ENHANCING TOURISTS' SATISFACTION THROUGH BLOCKCHAIN TECHNOLOGY

* Dr. Bireswar Pradhan[1], Dr. Mou Roy[2] and Dr. Shilpi Bhatia[3]

[1]Academic Counsellor, IGNOU, [2]Assistant Professor, SOA Deemed to be University, Bhubaneswar,

[3]Lecturer, AIHM Chandigarh

*bpradhan1232013@gmail.com

ABSTRACT

Background: *Blockchain technology, a decentralized ledger system, offers a secure and transparent means to record transactions, holding promise for enhancing tourists' contentment within the travel industry.* **Objective:** *The aim of the study was to assess how blockchain technology impacts tourists' trust, willingness to pay, and environmental considerations.* **Methodology:** *Employing a qualitative research approach combined with thematic analysis, the study was conducted. The research was conducted in the Kolkata region of West Bengal. Sample size was 18 participants who were tourists utilizing travel agency services for travel purposes. Data was collected by semi-structured interview. Thematic was utilized to analyze the interview data.* **Results:** *The research unveiled that respondent possessed a solid comprehension of blockchain technology and recognized its potential effects on the travel sector. Their preference leaned towards travel-related products and services utilizing blockchain, driven by the belief in heightened security, efficiency, and cost-effectiveness. Furthermore, respondents expressed a willingness to invest more in travel offerings incorporating blockchain technology, assuming it would deliver superior security, transparency, efficiency, sustainability, and innovation.* **Conclusion:** *The study's outcomes affirm that blockchain technology holds the potential to significantly enhance tourists' satisfaction within the travel industry. Nonetheless, further investigation is required to explore the precise mechanisms by which blockchain can elevate tourists' experiences.*

Key Words: *Distributed Ledger, Technology, Environmental Impact, Thematic Analysis, Efficient*

INTRODUCTION

Blockchain, often referred to as a decentralized and distributed digital ledger technology, is devised to meticulously record transactions across multiple computers in a secure and transparent fashion (Nakamoto, 2008). Initially conceived as the foundational technology for the cryptocurrency Bitcoin, blockchain's utility has since transcended the realm of digital currencies. At its fundamental core, blockchain comprises a series of blocks, each housing a roster of transactions. These transactions are aggregated into blocks and linked together in a sequential order, forming a chain. Some pivotal attributes and principles of blockchain include: Decentralization- Unlike conventional centralized systems, wherein a singular

entity wields control, blockchain functions in a decentralized manner, upheld and authenticated by a network of participants or nodes (Narayanan et al., 2016). This decentralization mitigates the risk of a single point of failure and bolsters security. Transparency: Transactions inscribed on a blockchain are visible to all network participants, fostering transparency that deters fraudulent activities and empowers participants to scrutinize data integrity (Mougayar, 2016).

Security- Each block comprises a cryptographic hash of the preceding block, creating a robust linkage between blocks. Consequently, altering a solitary block becomes exceptionally challenging, as it necessitates the modification of the entire

chain, a computationally unviable task (Nakamoto, 2008). Consensus Mechanisms- Blockchain networks employ consensus mechanisms to authenticate and agree on the blockchain's state. Common mechanisms encompass Proof of Work (PoW) and Proof of Stake (PoS) (Mougayar, 2016). These mechanisms ensure unanimity among all network nodes regarding transaction validity prior to their inclusion in the blockchain. Immutability- Once a transaction is enshrined within a block, and the block is appended to the chain, the task of modifying or erasing the transaction becomes exceedingly arduous (Narayanan et al., 2016). This immutability significantly contributes to blockchain's security. Smart Contracts- Blockchain platforms like Ethereum introduced the concept of smart contracts, self-executing agreements with contract terms expressed in code. Smart contracts autonomously execute and enforce agreed-upon conditions without necessitating intermediaries. Applications- Beyond cryptocurrencies, blockchain technology has discovered utility across a myriad of industries, including supply chain management, healthcare, finance, and real estate. It offers a secure means to monitor and administer assets, optimize processes, and uphold transparency and accountability (Mougayar, 2016).

It is important to underscore that while blockchain technology presents numerous advantages, it does confront certain limitations, including scalability challenges, concerns over energy consumption, especially in PoW systems, and the potential for regulatory hurdles in certain sectors (Swan, 2015). Nonetheless, its potential to reshape transaction and data management in a wide array of industries is undeniable. Blockchain, with its transformative potential, is still in its nascent stages but is swiftly gaining acceptance and being embraced by diverse enterprises and organizations (Mougayar, 2016).

In 1991, blockchain technology was initially proposed by Stuart Haber and W. Scott Storrentta, while its connection to Bitcoin was introduced by Satoshi Nakamoto in 2008 (Cong & He, 2019). Nakamoto, an enigmatic entity, presented a paper titled "Peer-to-Peer" in 2008, which discussed the application of digital currency, specifically Bitcoin, and the use of decentralized digital databases as a distribution framework known as blockchain (Lemieux, 2013). Consequently, blockchain serves as the underlying infrastructure for both Bitcoin and other digital currencies (Gupta, 2017). Bitcoin gained prominence during a global economic crisis, and businesses turned to it as an alternative to traditional banking systems and government entities, such

as central banks and treasuries, making it a viable option (Nakamoto, 2008; Yandle, 2010).

Nakamoto's concept introduced a distributed database within the blockchain, maintaining a sequence of interconnected blocks. In simple terms, the blockchain functions as a collectively shared distributed ledger, ensuring secure transactions through a robust and easily accessible network with a substantial user base.

The primary advantage of blockchain technology lies in its decentralized nature, eliminating the need for involvement from organizations, third parties, or central administrators. This results in a system that operates without intermediaries, granting all participants and users within the blockchain the power to make decisions. Unlike centralized databases, which are susceptible to hacking, corruption, or accidental damage (Tian, 2016), securing a database can be both time-consuming and costly. Decentralization builds trust by removing the need to assess the credibility of intermediaries or other network participants (Nofer et al., 2017). Additionally, transactions can be autonomously verified and processed within this setup.

Other notable features of blockchain technology include timestamping, duplication, the use of digital signatures (Nascimento et al., 2018), the implementation of security measures (Willie, 2019), the elimination of intermediaries, streamlined transactions, speed, and reduced transaction costs (Hospitalitynet, 2015). Moreover, it embodies trust, flexibility, reconciliation, improved operational efficiency (Subbiah et al., 2018), and traceability (Tapscott & Tapscott, 2016).

As Christensen noted in 2013, blockchain is a transformative technology that offers unique value propositions to the market. Disruptive technologies may not seem immediately significant to customers, but they have the potential to address their needs in the future. This anticipation is based on the connection between technological advancements and shifts in customer preferences, as emphasized by Adner in 2002.

Although disruptive technologies may initially seem less important than existing products, they can introduce novel benefits to customers, such as cost-effectiveness, enhanced practicality, compactness, and expansiveness, as explored by Bower and Christensen in 1996.

Despite being a relatively new field, blockchain has generated a substantial body of literature that provides valuable insights for exploration and analysis across a wide range of industries

(Hospitalitynet, 2015). Notable examples include supply chain management (Helo & Hao, 2019), property registration (Nascimento et al., 2018), the food industry (Bumblauskas et al., 2020), education (Sharma et al., 2019; Tapscott & Kaplan, 2019), financial exchanges (Ducas & Wilner, 2017), the banking sector (Guo & Liang, 2016), smart contracts (Cong & He, 2019), accounting (McCallig et al., 2019), electricity and energy distribution networks (Diestelmeier, 2019; Teufel et al., 2019), healthcare (Holbl et al., 2018), tourism and business models (Aghaei, 2020), data storage (Kumar & Tripathi, 2020; Zhu et al., 2020), the Internet of Things (Liu, 2018), fundraising (Cai, 2018; Zhao & Coffie, 2018), digital identity (Rivera et al., 2017), transportation (Guhathakurta, 2018), military applications (Chedrawi & Howayeck, 2018), the accommodation market (Wright, 2018), and the oil and gas industry (Lu et al., 2019).

Blockchain and Business

Exploring the realm of technological advancements unveils a fascinating nexus between business models and industry-specific technologies. Research highlights the dire repercussions of clinging to outdated beliefs and the misalignment between business models and technology (Tripsas & Gavetti, 2000). Conversely, pinning all hopes on technological innovations does not guarantee a company's success (Zott et al., 2011) or a competitive edge (Johnson et al., 2008). Instead, the interplay between evolving technologies and the creation of economic value (Chesbrough & Rosenbloom, 2002), as well as corporate performance, holds paramount importance (Johnson et al., 2008), and the effective extraction of value from innovations is indispensable for business prosperity (Teece, 2010).

Demonstrating the profound potential of information technology, the impact of blockchain technology on reshaping business models stands out (Bower & Christensen, 1995; Brynjolfsson & McAfee, 2014). The influence of blockchain may transcend mere process modifications and the introduction of new products and services. Many experts anticipate its effects permeating all business models (Swan, 2015; Tapscott & Tapscott, 2016). Research by Holotiuk et al. (2017) affirms that the changes resulting from blockchain implementation materialize in novel services, innovative revenue structures, and, ultimately, fresh business models. Consequently, embracing and integrating blockchain technology presents researchers with a valuable opportunity to understand the synergy between existing and emerging business models, as well as the potential for new models

(Holotiuk et al., 2017).

Christensen (2013) posited that blockchain technology's disruptive potential arises from its current offering of seemingly unconventional or less conventional features, which ultimately lead to industry-wide transformations over time. The findings of a study by Hospitalitynet (2015) indicated that blockchain technology significantly affects all dimensions of business models, with its most remarkable aspect being its multi-dimensional influence. The capabilities of blockchain, such as improved operational efficiency, the elimination of intermediaries in transactions, implications for microeconomics, crowdfunding, digital ownership, and asset authentication (Parker, 2018), further underscore its significance.

Furthermore, blockchain has the potential to redefine the concept of trust, prompting businesses to place a greater emphasis on nurturing customer relationships. Looking ahead, it is projected that blockchain will play a pivotal role in various industries by 2025 (Preece & Easton, 2019). This investigation aims to shed light on how an emerging technology can reshape business models within the tourism sector, offering a fresh perspective to the business model literature, particularly within the realm of tourism

Blockchain and Tourism

In 2017, Gelter coined blockchain technology as a "revolutionary force destined to reshape financial transactions in the future, with profound implications for the tourism industry." Within the realm of the tourism sector, blockchain consistently explores inventive strategies to bolster its competitive advantage, enhance customer satisfaction, and optimize overall operational efficiency. This drive for innovation resonates throughout various facets of the industry. Notably, blockchain opens unique opportunities for travel agencies to align with customer preferences and requirements, fostering more personalized, peer-to-peer interactions. Consequently, these initiatives lead to increased customer loyalty, as supported by sources such as Hospitalitynet (2015) and research by Treiblmaier and Onder (2019).

Peer-to-peer interactions foster trust and a sense of security, resulting in a positive emotional experience for tourists. As Patwardhan et al. (2020) outline, this emotional engagement is expected to have a favorable impact on tourist loyalty. "Tourists' perception of value is a precursor to tourist satisfaction" (Xie et al., 2020).

Numerous travel agencies have integrated blockchain technology into their operations, with notable examples including Travelchain in Russia, Winding Tree in Switzerland, Cool Cousin in London, WebJet in Australia, Sandblock in France, and Accenture in Canada (Liebkind, 2018). Additionally, the TUI Group in Germany has also embraced this technology (Whyte, 2018).

Around mid-2018, Expedia Travel ventured into the use of bitcoin for payment processing, particularly within the accommodation sector. This adoption extended to financial management and property listing. Meanwhile, "LockChain," now known as LockTrip, introduced its own cryptocurrency for transactions (LockTrip, 2018). The appeal of using LockTrip for revenue management lies in its ability to eliminate commission expenses and mitigate the risk of currency depreciation due to exchanges (Willie, 2019).

Blockchain technology offers a myriad of innovative benefits for travel agencies, including secure and seamless transfer and sharing of customer/passenger data, enhanced online reliability, heightened transaction security, and a substantial reduction in the occurrence of lost or stolen records and transactions (Willie, 2019). The technology harnesses advanced cryptographic techniques and intricate computer codes to fortify security. Notably, blockchain has the potential to streamline all aspects of business transactions within the tourism industry, all in a swift, transparent, and secure framework.

Consider, for example, restaurants where customers rely on credit cards for payments, incurring associated commission costs. By employing blockchain, these costs are not only circumvented but also delays in payment and receipt for restaurants are eliminated. According to findings from various researchers (Raskin, 2017; Stankovic, 2018; Willie, 2019), blockchain-powered smart contracts enable the secure exchange of valuable assets and services such as property, money, ticketing, or visa issuance between tourists and hosts in a transparent digital environment. The inherent transparency of these contracts involves all parties, reducing the need for third-party intermediaries such as lawyers and significantly cutting mediation expenses.

Drawing from the arguments, it is reasonable to assert that recent innovations, exemplified by blockchain technology as emphasized by Jayawardena (2019), have the potential to exert a significant influence on various segments within the tourism industry. With this it becomes imperative to know how tourists perceive blockchain technology and what

impact will it have on them. The objectives of the study were:

- To investigate the impact of blockchain technology on tourists' willingness to pay for travel products and services.

- To examine the impact of blockchain technology on tourists' trust in travel providers.

- To assess the impact of blockchain technology on tourists' environmental impact.

METHODOLOGY

Research Design: This study employed a qualitative research approach, focusing on a detailed exploration of the subject matter. Qualitative research allows for an in-depth understanding of the experiences and perceptions of tourists who use the facility.

Locale: The research was conducted in the Kolkata region of West Bengal. This area is chosen due to its popularity as a tourist destination and tourists visit regularly making it an ideal location for the investigation.

Sampling Design: The sample size for this study comprised of 18 participants who were tourists utilizing travel agency services for travel purposes. The choice of this relatively small sample size aligns with recommendations by Kvale (1996), suggesting that a range of five to twenty-five samples is sufficient for conducting interviews in qualitative research. The selection of this sample size took into consideration factors such as the availability of tourists in the research area and the available time and resources for the study.

Tools and Techniques: Data collection for this research primarily relied on semi-structured interviews. These interviews were conducted with the tourists. Each interview session had a duration of approximately 30 minutes, allowing for comprehensive discussions.

Data Analysis and Statistical Analysis: The data collected from the semi-structured interviews were analysed using thematic analysis. Thematic analysis is a well-established qualitative research method that involves the identification, coding, and interpretation of patterns and themes within the data. This method allows for a systematic and in-depth exploration of the insights shared by the participants, enabling the extraction of meaningful patterns and trends.

Thematic analysis, as described by Braun and Clarke (2006), was utilized to analyze the interview data. This approach involves systematically identifying, coding, and interpreting

patterns or themes within the data, offering a comprehensive understanding of the subjects under investigation. Thematic analysis was chosen for its ability to uncover significant insights and uncover underlying themes in the context of the travel industry in Kolkata.

Table 1: Objectives and its related interview questions

Objectives	Interview questions
To investigate the impact of blockchain technology on tourists' willingness to pay for travel products and services.	Do you know what blockchain technology is? How do you think blockchain technology could impact the travel industry? Would you be more likely to book a travel product or service if it was powered by blockchain technology? What are the key factors that would influence your decision to pay more for a travel product or service that uses blockchain technology?
To examine the impact of blockchain technology on tourists' trust in travel providers.	How does blockchain technology improve the transparency of travel related monetary transactions? How does blockchain technology reduce the risk of fraud and abuse in the travel industry? How does blockchain technology make it easier for tourists to track their travel bookings and payments?
To assess the impact of blockchain technology on tourists' environmental impact.	How has the integration of blockchain technology influenced the overall environmental impact of tourists, particularly in terms of carbon emissions and resource consumption? What measurable changes can be attributed to the adoption of blockchain technology in the tourism industry, specifically regarding tourists' ecological footprint and conservation efforts? In what ways has the implementation of blockchain solutions affected the behaviour and decision-making of tourists, leading to a reduction in their environmental impact during travel and leisure activities?

RESULTS AND DISCUSSION

Table 2: Socio-Demographic- Tourists

Tourist Age		Frequency	Percent	Valid Percent	Cumulative Percent
	18-25	6	33.3	33.3	33.3
	26-33	4	22.2	22.2	55.6
	34-41	3	16.7	16.7	72.2
	42-49	2	11.1	11.1	83.3
	50-57	2	11.1	11.1	94.4
	58 and above	1	5.6	5.6	100.0
	Total	18	100.0	100.0	
Tourist Gender	Male	10	55.6	55.6	55.6
	Female	8	44.4	44.4	100.0
	Total	18	100.0	100.0	
Tourist Income Level	20,000 to 40,000	5	27.8	27.8	27.8
	40,001 to 60,000	7	38.9	38.9	66.7
	60,001 to 80,000	4	22.2	22.2	88.9
	80,001 and above	2	11.1	11.1	100.0
	Total	18	100.0	100.0	
Education Level	1oth	2	11.1	11.1	11.1
	10+ 2	4	22.2	22.2	33.3
	Graduate	5	27.8	27.8	61.1
	Post Graduate	2	11.1	11.1	72.2
	Doctor/ Doctorate	5	27.8	27.8	100.0
	Total	18	100.0	100.0	
Occupation	Service	10	55.6	55.6	55.6
	Business	8	44.4	44.4	100.0
	Total	18	100.0	100.0	

The table contains demographic characteristics of tourists, including their age, gender, income level, education level, and occupation. The most common age group among the tourists was 18-25, making up 33.3% of the total sample. The second most common age group is 26-33, at 22.2%. As you move

up in age categories, the percentage of tourists in each group decreases. The data suggests a relatively younger tourist population. Most tourists were male, comprising 55.6% of the total sample. Female made up the remaining 44.4%. The highest number of tourists were in 40,001 to 60,000 income bracket, accounting for 38.9%. The lowest number of tourists were in the 80,001 and above category, making up 11.1%. The data suggested a fairly even distribution among the income groups, with a slight skew towards the middle-income category.

The most common education level among tourists was "Graduate," at 27.8%. The least common education level is "10th," at 11.1%. This data indicated a mix of education levels among tourists, with a significant percentage having completed graduate or higher education. The "Service" occupation was more prevalent, representing 55.6% of the total sample. The "Business" occupation accounted for the remaining 44.4%. This suggested most tourists came from service-related occupations.

These insights can be valuable for tailoring marketing strategies or services to cater to the predominant demographic groups among tourists. The demographic profile of tourists of this study supports the earlier studies Willie (2019) and Whyte (2018).

Table 3: Themes extracted from answers

Question (s)	Themes from the answers of the questions
Do you know what blockchain technology is?	Decentralization, Transparency, Immutability, Security, Consensus mechanisms, Smart contracts, Cryptocurrencies
How do you think blockchain technology could impact the travel industry?	Security and privacy, Personalization, Efficiency, Sustainability
Would you be more likely to book a travel product or service if it was powered by blockchain technology?	Security, Efficiency, Cost-savings, Transparency, Sustainability
What are the key factors that would influence your decision to pay more for a travel product or service that uses blockchain technology?	Security, Transparency, Efficiency, Sustainability, Innovation

The table has shown the themes extracted from the answers to three questions about blockchain technology and its potential impact on the travel industry. The first question, "Do you know what blockchain technology is?", was answered with a variety of themes, including decentralization, transparency, immutability, security, consensus mechanisms, smart contracts, and cryptocurrencies. These themes show that the respondents have a good understanding of the basic concepts of blockchain technology. The second question, "How do you think blockchain technology could impact the travel industry?", was answered with the themes of security and privacy, personalization, efficiency, and sustainability. These themes suggest that the respondents believe that blockchain technology has the potential to improve the security and privacy of travel data, personalize travel experiences, make travel transactions more efficient, and reduce the environmental impact of travel. The third question, "Would you be more likely to book a travel product or service if it was powered by blockchain technology?", was answered with the themes of security, efficiency, cost-savings, transparency, and sustainability. These themes suggest that the respondents are more likely to choose travel products and services that use blockchain technology because they believe it will be more secure, efficient, and cost-effective.

The fourth question, "What are the key factors that would influence your decision to pay more for a travel product or service that uses blockchain technology?", was answered with the themes of security, transparency, efficiency, sustainability, and innovation. These themes suggest that the respondents are willing to pay more for travel products and services that use blockchain technology if they believe it will provide them with a higher level of security, transparency, efficiency, sustainability, and innovation. Overall, the themes extracted from the answers to these questions suggest that the respondents had a good understanding of blockchain technology and its potential impact on the travel industry. They are also more likely to choose travel products and services that use blockchain technology because they believe it will be more secure, efficient, and cost-effective. Additionally, they were willing to pay more for travel products and services that use blockchain technology if they believe it will provide them with a higher level of security, transparency, efficiency, sustainability, and innovation.

Table 4: Themes extracted from answers

Question (s)	Themes from the answers of the questions
How does blockchain technology improve the transparency of travel transactions?	Immutability and transparent ledger, Decentralization, Smart contracts, Data integrity and security, Real-time tracking and verification, Interoperability, Auditing and compliance, Reduced disputes and chargebacks, Feedback, and reviews
How does blockchain technology reduce the risk of fraud and abuse in the travel industry?	Immutability, Transparency, Security, Efficiency, Disintermediation, Airline ticketing, Hotel bookings, Travel insurance, Loyalty programs
How does blockchain technology make it easier for tourists to track their travel bookings and payments?	Transparency, Security, Efficiency, Travala, Winding Tree

The insights gleaned from the responses to these questions encompass several key themes:

Immutable and Transparent Ledger: Blockchain, as a distributed ledger technology, maintains an unalterable database accessible to all network participants. This ensures real-time tracking and transparent, tamper-proof travel transactions (Aghaei, 2020). Decentralization: Blockchain operates without central authority, rendering it highly resistant to fraudulent activities. The absence of a single point of control makes it less vulnerable to malicious exploitation. Smart Contracts: Self-executing smart contracts stored on the blockchain enable automated travel transactions, such as ticket sales and payments. This automation minimizes errors and fraud while enhancing efficiency (Gelter, 2017). Data Integrity and Security: With encrypted transactions stored securely on the blockchain, unauthorized access or alterations to travel data become challenging, ensuring data integrity.

Real-time Tracking and Verification: Blockchain's real-time transaction tracking enhances efficiency, transparency, and prevents fraud in travel operations. Interoperability: Blockchain facilitates the integration of various travel industry systems, including airlines, hotels, and travel agencies. This integration streamlines operations and reduces costs. Auditing and Compliance: Blockchain's application for auditing

travel transactions and ensuring regulatory compliance safeguards both travelers and businesses. Reduced Disputes and Chargebacks: By providing a transparent and immutable transaction history, blockchain minimizes disputes and chargebacks in the travel industry (Patwardhan, et.al., 2020). Feedback and Reviews: Blockchain can collect valuable feedback and reviews from travelers, enabling businesses to enhance their products and services continually.

In summary, the themes derived from the responses to the three questions in table 4 underscore the potential of blockchain technology to significantly enhance the transparency, security, and efficiency of the travel industry. By making travel transactions more transparent and secure, blockchain stands to mitigate fraud, elevate the overall customer experience, and contribute to the industry's growth.

Table 5: Themes extracted from answers

Question (s)	Themes from the answers of the questions
How has the integration of blockchain technology influenced the overall environmental impact of tourists, particularly in terms of carbon emissions and resource consumption?	Sustainable choices and Transparency, Efficient Resource Management, Carbon Offsetting and Tokenization, Decentralization and Resource efficiency, Digital identity and paper less Travel, Informed decision-making, Incentivizing, Informed decision-making, Incentivizing Eeco-Friendly Behaviour, Challenges and considerations
What measurable changes can be attributed to the adoption of blockchain technology in the tourism industry, specifically regarding tourists' ecological footprint and conservation efforts?	Transparency and traceability, Security and fraud prevention, Efficiency, Collaboration, Empowerment of local communities,
In what ways has the implementation of blockchain solutions affected the behavior and decision-making of tourists, leading to a reduction in their environmental impact during travel and leisure activities?	Rewards programs, Traceability, Transparency, Sustainable tourism certification

Table 5 illustrates the outcomes obtained from responses to three inquiries regarding the influence of blockchain

technology on the environmental impact of tourists in the context of the tourism industry. The initial query examines how the integration of blockchain technology has affected the overall environmental impact of tourists, particularly about carbon emissions and resource utilization. The following themes emerged from the responses:

Promoting Sustainability and Transparency: Blockchain technology facilitates the monitoring of environmental impacts associated with tourism activities, empowering travellers to make sustainable choices. For example, a blockchain-based platform can trace the carbon emissions of a flight, enabling tourists to opt for more eco-friendly options. Enhancing Resource Management Efficiency: Blockchain can enhance the efficient utilization of resources in the tourism sector. For instance, a blockchain-based system can monitor water and energy consumption in a hotel, aiding in consumption reduction efforts. Carbon Offset and Tokenization: Blockchain allows for carbon offsetting by enabling tourists to purchase tokens representing carbon emissions offset. Decentralization and Efficient Resource Utilization: Blockchain's decentralization potential can lead to more resource-efficient practices in the tourism industry, enabling tourists to book accommodations directly with property owners and bypass intermediaries. Digital Identity and Paperless Travel: Blockchain facilitates the creation of digital identities for tourists, reducing paper usage in the industry. Tourists can utilize their digital identity for hotel check-ins and car rentals. Informed Decision-Making: Blockchain provides tourists with comprehensive information about the environmental impact of their travel choices, enabling them to make well-informed decisions. Eco-Friendly Behavior Incentives: Blockchain can incentivize eco-friendly actions among tourists, such as rewards for choosing sustainable accommodations or using public transportation.

The second question explores measurable changes attributed to blockchain adoption in the tourism industry concerning tourists' ecological footprint and conservation efforts. The themes derived from the responses encompass:

Enhanced Transparency and Traceability: Blockchain enhances transparency and traceability, reducing fraud and simplifying the tracking of tourism-related environmental impacts. Security and Fraud Prevention: Blockchain bolsters security and prevents fraud in the tourism industry, safeguarding tourists' data, and financial interests. Improved Efficiency: Blockchain contributes to greater efficiency in the

tourism sector, resulting in reduced costs and environmental impact. Stakeholder Collaboration: Blockchain fosters collaboration among various stakeholders in the tourism industry, which, in turn, enhances sustainability in tourism practices. Empowerment of Local Communities: Blockchain can empower local communities in the tourism industry, ensuring more equitable distribution of tourism-related benefits.

The third question investigates how the implementation of blockchain solutions has affected tourists' behaviour and decision-making, leading to reduced environmental impact during travel and leisure activities. The themes that emerged from the responses include: Rewards Programs: Blockchain facilitates the creation of rewards programs that incentivize eco-friendly behavior among tourists, offering rewards for selecting sustainable accommodations or transportation options. Traceability: Blockchain allows for the tracking of the environmental impact of tourism activities, empowering tourists to make well-informed decisions. Transparency: Blockchain improves transparency in the tourism industry, instilling trust in tourists that their travel choices are sustainable. Sustainable Tourism Certification: Blockchain can establish certification programs for sustainable tourism, aiding tourists in identifying and selecting eco-friendly travel options.

In conclusion, these themes underline the multifaceted influence of blockchain technology on the environmental dimensions of the tourism industry. From promoting transparency and efficiency to incentivizing and empowering stakeholders, blockchain holds the potential to drive positive change in the industry's ecological footprint and conservation endeavours. Nonetheless, challenges and considerations must be addressed to fully realize the benefits of blockchain integration.

CONCLUSION

Blockchain technology harbours the potential to markedly enhance transparency, security, and efficiency within the travel industry. By rendering travel transactions more transparent and secure, blockchain has the potential to mitigate fraud and misuse while enhancing the overall customer experience. Blockchain technology holds the potential to instigate positive change in the industry's environmental impact and conservation initiatives. Nevertheless, it is imperative to address challenges and considerations comprehensively to fully harness the advantages of blockchain integration. Here are some of the challenges that require resolution:

Blockchain technology is still in its early stages of development. A dearth of established standards and regulations for blockchain in the travel industry persists. There exists a pressing need for increased education and awareness regarding blockchain technology among both travelers and industry professionals. Despite these challenges, the potential gains from blockchain technology in the travel industry remain substantial. If executed proficiently, blockchain can contribute to the enhancement of travel security, efficiency, and sustainability, ultimately improving the customer experience and making travel more economically viable.

REFERENCES

Adner, R. (2002). When are technologies disruptive? A demand-based view of the emergence of competition. Strategic Management Journal, 23(8), 667–688. https://doi.org/10.1002/smj.246

Aghaei, H. (2020). Designing a blockchain business model (case study: tourism industry). Master Thesis on MBA-Technology, Islamic Azad University. Njafabad Branch

Bower, J. L., & Christensen, C. M. (1995). Disruptive technologies: Catching the wave. Harward Busness Review. https://hbr.org/1995/01/disruptive-technologies-catchi ng-the-wave

Bower, J. L., & Christensen, C. M. (1996). Disruptive technologies: Catching the wave. The Journal of Product Innovation Management, 13(1), 75–76.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research inPsychology, 3(2), 77-101.

Brynjolfsson, E., & McAfee, A. (2014). The second machine age: Work, progress, and prosperity in a time of brilliant technologies. W.W. Norton & Company, Inc.

Bumblauskas, D., Mann, A., Dugan, B., & Rittmer, J. (2020). A blockchain use case in food distribution: Do you know where your food has been? International Journal of Information Management, 52, 102008. https://doi.org/10.1016/j. ijinfomgt.2019.09.004

Cai, C. W. (2018). Disruption of financial intermediation by FinTech: A review on crowdfunding and blockchain. Accounting and Finance, 58(4), 965–992. https://doi.org/10.1111/acfi.12405

Chedrawi, C., &Howayeck, P. (2018). The role of Blockchain Technology in Military Strategy formulation, a resource based view on capabilities. In Paper presented at the cognitive analytics management conference 2018. Lebanon: American University of Beirut.

Chesbrough, H., & Rosenbloom, R. S. (2002). The role of the business model in capturing value from innovation: Evidence from Xerox Corporation's technology spin-off companies. Industrial and Corporate Change, 11(3), 529–555. https://doi.org/ 10.1093/icc/11.3.529

Christensen, C. M. (2013). The innovator's dilemma: when new technologies cause great firms to fail: Boston. MA: Harvard Business School Press. Collomb, A., & Sok, K. (2016). Blockchain/distributed ledger technology (DLT): What impact on the financial sector? Digiworld Economic Journal, 103, 93–111

Cong, L. W., & He, Z. (2019). Blockchain disruption and smart contracts. The Review of Financial Studies, 32(5), 1754–1797. https://doi.org/10.1093/rfs/hhz007

Diestelmeier, L. (2019). Changing power: Shifting the role of electricity consumers with blockchain technology–policy implications for EU electricity law. Energy Policy, 128, 189–196. https://doi.org/10.1016/j.enpol.2018.12.065

Ducas, E., & Wilner, A. (2017). The security and financial implications of blockchain technologies: Regulating emerging technologies in Canada. International Journal, 72 (4), 538–562. https://doi.org/10.1177/0020702017741909

Gelter, H. (2017). Digital tourism-an analysis of digital trends in tourism and customer digital mobile behaviour. Visit Artic Europe, Finland, May: Report.

Guhathakurta, R. (2018). Blockchain in automotive domain. In K. Subbiah, et al. (Eds.), The age of Blockchain: A collection of articles (pp. 16–19). USA: IndraStra Global. https://doi.org/10.5281/zenodo.1202390

Guo, Y., & Liang, C. (2016). Blockchain application and outlook in the banking industry. Financial Innovation, 2(1), 1–12. https://doi.org/10.1186/s40854-016-0034-9

Gupta, V. (2017). A Brief History of Blockchain. Harvard Business Review. online at http s://hbr.org/2017/02/a-brief-history-of-blockchain.

Helo, P., & Hao, Y. (2019). Blockchains in operations and supply chains: A model and reference implementation. Computers & Industrial Engineering, 136, 242–251. https:// doi.org/10.1016/j.cie.2019.07.023

Holbl, ¨ M., Kompara, M., Kamiˇsali´c, A., & Nemec Zlatolas, L. (2018). A systematic review of the use of blockchain in healthcare. Symmetry, 10(10), 470. https://doi.org/ 10.3390/sym10100470

Holotiuk, F., Pisani, F., & Moormann, J. (2017). The impact of blockchain technology on business models in the payments industry. In In: Proceedings of 13th

international conference on Wirtschaftsinformatik (WI 2017), Gallen, Switzerland (pp. 912–926).

Hospitalitynet. (2015). Tourism Megatrends: 10 Things You Need To Know About The Future Of Tourism. https://www.hospitalitynet.org/news/4073042.html

Iansiti, M., & Lakhani, K. R. (2017). The truth about Blockchain. Harvard Business Review, 95(1), 118–127.

Jayawardena, C. C. (2019). What are the key innovative strategies needed for future tourism in the world? Worldwide Hospitality and Tourism Themes, 11(2), 235–247. https://doi.org/10.1108/WHATT-01-2019-0001

Johnson, M. W., Christensen, C. M., &Kagermann, H. (2008). Reinventing your business model. Harvard Business Review, 86(12), 57–68.

Kumar, R., & Tripathi, R. (2020). Blockchain-based framework for data storage in peerto-peer scheme using interplanetary file system. In S. Krishnan (Ed.), Handbook of research on Blockchain technology (pp. 35–59). Academic press.

Kvale, S. (1996). InterViews: An introduction to qualitative research interviewing. Thousand oaks, CA: SAGE.

Lemieux, P. (2013). Who is satoshinakamoto? Regulation, 36(3), 14–16.

Liebkind, J. (2018). Companies using blockchain to change travel. https://www.investo pedia.com/news/6-companies-using-blockchainchange-travel-0/.

Liu, J. (2018). Business models based on IoT, AI and blockchain. Master's Thesis. Faculty of Science and Technology, Uppsala University.

LockTrip. (2018). LockTrip. Retrieved from Medium. In https://medium.com/@LockCha inCo/lockchain-rebranding-to-locktrip-completed3cbd97d4f9c1

Lu, H., Huang, K., Azimi, M., & Guo, L. (2019). Blockchain technology in the oil and gas industry: A review of applications, opportunities, challenges, and risks. IEEE Access, 9(1), 41426–41444. https://doi.org/10.1109/ACCESS.2019.2907695

McCallig, J., Robb, A., & Rohde, F. (2019). Establishing the representational faithfulness of financial accounting information using multiparty security, network analysis and a blockchain. International Journal of Accounting Information Systems, 33, 47–58. https://doi.org/10.1016/j.accinf.2019.03.004

Mougayar, W. (2016). The Business Blockchain: Promise, Practice, and Application of the Next Internet Technology. Wiley

Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic cash system. https://bitcoin. org/bitcoin.pdf.

Narayanan, A., Bonneau, J., Felten, E., Miller, A., & Goldfeder, S. (2016). Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction. Princeton University Press.

Nascimento, S., Polvora, ´ A., & Lourenço, J. S. (2018). Blockchain4EU: Blockchain for Industrial. Publications office of the European Union Luxembourg. https://doi.org/ 10.2760/20492010.2760/410134

Nofer, M., Gomber, P., Hinz, O., &Schiereck, D. (2017). Blockchain. Business & Information Systems Engineering, 59(3), 183–187. https://doi.org/10.1007/s12599- 017-0467-3

Parker, H. (2018). Blockchain disruptions and emerging business models. https://consul tation.ngi.eu/channels/ngi-ict2018/blockchain-disruptions-and-emerging-businessmodels

Patwardhan, V., Ribeiro, M. A., Woosnam, K. M., Payini, V., & Mallya, J. (2020). Visitors' loyalty to religious tourism destinations: Considering place attachment, emotional experience and religious affiliation. Tourism Management Perspectives, 36(3), 100737. https://doi.org/10.1016/j.tmp.2020.100737

Preece, J., & Easton, J. (2019). A review of prospective applications of Blockchain Technology in the Railway Industry. International Journal of Railway Technology, 1–22. https://doi.org/10.13140/RG.2.2.15751.75681

Raskin, M. (2017). The Law and Legality of Smart Contracts (September 22, 2016). 1 Georgetown Law Technology Review, 304. Available at SSRN.

Rivera, R., Robledo, J. G., Larios, V. M., & Avalos, J. M. (2017). How digital identity on blockchain can contribute in a smart city environment. In International smart cities conference (ISC2). IEEE. https://doi.org/10.1109/ISC2.2017.8090839

Sharma, R. C., Yildirim, H., &Kurubacak, G. (2019). Blockchain technology applications in Education. IGI Global. https://doi.org/10.4018/978-1-5225-9478-9

Stankovic, S. (2018). Who is Nick Szabo. The Mysterious Blockchain Titan. https://unbl ock.net/nick-szabo/.

Subbiah, K., Ferrarini, B., Maupin, J., Hinojales, M., Guhathakurta, R., Kulshrestha, S., & Wright, D. (2018). The Age of Blockchain: A Collection of Articles. USA: IndraStra global.

Swan, M. (2015). Blockchain: Blueprint for a new economy. O'Reilly media Inc.

Tapscott, D., & Kaplan, A. (2019). Blockchain revolution in education and lifelong learning. In Preparing for disruption, leading the transformation, A Blockchain Research Institute Big Idea White paper. https://www.ibm.com/downloads/cas/93DDVAKE.

Tapscott, D., & Tapscott, A. (2016). Blockchain revolution: how the technology behind bitcoin is changing money, business, and the world. New York: Penguin Random House.

Teece, D. J. (2010). Business models, business strategy and innovation. Long Range Planning, 43(2–3), 172–194. https://doi.org/10.1016/j.lrp.2009.07.003

Teufel, B., Sentic, A., &Barmet, M. (2019). Blockchain energy: Blockchain in future energy systems. Journal of Electronic Science and Technology, 17(4), 100011. https:// doi.org/10.1016/j.jnlest.2020.100011

Tian, F. (2016). An Agri-food supply chain traceability system for China based on RFID & blockchain technology. In 13th international conference on service systems and service management (ICSSSM). Kunming, China: IEEE. https://doi.org/10.1109/ ICSSSM.2016.7538424

Treiblmaier, H., & Onder, ¨I. (2019). The impact of blockchain on the tourism industry: A theory-based research framework. In H. Treiblmaier, & R. Beck (Eds.), Business Transformation through blockchain (pp. 3–21). Palgrave Macmillan.

Tripsas, M., &Gavetti, G. (2000). Capabilities, cognition, and inertia: Evidence from digital imaging. Strategic Management Journal, 21(10− 11), 1147–1161. https:// doi. org/10.1002/1097-0266(200010/11)21

Whyte, P. (2018). TUI Group Wants a Bigger Slice of the Tours and Activities Market. In Skift https://skift.com/2018/02/13/tui-group-wants-a-bigger-slice-of-the-tours-and -activities-market/.

Willie, P. (2019). Can all sectors of the hospitality and tourism industry be influenced by the innovation of blockchain technology? Worldwide Hospitality and Tourism Themes, 11(2), 112–120. https://doi.org/10.1108/WHATT-11-2018-0077

Wright, D. (2018). How blockchain will transform housing markets. In K. Subbiah, et al. (Eds.), The age of Blockchain: A collection of articles (pp. 24–27). USA: IndraStra Global

Xie, J., Tkaczynski, A., & Prebensen, N. K. (2020). Human value co-creation behavior in tourism: Insight from an Australian whale watching experience. Tourism Management Perspectives, 35, 100709. https://doi.org/10.1016/j.tmp.2020.100709

Yandle, B. (2010). Lost trust: The real cause of the financial meltdown. The Independent Review, 14(3), 341–361

Zhao, H., & Coffie, C. P. K. (January 11, 2018). The Applications of Blockchain Technology in Crowdfunding Contract. Available at SSRN.

Zhu, Z., Qi, G., Zheng, M., Sun, J., & Chai, Y. (2020). Blockchain based consensus checking in decentralized cloud storage. Simulation Modelling Practice and Theory, 102, 101987. https://doi.org/10.1016/j.simpat.2019.101987

Zott, C., Amit, R., & Massa, L. (2011). The business model: Recent developments and future research. Journal of Management, 37(4), 1019–1042. https://doi.org/10.1177/0149206311406265