockchain's structure. When combined with smart contracts, blockchain technology facilitates direct value exchanges between parties, eliminating the need for intermediaries. This, in turn, results in increased productivity and efficiency, along with reduced transaction costs like inspection and verification fees. These distinctive characteristics position blockchain technology as a revolutionary innovation capable of prompting companies to reimagine their operational methodologies and business models. In this context, blockchain represents a radical innovation rather than an incremental one, introducing novel functionalities that surpass existing technologies and practices (Ivanov & Webster, 2020).

Efficiency and Competitive Advantage: Blockchain simplified transaction recording as a single event, validated by the network of miners or participants. This efficiency proves highly beneficial to businesses, eliminating the need to record and store transactions in multiple databases. Consequently, it saves time, reduces human errors, and minimizes the risk of fraud (Bodkhe et al., 2020).

Organizational Transformation and Innovation: While blockchain technology can undoubtedly offer competitive

advantages to companies, it is not without its challenges. Its implementation necessitates fundamental organizational changes, acquisition of new skills, adoption of new tools, and the adoption of innovative working methodologies that can disrupt established practices. The impact of blockchain's invention is often likened to that of the internet, given its potential to catalyze radical transformations across various industries. Consequently, blockchain technology will compel companies to foster innovation and reconsider their business models, with the risk of obsolescence looking for those that fail to adapt (Rashideh, 2020).

When discussing blockchain technology, the primary focus often centers around the well-known cryptocurrency, Bitcoin, which serves as one of the most prominent examples of blockchain technology. The dominance of Bitcoin in this context is reinforced by Google Trends analysis, which shows search queries for Bitcoin surpassing those for blockchain by a factor of twenty. Furthermore, research indicates that current studies on blockchain predominantly concentrate on the Bitcoin cryptocurrency system rather than blockchain technology in a broader sense. However, it is important to recognize that blockchain's understanding opens doors to a multitude of potential applications (Erol et al., 2022).

Blockchain represents a decentralized technology initially developed for the Bitcoin cryptocurrency, and it has gained substantial popularity due to its key attributes, including security, privacy, and data integrity, all achieved without reliance on a central authority to oversee transactions. Additionally, blockchain enables the creation of decentralized digital currencies like Bitcoin and self-executing smart contracts. It operates as a digital ledger, composed of "blocks" containing transaction records within a network. For cryptocurrencies, these transactions often involve currency exchange for goods or services. When a specific number of transactions accumulate, a block is added to the ledger, forming a "chain of blocks," hence the term blockchain.

Summarizing the technological aspects of blockchain, highlight four critical features: decentralization, which establishes trust through mathematical methods rather than central authority; traceability, ensuring all transactions are traceable through block information; immutability, preventing alteration once a transaction is recorded; and the intrinsic connection between blockchain and cryptocurrency properties. These features offer several advantages in the application of blockchain, such as reliability, trustworthiness, security, and efficiency.

While Bitcoin remains a topic of debate, functioning on a global scale with anonymous transactions and no government control, the underlying blockchain technology

remains a vital innovation with applications extending beyond finance. Potential uses span various industries and sectors, particularly in fields dependent on licensing and document authentication, such as health records, music licenses, notarized documents, the food supply chain, insurance, land registry, and more. Nevertheless, the extent of blockchain's impact remains uncertain.

In the context of the tourism industry, companies, institutions, and governments encounter both opportunities and challenges related to blockchain. This includes transaction processing, maintenance of customer databases, and other areas of application. The tourism sector comprises individual services interconnected through autonomous service providers, potentially disrupting the value chains of various companies within the larger system. Consequently, blockchain needs to address this dynamic. The tourism industry includes dominant players alongside many SMEs and individual companies. Additionally, intermediaries have played a significant role in tourism, such as Online Travel Agencies (OTAs). With the rise of blockchain, this trend may further promote the decentralization of services and reduce the influence of current intermediaries. The introduction of blockchain is likely to alter several processes and transactions within tourism companies and impact cooperation between these entities.

Research at the intersection of blockchain and tourism is still in its early stages. The pioneers in studying applications in Moldova, identifying potential use cases such as cryptocurrency, client testimonials, blockchain-based heritage conservation donations, supply chain management, and business model disintermediation. Blockchain technology has already established itself in the hospitality sector, with a primary focus on enhancing operational effectiveness, efficiency, and overall profitability. Moreover, there are opportunities for the adoption of blockchain technology at the destination level. Examples of blockchain technology implementation and smart contracts, indicating that the tourism industry lags other sectors in adoption but shows potential for a disruptive impact.

Insights into how small island economies, can benefit from the adoption of blockchain technologies, promoting collaboration among stakeholders and more regulated data management concerning privacy issues. Furthermore, explore how technologies like blockchain can be utilized in digital marketing through virtual reality, highlighting the positive impact on the industry.

A key factor in the advancement of blockchain technology is the use of smart contracts. Using a smart contract system for financial payment procedures can greatly reduce the number of intermediary organizations and transfer fees while producing processes that are dependable,

transparent, and accountable for tourism businesses. Potential use cases in the tourism industry are demonstrated by a framework such as BloHost (Blockchain Enabled Smart Tourism and Hospitality Management), especially in heterogeneous payment gateways. With the help of this framework's decentralized blockchain mechanism, individual travelers will be able to communicate with multiple stakeholders while making payments with just one wallet identifier.

The theoretical discourse on blockchain and tourism requires more comprehensive analysis to identify its potential advantages. The tourism industry faces the challenge of adapting its business models to evolving technology, a subject often discussed in conjunction with artificial intelligence (AI) and virtual reality (VR). Blockchain may serve as an additional catalyst for advancing this discourse and discovering practical solutions to issues like efficient data management.

2. LITERATURE REVIEW

The concept of blockchain technology revolutionizes various industries by eliminating central intermediaries and leveraging decentralized systems for functions. Acting like a decentralized booking system, it operates transparently through the collective management of participants' computers, fostering trust as it does not exclusively belong to any entity. Described as a distributed, decentralized public ledger, blockchain establishes an attack-resistant, digital data storage system with linked block structures and a trusted consensus mechanism.

This technology allows for the replication of extensive contract registers worldwide through miners, avoiding the need for intermediaries. Smart contracts and digital IDs emerge as opportunities for various business activities and peer-to-peer exchanges. In the tourism sector, identify six domains where blockchain can be applied, such as reservation and ticketing, identity management, loyalty programs, digital payment, credential management, and inventory management. Initiatives like Spain's Alastria project and Dubai's Tourism 2.0 showcase the integration of blockchain for streamlined tourist operations (Dubai Department of Tourism and Commerce Marketing, 2018). True Tickets employs blockchain to secure tickets, enhancing transparency and security in the ticketing business (True Tickets). Notably, many of these initiatives are driven by public authorities, showcasing a common practice of governments promoting technology adoption through research projects and subsidies. For instance, the UK's Digital Catapult center, funded by the government, supports early adoption of advanced digital technologies for emulation by the country's industry (Digital Catapult center).

There is a growing interest in Blockchain technology, evident in the cryptocurrency market's market capitalization reaching \$1.67 trillion by January 2022. Projections suggest a potential \$1.76 trillion impact on global economic growth by 2030. The technology offers cost reduction, transaction security, and transparent loyalty systems, particularly valuable for the dynamic tourism sector that historically adopts new technologies rapidly.

Since the introduction of Bitcoin, Blockchain technology has evolved into the "Crypto Economy", employing cryptographic hashes for asset transfers and confirmation within a decentralized network. This aims to replace traditional trust in financial institutions with algorithm-based trust characteristics, fostering security, transparency, and privacy management.

Practical applications, like Smart Contracts, automatically execute predefined instructions in a computerized protocol. For instance, a Smart Contract could cancel a tourist accommodation booking if the customer fails to confirm credit card details. Blockchain's utilities can significantly impact each part of the tourism service value chain, aligning with the sector's tendency to embrace technological advancements.

Despite limited academic literature, key works emphasize Blockchain's potential to enhance tourism service efficiency, sustainability, and customer experience. As tourism activities impact public administration and sustainability, Blockchain emerges as a tool for regulating and managing tourist destinations.

Historically, technological breakthroughs drive new business models in tourism, addressing modernization and distribution challenges. With a growing emphasis on sustainability, technology's role becomes crucial, impacting tourism demand estimation, stakeholders, and environmental balance.

The exponential growth in academic publications necessitates bibliometric analysis for effective literature synthesis. This paper employs open-source tools like Bibliometrix and VOS Viewer to map trends and research areas in Blockchain technology's application to tourism. The goal is to identify activities and uses that could influence the sector's sustainability.

3. PROPOSED METHODOLOGY

The tourism industry plays a significant role in the global economy and has several important impacts on various aspects of society. Blockchain was initially developed to provide a way to secure and store digital data so that the recorded information cannot change without the agreement of both parties involved. We have developed a methodology that goes by the acronym BITI (Blockchain

in Tourism Industry) which is the way we will develop a system that solves problems faced by the tourism industry. This methodology builds trust, promotes sustainability, provides Decentralization, sets tracing to luggage and cuts cost significantly for tourists.

BITI contains the following features:

Data Security

The data which is collected during booking flights, hotels, rentals can get tampered with if not done through a payment gateway this is where blockchain technology comes to the picture by using decentralization technique. In decentralization the information is shared involving very few people and no third-party company is involved this way the tourist data remains secure. The data once entered in the blockchain becomes immutable and it cannot be reverse engineered because the blockchain uses a hash algorithm, The Secure Hash Algorithm 256, or SHA-256, is the most widely used hash function.

Payments

Blockchain makes this payment procedure easier. It is no longer necessary to use several middlemen for transaction processing and authentication when using a decentralized network. Real-time payment authentication is performed using blockchain data. For traceability, this new transaction is appended to a block, which is subsequently appended to the chain. Processing that once took days now only takes minutes. These advantages improve the speed, transparency, and security of cross-border payments for both peer-to-peer (P2P) and business-to-business (B2B) transactions. Smart contracts are self-executing agreements with predetermined terms and conditions that can be implemented more easily with the use of blockchain technology. Several procedures in the travel and tourism sector, including reservations for hotels and flights, can be made more efficient by automation.

Luggage Tracking

Luggage tracking using blockchain is a promising new technology that can help in improving the effectiveness and precision of luggage tracking. Combining blockchain with RFID and Internet of Things (IoT) devices for real-time tracking. RFID readers and IoT sensors placed throughout the luggage handling process can continuously update the blockchain with luggage's location and status. Travelers can get entry to the blockchain network via a person-friendly interface, consisting of a cell app. They can test the popularity and region in their luggage in real-time and receive notifications whilst it reaches precise milestones (e.g., while it is loaded onto the aircraft or arrives at the vacation spot airport). In cases of misplaced or mishandled baggage, the blockchain can facilitate short

and transparent decisions. All parties involved can see the history of the bags's movements and pinpoint where the issue took place. It is well-suited for luggage tracking because it can always provide a tamper-proof record of the location of luggage.

Sustainability

Blockchain technology can help reduce waste by optimizing supply chain processes and reducing systemic inefficiencies. This not only saves costs but also reduces the long-term environmental impact of the chain of supply. Blockchain-based technology can be used to optimize transportation routes and reduce inefficiencies in the supply chain to further help reduce carbon emissions associated with transportation. Blockchain technology can help reduce waste by improving inventory, visibility, and management, consequently reducing overproduction. It enables companies to track energy consumption at each stage, thereby identifying areas where energy is being wasted or used inefficiently. Blockchain technology has the potential to optimize energy usage in supply chains by identifying areas where energy is being wasted so more efficient processes can be implemented.

Smart Contracts

The use of smart contracts in the travel and tourism sector could have a significant impact on how people travel in the upcoming ten years. The suggested remedies might make it easier to reach consumers throughout the world and let new players into the domestic travel industry. The use of blockchain implies a bright future for the travel and tourism sector as well as for many other areas of the contemporary economy. Participants in the tourism industry may remain anonymous thanks to the use of blockchain-based smart contracts. There is no desire for anonymity or prolonged use of pseudonyms. Appropriate data management is required in the context of shared solutions, where data is dispersed among all network users. Because permissioned blockchains are typically created by consortia or a specific participant group that sets its own rules for who can participate on the network and how, they offer the possibility to expand the technology of distributed data by adding features like participant management and privacy protection.

4. TECHNIQUE INVOLVED IN PROPOSED METHODOLOGY

The purpose of this proposed methodology is to develop a system which can create an environment based on blockchain technology and to inculcate the following aspects of blockchain in the tourism industry.

Data Security: Blockchain is an allotted ledger era (DLT) that may be used to store and steady data. It is based totally on the precept of cryptography, which uses mathematical algorithms to guard records from unauthorized get right of entry to. One of the key techniques utilized in blockchain to steady statistics is hashing. Hashing is a system of converting records into a unique string of characters, known as a hash. This hash is then saved on the blockchain. If the facts are ever modified, the hash will even alternate. This makes it very tough to tamper with statistics on the blockchain without detection. Another key method utilized in blockchain to stable records is encryption. Encryption is the technique of changing statistics right into a format that is unreadable to all people who do not have the decryption key. This key's stored on the blockchain and is used to decrypt the information while wished as given in Figures 1 and 2.



Figure 1: Encryption using Private Key.

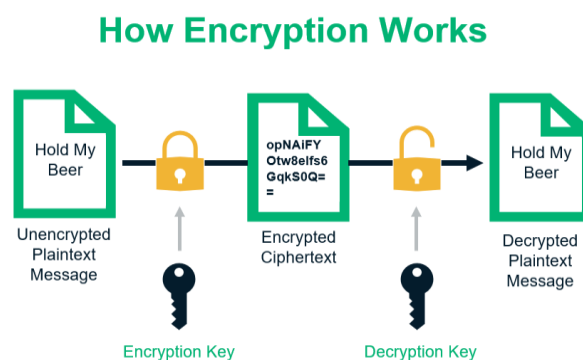


Figure 2: Encryption using Plaintext.

Blockchain also makes use of some of different strategies to secure records, such as:

Digital Signatures: Digital signatures are used to ensure that a transaction has not been tampered with and to verify the identity of the sender.

Consensus Mechanisms: Consensus mechanisms are used to make sure that each one node at the blockchain agrees on the kingdom of the ledger. This facilitates saving you from fraud and tampering. Blockchain is a powerful tool that may be used to secure information in a whole lot of applications. It is specifically nicely-suited for applications

wherein records wish to be shared and depended on by means of multiple parties.

Payments: The blockchain's payment mechanism is simple to use. We have provided a clear explanation, using an example, of how a cross-border payment will take place over a Stellar Blockchain Payment System. Payments the usage of blockchain involve numerous key techniques and procedures to make stable and efficient transactions. Blockchain generation is normally associated with cryptocurrencies like Bitcoin, but it could additionally be applied to numerous price and economic systems.

Here are the important thing strategies involved in making bills the use of blockchain:

Distributed Ledger Technology: Blockchain is an allotted ledger, which means that a couple of copies of the identical ledger are maintained throughout a network of computer systems. Each player in the community has a duplicate of the ledger, and they all work together to validate and document transactions. This decentralized nature complements transparency and security.

Cryptography: Cryptography is essential to the blockchain era. Public and private keys are used to secure transactions. When a sender signs a transaction with their private key, the recipient can verify that the sender's public key was used to certify the signature. This guarantees consistent and tamper-evident transactions.

Smart Contracts: Smart contracts are automatically carrying out agreements that have the terms of the contract written into code right away. They operate automatically when certain conditions are satisfied. Smart contracts can be used to automate diverse payment tactics, which include releasing funds upon shipping of products or offerings.

Consensus Mechanisms: To confirm and reach a consensus regarding the kingdom of the ledger, blockchain networks employ consensus mechanisms. The most commonplace consensus mechanism in cryptocurrency networks is Evidence of Stake (PoS) and Proof of Work (PoW), but there are various others. These mechanisms ensure that transactions are demonstrated by means of network contributors before they are brought to the blockchain.

Wallets: Blockchain payments require users to have a digital pocket, that is a software or hardware tool that stores their private keys and enables them to ship and get hold of cryptocurrencies. Wallets come in diverse bureaucracy, which include web wallets, cellular wallets, computer wallets, and hardware wallets.

Transactions: To make a price on a blockchain, a user initiates a transaction by means of specifying the recipient's address and the amount they want to send. The

transaction is broadcast to the network, proven by means of nodes, and, as soon as shown, introduced to the blockchain.

Block Confirmation: After validation, the transaction is grouped with others right into a block. The block is then brought to the blockchain, and this system is called confirmation. The quantity of confirmations a transaction requires relies upon on the blockchain's consensus mechanism and its safety requirements. More confirmations usually suggest a greater secure transaction.

Public and Private Blockchains: Depending on the use case, payments can be made on public blockchains (open and decentralized) or private blockchains (restrained get right of entry to and manage). Public blockchains are usually used for cryptocurrencies, at the same time as private blockchains are often used for enterprise packages.

Cross-Chain Transactions: In cases where distinct blockchain networks are involved, interoperability solutions are used to facilitate payments throughout more than one blockchains. These answers permit assets to move among distinctive blockchains securely.

Payment Gateways: Payment gateways and service companies provide interfaces and APIs that make it easier for agencies to simply accept cryptocurrency payments. They convert cryptocurrencies into traditional fiat currencies and settle bills to merchants.

Regulatory Compliance: Payment solutions the use of the blockchain era should adhere to applicable prison and regulatory frameworks. Many international locations have precise rules regarding cryptocurrencies and blockchain-based financial offerings.

Luggage Tracking: Blockchain records all bags-associated transactions and affords a stable and obvious platform for tracking. The preference of blockchain (public or personal) may also vary based totally on the unique use case and requirements. Each piece of baggage is related to a completely unique identifier, which could be an RFID tag, QR code, or a barcode. This identifier is linked to the traveler's virtual wallet within the blockchain. The wallet includes statistics about the traveler, flight information, destination, and a document of the bags. To ensure real-time tracking, blockchain networks are included with sensors and devices, consisting of RFID tags and IoT sensors, which might be strategically positioned at some stage in the bags managing system. These gadgets constantly ship updates to the blockchain with data about the baggage's region and standing. For instance, while luggage is loaded onto an aircraft, the associated RFID tag communicates this statistics to the blockchain, and a clever agreement triggers an update as given in Figure 3.

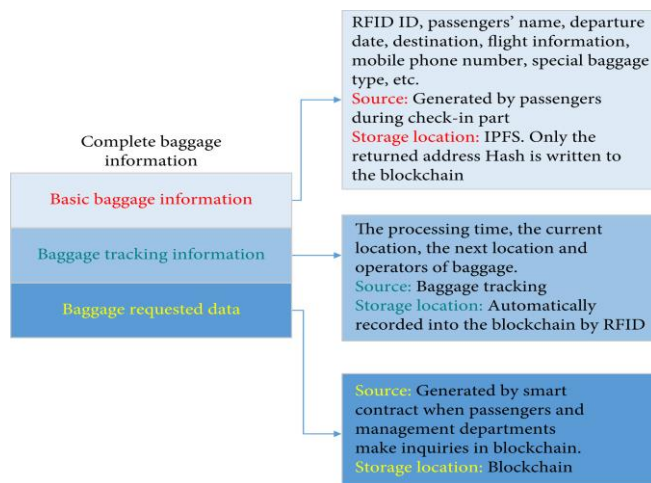


Figure 3: Baggage Information.

5. RESULT AND DISCUSSION

The tourism sector could undergo multiple revolutions thanks to blockchain technology. **Transparent and Secure Transactions:** Blockchain can enhance payment security and reduce fraud in the travel industry. Travelers can make payments in cryptocurrencies, which are inherently secure due to blockchain's encryption and decentralization.

Smart Contracts: Smart contracts can automate various processes in tourism, such as booking accommodations, flights, or tours. These self-executing contracts can release funds or confirm reservations automatically when predefined conditions are met.

Identity Verification: Blockchain can provide a secure and decentralized way to manage traveler identities. This can streamline check-ins at hotels, airports, and other travel-related services, enhancing the overall experience. **Supply Chain Management:** For the hospitality sector, blockchain can help manage the supply chain, ensuring the authenticity of products and services. For example, it can be used to verify the origin and quality of food in restaurants.

Loyalty Programs: Blockchain can make loyalty programs more transparent and versatile. Tokens or points earned by travelers could be stored on a blockchain, making it easier for users to track and redeem rewards across different providers. **Data Security and Privacy:** The tourism industry collects a lot of personal data. Blockchain can enhance data security by giving travelers more control over their information. They can share specific data with service providers without revealing their entire identity. **Reducing Intermediaries:** Blockchain can eliminate the need for numerous intermediaries in the travel booking process. This can lower costs for both travelers and service providers.

Tourism Reviews: Online reviews can be manipulated, and trust is a big issue in the tourism industry. Blockchain

can enable more reliable and transparent review systems, making it harder to fake or delete reviews.

Crisis Management: In times of crisis, such as natural disasters or pandemics, blockchain can help manage and disseminate information in a decentralized and secure manner, ensuring the safety of travelers.

Cultural Preservation: Blockchain can be used to track and protect cultural heritage, ensuring that historical sites and artifacts are not subject to theft or vandalism. The application of blockchain technology in the tourism industry is poised to revolutionize the way travel services are delivered and experienced. By establishing a transparent and secure booking system, blockchain can eliminate double bookings and reduce fraud, providing travelers with peace of mind.

Smart contracts automate processes, making interactions between service providers and customers more efficient and trustworthy. Blockchain also enhances security by storing and verifying traveler identities securely, streamlining check-in procedures. Furthermore, it can improve the transparency of the supply chain, making it possible to track the journey of products and services in real time. While the potential benefits are substantial, the adoption of blockchain in the tourism industry faces challenges, such as scalability, regulatory issues, and the need for industry wise cooperation. Nonetheless, it holds promise for improving the efficiency, security, and trustworthiness of various tourism-related processes as given in Figures 4 and 5.

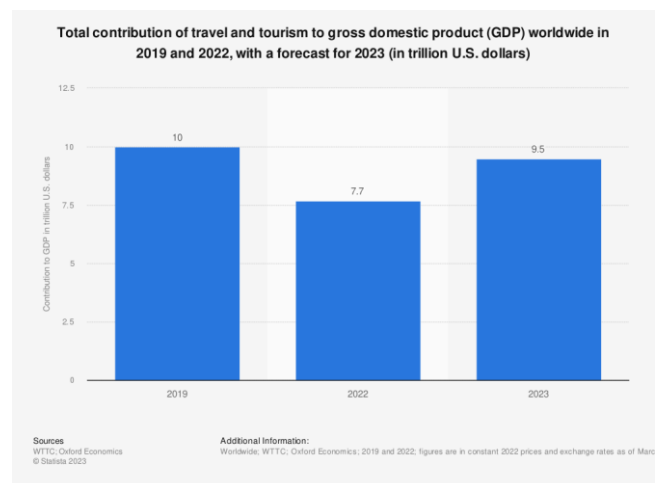


Figure 4: Total Contribution of GDP.

The findings and analysis of blockchain technology's use in the travel and tourism sector are complimentary. While the discussion section examines the broader potential of blockchain technology to transform the tourism sector, the results section offers specific examples of how the technology is being used to improve the industry.

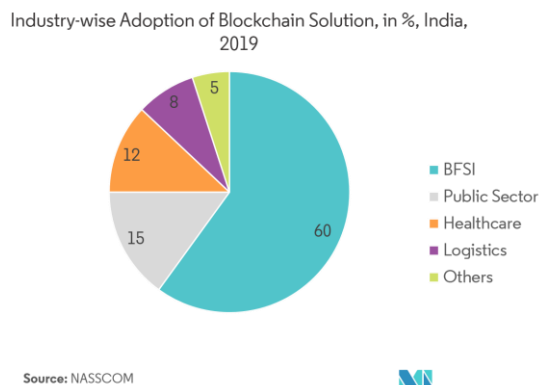


Figure 5: Blockchain Industry Adoption.

The discussion and results sections taken together offer a thorough assessment of blockchain's status in the travel and tourism sector as well as its prospects for expansion and advancement in the future.

6. CONCLUSION

In conclusion, blockchain technology offers a transformative solution for businesses, characterized by transparency, security, and decentralization. Its potential applications extend far beyond cryptocurrency, holding the promise of reshaping industries like tourism. While still in its early stages of exploration, blockchain's ability to streamline transactions, reduce intermediaries, and enhance data management makes it a significant force for innovation and efficiency in the tourism sector. As with any groundbreaking technology, it presents both opportunities and challenges, urging stakeholders to adapt their business models and embrace change to stay relevant in this ever-evolving landscape.

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