

Article

The Impact of Blockchain Technology Adoption on Tourism Industry: A Systematic Literature Review

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Abstract: The current COVID-19 pandemic has led to the acceleration of the digitization process and to a shifting to Industry 4.0. Blockchain (BC) is one of the technologies that has been introduced worldwide in recent years. It has been beneficial for the tourism industry, in addition to many other sectors. This article investigates the advantages and disadvantages of BC adoption in the tourism industry, as well as the possible solutions to overcome the challenges. This paper conducts a systematic literature review (SLR) that consists of the operations for detecting, selecting, categorizing, and analyzing relevant articles on a specified subject. It is evident from the results that the majority of the academic works illustrate the benefits of BC implementation and explain its potential by providing diverse models of BC-based systems. However, since BC is a young technology, numerous challenges have appeared on the path to its full adoption in the tourism industry. Possible solutions are the achievement of a collaborative approach among the stakeholders, the deepening of academic research in the field, testing more models of BC-based systems, and the establishment of relevant policies. Consequently, the implications for the theory, practice, policy, and research of this work are significant.

Keywords: blockchain; tourism; vacation; leisure; holiday; systematic literature review; smart contract; cryptocurrency



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1. Introduction

The processes of economic digitalization involve many countries and the opening of organizations to new business models. For instance, the adoption of technologies such as blockchain (BC), information and communication technologies (ICT), artificial intelligence (AI), and big data or the Internet of Things (IoT) are transforming the way that people act and engage in their businesses, and the way that they produce goods and share useful information among the rest of the stakeholders along supply chains. Moreover, the integration of these technologies with the collaborative approach of the stakeholders can strengthen the overall effect [1].

Over the past decade, BC has attracted a lot of scholarly attention for its unique features, which are able to improve the performance of some economic sectors, such as finance, health, agriculture, etc., contributing to the obtainment of transparent, efficient, and sustainable products or services [2].

Blockchain is a particular type of distributed ledger technology (DLT) that was first used as a component of the bitcoin protocol, which is a cryptocurrency that was launched in 2009 by Satoshi Nakamoto [3]. Subsequently, it reduced the costs for both companies and consumers in different economic areas. Additionally, it increases process efficiency, improves the level of trust among business partners and in personal data protection, and reduces the role of intermediaries [4].

Its success and diffusion worldwide are further due to the possibility of connecting this technology with other ones, modernizing different industrial sectors, and changing

the so-called Industry 4.0. At present, no univocal definition of BC is considered. For instance, Jaber et al. [5] define BC as a distributed ledger technology that allows the storing and sharing of data in a decentralized and immutable manner in a peer-to-peer network. Similarly, Treiblmaier [6] considers BC as a digital, distributed, and decentralized ledger, where each transaction is added and recorded in chronological order, with the goal of making a permanent and tamperproof register. Thus, BC is a technology that is able to permanently store and protect data from alterations.

The tourism and hospitality industry has been applying BC since 2014 in order to increase the benefits for all the actors involved in this sector [7]. Generally, tourism is characterized by different actors, such as hoteliers, airline companies, travel agents, tour operators, insurance firms, payment service providers, and others, who have complex business relationships and high competition among each other. Thus, the use of BC jointly with other technologies, such as ICT, AI, smartphones, mobile devices, etc., can overcome these problems and improve the quality of the services offered to customers. Indeed, ICTs have already been widely adopted by the tourism industry and have resulted in the rapid development and generation of considerable data [8]. Wei et al. [9] call this new tourism business model “intelligent tourism” or “smart tourism”. However, if, on the one hand, this new model of tourism helps to solve problems, meaning improved customer services, decreased competition among stakeholders, and reduced service costs [4], on the other hand, it creates new challenges, such as secure big-data storage and analysis [9–11].

Currently, the introduction of BC technology in the tourism sector is growing. Thus, it is important to analyze its advantages and disadvantages. To reach these goals, a systematic literature review (SLR) was carried out that aimed at: (1) offering an updated overview on the application of this technology in the vacation sector; and (2) providing an in-depth analysis of the advantages and challenges of BC adoption in the tourism industry from the perspective of enhancing services and reducing costs for the actors involved in this sector.

The results could be useful for tourist operators to understand the potentiality of this technology for their business models, for policy makers to further support the development of this industry, as well as for researchers to better delineate areas of future research that are less explored in this work.

2. Research Methodology

According to Rana et al. [2], the SRL methodology consists of the operations for detecting, selecting, categorizing, and analyzing relevant articles on a specified subject. It should be carried out in a rigorous, transparent, and replicable way that leads to a deep, comprehensive, and high-quality review on the studied research subject [12]. Indeed, the replicability of the SRL procedure contributes to increasing the consistency of the results, allows data synthesis, and is thus a framework that can integrate extant knowledge [13]. In this work, in order to achieve these goals, a specific protocol was followed that ensures the quality of the paper and prevents the loss of scientific information. According to Giacomarra et al. [14], first, the conceptual boundaries of the study were defined, which meant focusing on a specific field. In this case, BC technology was investigated, and particularly how it is employed in the tourism sector for improving agency services and the quality of tourist travels. This is because a vast and increasing number of academic works that deal with the application of BC technology is presented in several databases. Secondly, academic papers were selected using the Boolean OR/ AND operators, creating a search sequence for the respective groups [14] that was associated with the following keywords: blockchain AND vacation OR tourism OR holiday OR leisure. Because the application of BC technology in the tourism industry is recent evidence, a time span between 2017 and 2022 (1 March) was considered. Thirdly, among several databases, the ones supporting academic research were chosen, such as the Science Direct, Scopus, and Web of Science databases. After the first selection, papers were downloaded and submitted to the second selection, which fitted the following criteria: research article, review article, chapter of book, and minireview. Other documents were excluded, such as letters, note conference articles,

interviews, editorials, short communications, etc. [12,15,16]. In addition, articles published in the English language were considered, and duplicates were eliminated. In Figure 1, the process adopted for selecting the papers in the present study is shown.

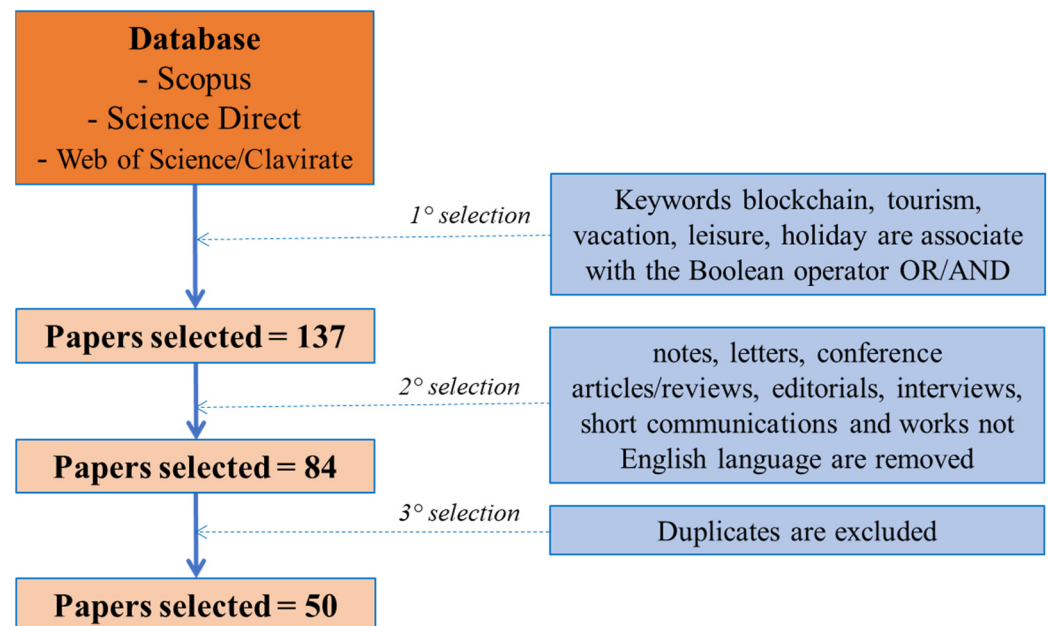


Figure 1. Phases of selection processes. Source: own elaboration.

3. Results and Discussion

In this section, the SLR's results are shown according to the expected goals of the paper. Thus, the first paragraph presents the results of the selection process of academic works; then, an overview on the use of BC technology in the vacation sector is provided, and the advantage of its adoption is illustrated; after that, the challenges of the tourism industry are discussed from the perspective of improving the quality of services provided to consumers by the vacation sector.

3.1. Selection Results

In this section, the results of the selection process are presented. Table 1 shows all studies published from 2017 to 1 March 2022 in the Scopus (93), Web of science (32), and Science Direct (12) databases. After the second selection, which removed the papers that did not have the previously chosen criteria, the number of studies drastically decreased in Scopus, from 80 to 43 for the terms Blockchain AND tourism, from 2 to 0 for the terms Blockchain AND vacation, and from 11 to 5 for the terms Blockchain AND leisure. Regarding the databases Web of science and Science Direct, the selection decreased the number of papers from 32 to 26 and from 12 to 10, respectively, for the words Blockchain AND tourism. No other studies were selected for the other keywords, and so the term tourism was useful for the analysis.

Moreover, in the Scopus database, India is the nation with the most papers published in this field (6), followed by China (5), and Italy and the United States (4). Regarding the second database, China, Italy, and Spain are the main nationalities of the researchers. Science Direct does not report this aspect. The tendency of the publications indicates that research on this topic has dramatically increased over the last five years, from 2017 (1 study) to 2021 (19 studies). Specifically, in the last 2 months of 2022, two studies were published.

Finally, after the third selection, which eliminated duplicates, the total number of papers selected decreased from 84 to 50.

Table 1. Numbers of papers selected using a specific group of keywords from 2017 to 1 March 2022.

Keywords	DATABASES					
	Scopus		Web of Science		Science Direct	
	Total Number of Papers	Number of Papers per Country	Total Number of Papers	Number of Papers per Country	Total Number of Papers	Number of Papers per Country
Blockchain AND tourism: Before selection	80	India (6) China (5) Italy (4) USA (4) Australia (3) Austria (3) Spain (3) Turkey (3) UK (3) Croatia (2) Others (7)	32	China (4) Italy (3) Spain (3) Croatia (2) India (2) Turkey (2) Others (17)	12	Not considered
After selection	43		26		10	
Blockchain AND vacation: Before selection	2	-	0	-	0	-
After selection	0					
Blockchain AND leisure: Before selection	11	India (2) Others (6)	0	-	0	-
After selection	5					
Blockchain AND holiday: Before selection	0	-	0	-	0	-
After selection						

Source: own elaboration.

3.2. The Advantage of BC Technology Adoption in the Tourism Industry

There are a number of misunderstandings in the research regarding BC technology and its adoption in the tourism sector, as Treiblmaier declares [17]. The author concludes that, by studying this technology with its core characteristics, we can develop relevant models and theories in order to support further research and the advancement of the industry. After reading the selected papers, we created an overview of BC application in the tourism sector, with a particular focus on its benefits for the industry, which is presented in this section.

3.2.1. Consumers' Attitudes

Pérez-Sánchez et al. [18] carried out a self-administered questionnaire in Hangzhou and revealed that Chinese customers are positively disposed towards the adoption of novel technologies by service providers. The authors found that the possibility of using BC technology for receiving specific services generated their loyalty towards the service-provider companies. Moreover, Raluca-Florentina [19], through quantitative marketing research, studied Romanian customers' satisfaction after using an e-commerce application for tourist-service acquisition, and they concluded that BC application would advance this industry by ensuring disintermediation, operational efficiency, cost reduction, and a comfortable way of making transactions. Additionally, Bolici et al. [20] studied the society on Twitter and discovered that there is significant interest in BC application in the tourism sector. The authors exposed several aspects regarding BC adoption. Specifically, they argue that, in the BC network of the tourism sector, there are some participants who have a high impact on the information flow, as well as on the positive and negative attitudes of other "peers" towards a specific matter.

3.2.2. Data Treatment

According to Yadav et al. [11], the introduction of recent digital tools into tourism activities, such as smartphones, big data, smart sensors, ICT, AI, etc., has improved the connectivity and exchange of information among stakeholders, as well as the mapping of consumers' choices. However, this new typology of tourism, called "smart tourism" (SmT), presents some inconveniences regarding security, privacy, and the management of data that are useful for companies to profile customers. Additionally, Bodkhe et al. [21] state that most of the existing security solutions are not able to include all aspects of the industry necessities. For achieving high scalability, robustness, secure data storage, network latency, auditability, immutability, and traceability, the promising tool is BC technology. Indeed, Treiblmaier [6] and Line et al. [22] argue that BC ensures data authenticity and therefore prevents the risk of their manipulation by unethical parties and protects customers' privacy. Indeed, a number of travel companies, such as LockTrip, Globaltourist, Winding Tree, and Travel Chain, have developed BC-based platforms and systems in order to meet the requirements of their personal and customers' privacy [11,22]. In line with this, BC application in the medical tourism sector has huge potential. For instance, Tyan et al. [23] state that BC technology offers a "privacy-by-design" solution that helps to diversify the information and restricts access to sensitive data, such as the personal information of medical tourists. Similarly, Parekh et al. [24] discuss the importance of blockchain technology to improve disintermediation, transparency, and trust in healthcare services, significantly increasing the efficiency of operations, such as the transfer of expenses required to settle disputes, disbursement of payments, etc. In this sector, usually the time is a decisive factor for obtaining the desirable result; moreover, the cost of the service is the important factor, and the abilities of the automated fulfillment of the agreement and disbursement of payments are advantages of the healthcare system. Thus, Tyan et al. [25] illustrate the benefits of BC adoption in medical tourism. The authors state that it simplifies the search for healthcare providers, provides a fast and secure payment method, ensures data security and privacy and reliable review systems, minimizes the waiting times for obtaining travel-related documents, and guarantees their authenticity.

Liu [26] argues that BC, thanks to its characteristics, is the suitable technology to apply in activities that require data collection, the investigation of identity, the management of the transaction process, and the exploration of provenance. BC technology simplifies customer authentication and thus hastens the reward delivery or the offering of adapted discounts [4]. Moreover, BC can be used to achieve interoperability, which provides the possibility of earning loyalty points or airline miles and using them elsewhere in this sector, in order to simplify communication with partners and provide a benefit with efficient payment options [7]. Travala and the TravelCoin Foundation are examples of successfully operating decentralized applications (DApps) in the tourism industry that are connected with BC [11]. Additionally, BC platforms provide opportunities to tourists to share their personal information, as well as their purchase history, travel location, search history, booked entities, and other activities, in a trustworthy and secure way [22]. As merit for giving up the above-mentioned data, customers can be awarded with a voucher that can be used in the future to buy flight tickets, book a hotel, or rent a car. Furthermore, this kind of digital ledger is beneficial for service providers since it ensures an immutable reputation and rating system. Certainly, once the review data is registered and protected by BC technology, it cannot be eliminated or modified by counterfeit users [27]. Thus, BC technology has the potential to boost the reliability of the online review system, providing immutable information declared by real accounts [7]. Subsequently, BC technology supports: (a) the collection of true data regarding customers; (b) the protection of sensitive data from tampering or stealing; (c) the trustworthiness of the reviews published by tourists; and (d) customers own personal data, meaning, they have the ability to manage their private information.

Moreover, tourist identification is needed regularly during travel, starting from the flight ticket purchase to the accommodation stay. BC technology supports the simplification and acceleration of a number of procedures that are needed for travel by digitalizing these

processes and using a secure biometric identity system [22]. Similar systems can easily detect people traveling with false documents and minimize the risks related to terrorism or criminal attacks. The Sita company is an explicit example of the successful implementation of this kind of system. It is a leading company that is adopting modern technologies in the tourism sector. Precisely, it applies BC, ICTs, AI, and other innovative technologies in the air-transport sector. Sita is a very recent project that supports the verification of travelers without passports or similar identifying documents thanks to wearable or mobile tools and through a BC-based secure biometric identity system [4]. Similarly, the service provided by Explore includes two stages of the authentication process. This minimizes the risk of data exposure or its abuse. This result is achieved through the development of smart contracts. Precisely, it permits only legitimate actors (for instance, passport offices) to interact with passengers' documents and add visa approval [11]. Moreover, Leng et al. [28] proposed an anti-counterfeiting method in their blockchain-driven model named Makerchain. The authors developed and linked to BC the chemical signature that protects the unique features of the products/services.

BC technology, through the efficient elaboration of data, minimizes human errors. Therefore, it is widely used by airline companies, such as Lufthansa, Austrian Airlines, Swiss Air, Air New Zealand, Brussels Airlines, and Eurowings, in order to avoid overbooking and double booking, to reduce the costs of reimbursement, and for other purposes. Furthermore, Surdi [29] discusses the potential of BC application in space tourism to provide the safety of satellite constellations. The author argues that, due to the high complexity of the collisions' prediction, moving towards decentralized systems is unavoidable. Precisely, BC technology holds the potential to spread the real-time information and quicken the analysis of the most current circumstances.

3.2.3. Planning of Tourism Activities

Presently, various industries use BC for the automatization of processes, such as updating discounts, incentives, and rewards. This has huge potential in the tourism sector as well. Nam et al. [30], based on an analyses of thirteen companies' business cases, recommended a BC-based system for the better planning of tourism activities. Arif et al. [31] made the same recommendation by describing a model of a BC-based system containing three kinds of nodes: user, server, and sensor. The nodes interact with each other and exchange information on incredibly short notice. Through this system, sensors provide dynamic data continuously, while users send multicriteria assessment data, and the server contributes the data analyzed by a machine-learning algorithm. Similarly, Benedict [32] proposes BC implementation in the tourism sector. With the provided model, the author seeks to support safe travel during the COVID-19 pandemic, and especially for people with asthma. In more detail, through a blockchain-enabled shared-mobility (BESM) architecture, it is possible to control the air quality (using sensors) in transport or COVID-19 circumstances in specific touristic locations and allow tourists on transport or in a city.

Additionally, BC technology can vitalize the integrated system, where customers find constantly updated transparent and traceable information regarding any service, including hotel availability, airplane tickets, car rentals, etc., by synchronizing the transactions of all the industry actors, and without accumulating the data into a single centralized database. It can also support purchasing health insurance easily thanks to the fastest information flow in the distributed system, as well as exchange travelers' bookings with low costs in the case that they are not able to travel anymore [7]. According to Valeri and Baggio [33], BC adoption benefits not only customers by providing well-managed services, but also companies by automating the process, cutting the load of routine operations, and thus boosting their overall productivity.

According to Ampountolas and Chiffer [34], travel-booking agencies need to shift towards digital innovation in order to adapt to the ever-growing hospitality industry. In this sense, BC technology implementation is a promising way to revolutionize operational processes, and to provide customers with real-time information regarding promotions,

product availability, and prices [9,34]. Indeed, in 2016, Webjet, an Australian travel-booking company, together with several partners (the European travel agency Thomas Cook, China's DidaTravel, Indonesia's Mitra Global, and Singapore's Far East Hospitality) implemented BC technology in order to eliminate the human errors that frequently take place in different phases of booking [7]. Furthermore, by using an integrated system between airplane companies and airports, BC can provide an innovative system to check the path of baggage and avoid it being stolen, loosened, or damaged. Additionally, compatible BC platforms in the different airports would boost this effect, providing comprehensive information, and preventing baggage mishandling or losses between airports. It could save the USD 500 million spent every year by airline companies on solving identified problems [7].

Luo and Zhou [35] argue that there are still no BC-based smart tourism solutions that would cover all the aspects of the sector and solve the fundamental challenges of the tourism industry, or they are only conceptual. Therefore, the authors propose a BC-based smart tourism platform named BlockTour. This seeks to address the challenges and provide a specific solution through the development of a real-world prototype. BlockTour helps to link tourists to the tourism companies in a secure and reliable way. The testing phase illustrated the practicability and high performance of the platform.

3.2.4. Smart Contracts and Cryptocurrencies

The tourism industry consists of various activities, stakeholders, and their heterogeneous interactions between each other. Therefore, it comprises numerous contracts and negotiations among different actors, which increases: the risks related to security, misunderstanding, or regret among stakeholders; delays in the accomplishment of obligations; and high costs [7]. The establishment of smart contracts significantly affects the abovementioned challenges by removing intermediaries from the market and making direct links between customers and service providers. Consequently, it reduces the costs of services, improves the efficiency of the overall processes, and minimizes the time needed to meet travelers' demands [36]. Turkay et al. [37], by analyzing the literature regarding BC application in the tourism industry, confirmed this evidence and state that this technology leads to improvement in the service quality, the acceleration of the processes, and cost reduction. In line with this, Demirel et al. [38], in their study, propose a BC technology and smart-contract-based system, including integrated reservations and hotel services. The projected system makes it simple for customers to obtain all kinds of services in a secure way, and it also discards some of the commission fees related to the intermediaries.

Smart contracts, together with cryptocurrencies, such as Bitcoin, Ethereum, or others, have the ability to support the tourism industry. Precisely, the use of smart contracts for advancing interactions between stakeholders and shifting traditional payment methods towards accepting cryptocurrencies results in removing the extra charges related to the intermediary services. Treiblmaier et al. [39] and Filimonau and Naumova [40] argue that BC technology application has huge potential for the significant transformation of the tourism sector through the presence of cryptocurrency as a payment method. According to the authors, the advantages include excluding intermediaries, reducing transaction fees, and simplifying the payment method for tourists. Moreover, Nam et al. [30] state that, by excluding intermediaries and using cryptocurrency, BC technology reduces or eliminates the costs of some operations. However, in spite of the documented benefits of cryptocurrencies for travel and their acceptance by many tourism operators, there is still a lack of understanding of travelers' attitudes. Investigating the positive and negative perceptual antecedents of 161 travelers from the Asia-Pacific region, Treiblmaier et al. [39] propose further research directions for using cryptocurrencies in the travel and tourism contexts. Moreover, Nuryyev et al. [41] argue that different internal and external factors affect the companies' decisions regarding cryptocurrency adoption as an alternative payment method. These can be: (a) the attitude of the companies' manager/owner that depends on his/her personal characteristics; (b) the perceived simplicity of use; and (3) the recognized benefit of this payment method.

Recently, more and more tourists worldwide are using cryptocurrencies for buying products or services [42]. An example in the tourism industry that uses blockchain and accepts cryptocurrency as a payment method is mentioned by Rashideh [4]. Tourism Union International (TUI) is a German-based travel company that has implemented a process for their clientele that allows them to book and pay for reservations or obtain additional services. Moreover, the smart contract exploited by TUI provides transparent information regarding the capacity of the hotel, a unique ranking system, automated communications, and information security [7]. In addition, other private companies, such as Travelflex, Tripago, Roomdao, CryptoBnB application by AirBnB, UBER, Singapore Airlines (KrisPay project), and Aeron are currently introducing BC technology with smart contracts [7,11,36]. Additionally, several public promotion tourism agencies have launched BC technology in their businesses and have shifted their payment methods towards the utilization of cryptocurrencies in order to improve the service quality and support local tourism. Irannezhad and Mahadevan [7] describe the case of the Caribbean island of Aruba, which introduced BC in order to provide comfortable services to the customers by creating direct links with leading airline companies and local hotels. Kwok and Koh [43] argue that this novel system can bring significant benefits to the small territories since the major shares of their economies represent the tourism industry. As a consequence, these places may achieve the level of a developed economy by offering efficient and innovative tourism services. Similarly, Tyan et al. [23] suppose that the better accessibility of the data for small and medium-sized companies, together with the establishment of local cryptocurrency, will strengthen the local tourism-service-provider companies and boost the economy. Additionally, financial investments play a crucial role in the development of little economies. In this sense, initial coin offerings (ICOs), which are the further development of the financial technologies (FinTech) and are based on BC, can lead to significant benefits, including increasing entrepreneurs' capital and solving the financial challenges of tourism ventures. However, the prosperity of ICOs is not well implied since this depends on human capital, the acceptance of cryptocurrency, and bonuses [44].

3.2.5. Decentralization and Traceability

Little and poor countries frequently suffer from high levels of corruption, and they have the urgency of establishing a reliable system. An apparent example is the country of Moldova, where, according to Ozdemir et al. [42], the establishment of BC technology has the ability to remove the corruption and boost the income of the citizens through decentralization and the elimination of the boundaries between the big and small players of the industry. Similarly, Tham and Sigala [45] argue that BC maintains equal opportunities for all actors of the tourism industry and develops an inclusive business environment, instead of a restricted and fragmented ecosystem. Indeed, Banerji et al. [46] argue that, through the decentralization of the processes and by making the digital-asset history immutable and transparent, BC minimizes the risk of fraud. Additionally, Dudin et al. [47], by using the example of the Russian Federation tourism sector, prove that governmental intervention and the use of BC is crucial for further development since, today, having only recreational resources in the country is not a guarantee of success in this sector.

Furthermore, thanks to its transparent nature, BC implementation assists in the development and growth of regions and national economies by advancing local agrotourism. BC technology, thanks to its distributed and transparent nature, ensures the traceability of the product provenance [10,48]. Therefore, it can benefit tourism that is related to wine and food tasting. Offering a local food and beverage with the certified quality and provenance, history, and traditions of the area certainly attracts tourists. In line with this, Baralla et al. [49] propose a BC-based system comprising smart contracts for tracking products in a transparent, reliable, and efficient way. The authors tested the proposed model in practice on the example of Sardinian (Italy) local food, and they illustrated the capacity of this technology for efficient information sharing, providing customers with the

ability to obtain detailed information regarding the product, and verifying its provenance and characteristics.

BC technology is increasingly used in the tourism sector for strategic and practical purposes [50]. Indeed, in the tourism industry, there are many examples of enhanced operational effectiveness, efficiencies, and profitability through BC technology application. Joo et al. [51], in their work, discuss several successful applications of BC technology in the tourism sector and conclude that it enables secure, reliable, and efficient decentralized systems, without the need for intermediaries, and it leads to innovative ecosystems and conducive businesses. Mofokeng and Matima [52] predict that combining BC technology with virtual reality and digital marketing will enlarge the impact of its application in the tourism industry, strengthen the advantages described above in this paragraph, and provide additional revenue. However, this tribe is in its early stage of development.

Valeri and Baggio [33] claim that there is a limited number of studies and business cases regarding the impact of BC technology adoption in the tourism industry. However, the existing data permitted the authors to conclude that this technology positively influences the overall productivity of companies through the automatization of routine processes, the minimization of the risk of fraud, ensuring the security of the data, the better management of contracts, and the simplification of payment methods.

The benefits of BC application in the tourism sector can be summarized as is shown in the following table (Table 2), which focuses on the main actors in the industry, on the specific repercussion that BC adoption brings to the identified stakeholder, and on the way of intervention, thereby achieving this result. The table was designed using the examples of previous academic works with similar methodology [53,54]. Precisely, the first column indicates the stakeholders who benefit from BC adoption, and then the metrics of BC implementation in the tourism sector are listed, and the descriptions of its interventions are provided. In the final column, the previous research is recorded.

Table 2. Benefits of BC technology for different stakeholders.

Stakeholders	Repercussions	Interventions	Ref.
Customers	Privacy protection	BC provides a “privacy-by-design” solution that helps to diversify the information and restrict the access to sensitive data.	[11,23]
	Convenient medical tourism	BC technology supports easy and secure communications without third parties and provides convenient payment methods, the automated disbursement of payments, the fulfilment of the obligations defined by the agreement, and the decreased cost of the service.	[24,25]
	Better planning of tourism activities	BC technology supports stakeholders’ interactions and information exchange on incredibly short notice and for safe travel, and especially during the COVID-19 pandemic. It synchronizes the processes and transactions of different actors, thereby cutting the costs, and simultaneously provides comfortable and integrated services to customers. BC ensures the security of space tourism.	[4,7,11,22,30–32,42]
	Interoperability	BC can be used for achieving interoperability, and to give the opportunity to customers to earn loyalty coins and to use them elsewhere in this sector.	[4]
Customers and society	Digitalized biometric identity system	BC simplifies the authentication process for customers by eliminating the need for paper documents requested in traditional systems. BC minimizes the risk of terrorism or criminal attacks through detecting people traveling with false documents.	[22,26]

Table 2. Cont.

Stakeholders	Repercussions	Interventions	Ref.
Customers and service providers	Eliminating intermediaries	Establishment of smart contracts and cryptocurrencies eliminates intermediaries, removes extra charges, reduces the costs of services, and simultaneously minimizes the misunderstanding and dissatisfaction among actors by making direct links between them.	[19,30,35,37–41]
	Synchronization and integration	Through synchronization, it is possible to have comprehensive information to avoid losing baggage (customers' comfort), for instance, and related costs (service providers' benefit)	[7]
	Customer loyalty	Customers are positively disposed towards the adoption of novel technologies by service providers. Thus, with this action, the companies achieve higher levels of customer loyalty.	[18–20]
Service providers	Improvement in data treatment	BC technology improves data collection and treatment; therefore, it supports the companies operating in the tourism sector to improve their product and services, as well as their profitability.	[6,9,33,34,50–52]
Whole industry	Improvement in review system	BC supports: (a) Collection of true data regarding consumers; (b) Protection of sensitive data from tampering or stealing; (c) Provision of the trustworthiness of reviews published by tourists (thus, ensures an immutable reputation for service providers); (d) Consumers' own personal data; BC gives customers the ability to manage their private information.	[21,22,27]
	Traceability	Through the traceability of the product provenance, BC technology supports local agrotourism and boosts the economies of the regions and the country.	[7,10,23,43,49]
	Security	Improving space tourism by the real-time analysis of the data, providing security related to constellations' collisions.	[29]
Little economies	Improvement in tourism-service quality	By establishing cryptocurrency payment methods, as well as creating direct links between different stakeholders, it is possible to promote local tourism and boost the economy.	[34,39,40,44,47,49]
Little and poor countries	Decentralization	BC, through decentralization, eliminates the inequality between small and large entities, creates a trusted system, and minimizes the risk of corruption.	[23,42,45,46]

Source: own elaboration

3.3. Challenges for BC Technology Adoption in Tourism Sector

BC technology, besides numerous advantages, and the potential for advancing the tourism industry, is characterized by some complications. For instance, there is a risk for hackers' attacks. According to Irannezhad and Mahadevan [7], the flawless development of the smart-contract code is crucially important in order to avoid exploitation by hackers and the utilization of content to their advantage, including money or confidential information. However, a well-developed BC system is resistant towards attacks. In more detail, successful attacks require the higher computational potential of the attacker, rather than an ordinary node. Attackers are advancing so that BC developers are too, and they are elaborating new systems that are increasingly resistant towards different kinds of attacks [55–57]. For instance, in business cases, it is mostly the partial centralization of the BC system that becomes necessary, and permissioned BCs are used that intend to have a definite number of authenticated member nodes to guarantee the reaching of consensus and to achieve better efficiency. Chen et al. [57] argue that denial-of-service (DoS) or network partition attacks can easily turn down these members. Even if there is a large number

of authenticated members, attacking a small number of them dramatically decreases the efficiency of the system. In response to these attacks, the authors propose a novel protocol named Eges, which uses different groups of authenticated members for different blocks and hides them in the pool of fake committee nodes. In this way, Eges ensures the high resistance of the system towards DoS and network partition attacks, and simultaneously achieves low latency.

Nevertheless, heretofore, none of the BCs protected the properties of owners in the case that the user's private key was lost or stolen and there was no way to recover it. This shifts all the responsibility from the intermediaries to the single owners of wallets and slows down the large-scale adoption of BC technology. Thees et al. [58] consider that the establishment of relevant common policies with the purpose of overcoming the abovementioned issues would boost the adoption of BC technology since, presently, different countries react individually in this sense and generate further confusion. On the other hand, Kim et al. [59], in their research, developed recoverable transactions. In the proposed model, it is possible to send crypto assets to the backup account after a definite time (in the case of owner death, for instance).

It is noteworthy that, despite the long discussion in the previous section regarding the reliability and trustworthiness of the data collected and managed through BC technology, the data content cannot be controlled by the technology. Therefore, there is still a risk of users registering false information on the tourism crowdsourcing platforms, for instance. Therefore, Veloso et al. [60] propose the development of a BC solution in relation to trust and reputation models. According to Tao et al. [61], some errors or inaccuracy may take place during the data entry in the blockchain, including mistakes in the description of physical resources that lead to the loss of trust among stakeholders or towards the platform. The authors conclude that a strong correlation between the physical resources and the virtual part is crucially important. BC integration with the Internet of Things (IoT) is helpful where they are applicable, meaning that the automatization of the data collection and registration on the BC platform increases the reliability of the information [62]. Leng et al. [63] discuss the optimization and self-learning ability of BC technology. The authors propose a novel iterative bilevel hybrid intelligence model named ManuChain, and they argue that it is critical for realizing system sustainability, the success of product/service providers, and the further development of industries.

Besides technical barriers, numerous strategic challenges have taken place in BC implementation since it is still a young and unexplored technology. Valeri and Baggio [33] argue that there is a lack of academic research and practical cases of BC implementation in the tourism industry, and they propose increasing the interest of researchers in this subject. With the aim of solving the abovementioned problem, Sharma et al. [64] studied developed and developing countries, represented by the Netherlands and India, and they illustrate the main drivers and challenges for BC implementation in the tourism industry. Obviously, the results were different between these countries: while the motivation for BC adoption in India is the expectation of potential cost reduction, in the Netherlands, risk management appeared as the main driver. On the other hand, Dutch tourism-service-provider firms consider market uncertainty as an obstructive factor, while India suffers from a lack of government regulations and policy.

Zhang et al. [65] discuss the problem related to the interoperability of the heterogeneous BC technologies that are implemented in the different sections of the tourism sectors. Precisely, the authors argue that, nowadays, the exploited BC systems are built on single-chain platforms that definitely support companies in business operations, such as tracking hotel guests, but they cannot be closely connected when it is necessary. For instance, users are not able to choose a less-congested-network BC platform on which to make transaction operations. The authors propose a multichain solution that includes the diverse services of the tourism industry in a way that enables the participants to interact with each other. In order to prove the significance of the proposed system, the authors tested it in practice, with a positive result.

Thees et al. [58] pose a question regarding the convenience of supporting the full adoption of BC with regulation or contrarily. According to Rashideh [4], the full implementation and spread of BC technology in the tourism sector may require the establishment of a central agency in order to develop a persistent network of stakeholders, sustain it over time, and avoid potential illegal activities. On the other hand, Irannezhad and Mahadevan [7] argue that the systematization of these processes may cause the centralization and formation of new middlemen in the tourism industry. Nam et al. [30] also suppose that the adoption of BC technology itself, despite its distributed nature, may result in the appearance of intermediaries in certain activities, such as providing coins/tokens in the case of cryptocurrency spread. Fragniere et al. [66], instead, propose the collaboration and competition of industry actors through smart contracts and under the governance of the state.

According to Rashideh [4], the collaborative approach of all the actors in the tourism industry, including policy makers, service providers, marketers, and tourists, is the solution to overcoming the issues related to BC adoption. However, collaboration is usually challenging. Additionally, Melkic and Čavlek [67] consider that, while there is the absence of the full recognition of BC technology, and a lack of awareness among the stakeholders in the tourism industry, it will barely achieve its potential of revolutionizing this sector. Erceg et al. [68] discuss a similar problem with the example of Macedonia and Croatia. The authors observed that the obstacles to BC adoption were related mainly to the absence of relevant policies in the countries, to the low awareness of the actors in the tourism sector, and to the environment, which was not ready to accept a BC-based system in the sense of infrastructure and connectivity. Similarly, Rana et al. [2] argue that, without preparing the ecosystem for BC adoption, this process is unlikely to be successful in many countries. However, the current COVID-19 pandemic might hasten the digitization process and, subsequently, the adoption of BC technology [69].

Additionally, for the smooth adoption of BC technology, Fragniere et al. [66] propose its step-by-step implementation since it is a radical innovation. Similarly, Aghaei et al. [70] assume that, in cases when the full implementation of BC technology is not convenient because of complexity, launching it only partially and not including all business operations may simplify the adoption of this technology. However, the authors also highlight other challenges for BC implementation in the tourism industry, which include low awareness of this technology and a lack of competences, as well as the absence of necessary policies, and they propose the collaboration of researchers, practitioners, and the government for the successful adoption of BC technology. Similarly, Filimonau and Naumova [40] emphasize the problem of low awareness and confusion in the hospitality-sector society regarding BC technology and its potential for further development. This applies to the business sector as well as to policy makers, and training is seen by the authors as a unique solution to promote innovative forward thinking and to reach hospitality-industry growth without sacrificing socioeconomic and environmental externalities.

Fragniere et al. [66], based on a study of the Swiss tourism economy and in-depth interviews with 18 business operators, confirmed the issues related to the lack of technical knowledge that leads to the idealization of BC technology and to confusion with regarding its real potential, as well as the need for “coopetition” (cooperation and competition). The authors elaborate several proposals for the successful implementation of BC technology in the tourism industry, basically taking into consideration the huge role of governmental interference and the overall level of digitization. They argue that the tourism industry is extremely fragmented, and that BC technology adoption can be the solution. However, the industry itself is not able to incrementally implement it without governmental intervention, the establishment of top-down research projects, and practical examples of BC-based businesses and financial support.

Treiblmaier [71] debates that the basis of all challenges related to BC adoption is the confusion in the terms due to the low awareness of this technology. He also asserts that BC is a “collective term”, and it includes several elements with definite functions.

Treiblmaier [71] supposes that the impact of each element is different for the tourism industry, and it is not correct to discuss the overall impact of BC technology. The author suggests that researchers analyze the impact of the BC elements on the tourism industry one by one, starting from the top of the technology stack.

The challenges related to BC adoption in the tourism industry, according to the literature analyzed in this section, are summarized below in Figure 2.

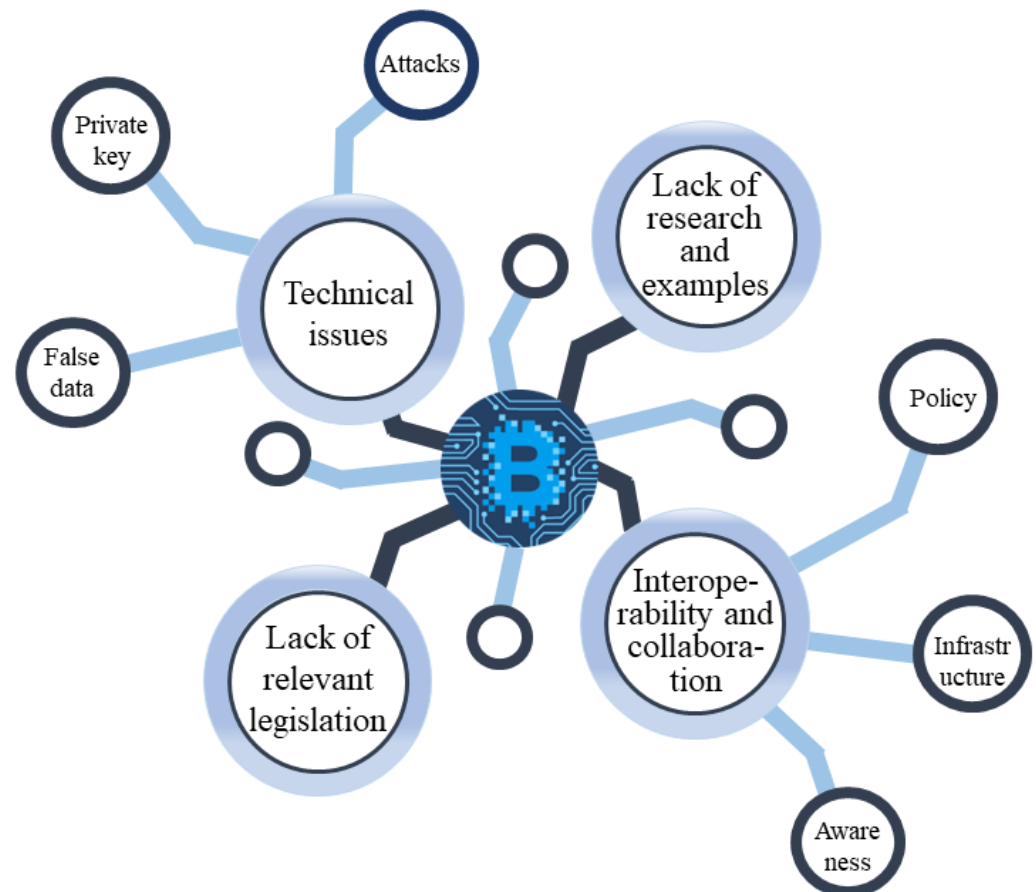


Figure 2. Challenges of BC implementation. Source: own elaboration.

4. Conclusions

4.1. Evidence Obtained

The results of the research illustrate that there is substantial interest in the adoption of BC technology in the tourism industry. This novel technology has great potential to revolutionize this sector; to help little economies to strengthen and shift towards the level of developed countries; and to support pure countries in the elimination of corruption, in the creation of a trusted system, and to stimulate equality between small and big entities.

BC adoption positively affects the service quality offered by the tourism sector and benefits different stakeholders. The list of these benefits is very lengthy and includes, precisely: (a) the provision of a “privacy-by-design” solution, which ensures the data privacy that is especially important for medical tourism; (b) the better planning of tourism services by synchronizing the processes, preventing the loss of luggage, avoiding the duplication of activities related to the control, and cutting the cost and time necessary to obtain some product or services; (c) it improves the review system by collecting and protecting true data; (d) BC ensures security thanks to the real-time analysis of the data; and (e) it provides traceability, which supports agrotourism.

Nevertheless, the adoption of BC technology, besides numerous benefits, causes some issues in terms of the process, data, and infrastructure levels [72]. Precisely, this technology is not free from hackers’ attacks and, once the private key is lost or stolen, there is no way

to recover it. Moreover, the technology is not able to differentiate true and false data, and so it cannot check the content, but its authorship and immutability are ensured [73].

The number of studies [33,40,66,71] prove that there is a lack of research regarding BC implementation in the tourism sector and low awareness among the stakeholders of this industry, which lead to the confusion that is linked to the real potentials of this technology.

Additionally, since the tourism sector is characterized by a fragmented nature, the synchronization of the processes and the preparation of the whole ecosystem for BC adoption are crucially important.

In sum, this research by SLR investigated the benefits and obstacles of BC adoption in the tourism sector. It is evident from the results that the majority of the academic works illustrate the benefits of the implementation of this technology and explain its potential by providing diverse models of BC-based systems. However, since BC is a young technology, numerous challenges appear on the path to its full implementation in the tourism industry.

The solutions suggested in the previous studies basically depend on the achievement of a collaborative approach among the stakeholders in the industry, the deepening of academic research in the field, the testing of more models of BC-based systems, and most important, the establishment of relevant policies by governments. Moreover, these policies should be compatible worldwide.

4.2. Originality and Limitations

There are a limited number of studies regarding BC implementation in the tourism industry, which is because of the youngness of this technology. To the best of our knowledge, there are no academic articles dealing with the advantages and disadvantages of BC adoption in the tourism sector through SLR methodology that involve as many aspects of its impact as are discussed in this paper.

However, the research might have some limitations. Thus, the search criteria that was chosen by the authors might not include all the articles that investigate the identified topic. However, we strongly believe that the outcome of this research is significant for the audience. Despite this limit, we believe that the results are important to drive other researchers to identify other papers on this subject.

4.3. Implications

The implications for the theory, practice, policy, and research of this work are significant. It provides relevant information regarding the potential of BC adoption on the development of the tourism industry, as well as the main obstacles and barriers for its adoption. The paper also deals with the potential solutions for solving identified problems.

Taking into consideration the outputs of the study, new BC-based-system models can be developed. In addition, practitioners may find this research useful for obtaining information about this novel technology and may be able to adopt it with less confusion and obstacles. The results of the study might be beneficial for policy makers in the establishment of relevant legislation for the facilitation of BC implementation. Furthermore, this article may become a stimulus for future researchers to deepen the analyses in different directions.

4.4. Future Research Direction

The article analyzes the academic works that deal with BC technology application in the tourism sector, and the conclusions are made based on the outputs of the identified studies. Researchers in this field agree on the positive impacts of BC implementation in the tourism industry: improving business processes, the quality of offered products/services, data treatment and security, as well as the country's economy as a whole. However, some researchers in other fields [72,73] argue that BC technology itself suffers from a number of security issues. Therefore, future research should investigate the major challenges of BC technology and discuss their reflections on the tourism sector.

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