Implementation of Blockchain Technology in the Tourism Industry: A Systematic Literature Review

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Abstract

- *Purpose/objectives*: in the last ten years, the implementation of blockchain (BC) technology offers many opportunities for all economic sectors such as finance, health, trade, agriculture, etc. This technology based on distributed digital ledger collects and stores data permanently and in an ordered way, allowing stakeholders to have access to information cryptologically protected. Since 2014, the blockchain technology has been introduced in the tourism industry with the goal to improve this sector. In this contest the present study intents to: 1) carrying out a systematic literature review (SLR) on the implementation of BC technology in tourism economic sector; 2) providing an analysis of its advantages and future challenges.
- *Design/methodology*: The SLR was conducted using detailed criteria to identify scientific papers. Moreover, specific keywords and databases were chosen. The time frame considered included the years 2017–2021 (31st March).
- *Findings*: the review analysis indicates that the use of BC technology contributes to increase transparency and safety of the services provided and decrease cost above all of tourist. However, some challenges remain open which further studies could try to solve.
- *Originality/value*: to date the academic literature published on this topic is limited, so these aspects have not yet been adequately analyzed. Therefore, the present article intends to show an update framework about BC technology and its impact on tourism industry.
- *Possible practical implications*: results might be helpful for stakeholders understand the potential impact of this technology on the business tourism ecosystem and for scholars to better define future research areas and trend less explored in this field.

Keywords

Blockchain; distributed ledger technology; tourism; systematic literature review; smart contract
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Introduction

Digitalization of the economy is one of the most currently dynamic changes, which opens new possibilities in creating business models. The new technologies such as information and communication technologies (ICT), blockchain (BC), internet of things (IoT) and artificial intelligence (AI) are transforming the way to share useful data among actors involve in the economics system. Among these technologies BC presents a whole new approach, drawing much attention from scholars

in many different application fields. Blockchain is a type of distributed ledger technology (DLT) that originally was part of bitcoin protocol, a cryptocurrency launched in 2009 by an anonymous inventor, known under the pseudonym of Satoshi Nakamoto (Giungato, et al., 2017). Its success has made this virtual money as a current currency in the financial transactions. Subsequently, BC is become revolutionary not only in the financial world but also in different economic sectors such as: industry, economic, health, agriculture etc., contributing for efficient, transparent and sustainable productions or services (Rana, et al. 2021). BC potentially reduces costs for both companies and costumers, increases process efficiency, improves personal data protection and the level of trust among business partners as well as reduces the role of intermediaries (Rashideh, 2020).

BC, often is connected with the other technologies, transforming and modernizing the industrial sector in the so-called industry 4.0. Presently, there is no univocal and shared definition of Blockchain. According to Treiblmaier (2018) it is defined as a digital, decentralized and distributed ledger where each transaction is added and logged in chronological order with the aim of creating tamperproof and permanent records. Consequently, BC is a new decentralized and distributed digital ledger that collects and stores information permanently and in an ordered way, allowing stakeholders to have access, cryptologically protected, to data.

Since 2014 BC has been applied also in the tourism and hospitality industry with the goal to increase safety and revenues of the stakeholders (Irannezhad and Mahadevan, 2020). The main function of this industry sector is serving travelers. Its business ecosystem is characterized by high competition, labor-intensive and, complex business relationships among its actors such as airline companies, hoteliers, tour operators, travel agents, insurance firms, government entities payment service providers, etc. (Treiblmaier and Önder, 2018). Currently, the introduction of technological innovations (i.e., ICT, AI, smartphones and mobile devices, etc.) has launched a new tourism business models (Consumer-to-Consumer or C2C) called "smart tourism" or "ambience intelligent tourism" or "etourism" which poses some challenges such as big data storage and its security (Buhalis, 2020; Wei et al., 2020; Yadav et al., 2021). Thus, BC could contribute to solve these disadvantages decreasing competition among stakeholders, improving costumer's services and reducing service costs (Rashideh, 2020). Although introduction of BC in the tourist and hospitality industry is still in the early stage its importance is raising so much that only in the first quarter of 2019, 15.4 million of US$ was raised by tourism blockchain-based startups (Irannezhad and Mahadevan, 2020). Some benefits, in fact, including both travel agencies and tourists. For instance, the former using BC technology can interact with multiple currencies or booking a tour easily and safety, while the latter can communicate directly with service providers, thus eliminating intermediaries (e.g., Airbnb, online travel agency – OTAs, platforms such as Tripadvisor and Booking.com, etc.).

To date no systematic literature review (SLR) was considered on these topics. Thus, it is important to investigate the applications of BC technology in the tourism industry in the perspectives on analyzing advantages and disadvantages of its use. To reach these objects, the present work is aimed at: 1) carrying out a SLR, offering an updating overview about BC technology applications from the perspective of improve quality and safety of vacation industry; 2) providing an analysis of current developments related to tourism and hospitality sector and BC technology, focusing on some examples of its advantages and challenges in the perspective of reducing cost and enhancing services provided by tourism industry actors.

Results, might be helpful for tourist operators to understand the potential impact of this technology on business model and for researchers to better define future research areas less explored in this field.

Research methodology

A SRL consists in a specific procedure for identifying, selecting, analyzing and synthesizing the relevant articles on given topic. To reach these goals it has to be performed in a rigorous, transparent and replicable way (Greenhalgh, 2014). This procedure leads to robust results which provide a deep analysis (Christofi et al., 2019) and a comprehensive and high-quality state-of-the-art review on the research area investigated. According to Giacomarra et al. (2020) this methodology has several advantages compared to traditional reviews, such as: a) it contributes to increase the reliability of the results; b) reduce errors, because of process is based on the replicability of process; c) allows for data

synthesis focusing on specific research area, and; e) provides a framework that can integrate extant knowledge. Thus, a specific protocol was made (Booth et al., 2016; Rana et al., 2021), assuring the quality performance of this method and reducing loss of scientific information (Vrontis and Christofi, 2019). In the SLR's first step, the conceptual boundaries were defined (Vrontis and Christofi, 2019; Giacomarra, et al., 2020). Nevertheless, due to the vast and increasingly expanding literature on the application of BC, SLR has focused on how this technology is employing in the tourism sector for improving agency services and tourist travels. In the second step, it was selected scientific papers using the Boolean OR/AND operator, creating a search string for the respective group (Giacomarra, et al., 2019) associate with the following keywords: blockchain AND tourism OR vacation OR leisure OR holiday AND industry. Because the application of BC into tourism sector is a new phenomenon, the time period considered for literature review was between 2017 and 2021 (31 March).

The third step consisted in defining the databases which supporting scientific research. Among several of them Scopus, Science Direct, and Web of Science databases were chosen. After downloading the papers, the authors selected the studies that fit the follow criteria: review article, research article, mini review, chapter of book. The authors excluded the other documents such as note, letter, conference article/review, editorials, interviews, etc. (Leonidou, et al., 2018; Christofi, et al., 2019; Cui, et al., 2021). Also, articles not published in English and duplicates were eliminated. In the figure 1 is shown the flowchart of the paper process selections.

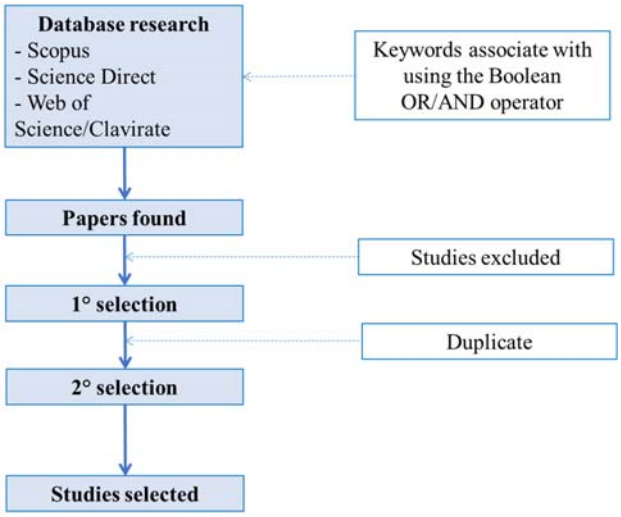

Figure no. *1*. Flowchart of paper selection processes

Results and discussion

In this section we presented the results deriving from SLS's analysis according to the work's two major objectives. In particular, we have divided the paragraph into two subparagraphs that describe firstly the outcomes of SRL selection of papers and secondly the review process of studies chosen.

First review objective results

The first goal of this paper was to quantify the existing studies on the applications of BC technology in the tourism sector. In Table 1 are shown the results of SLR from 2017 to 31st March 2021. Regarding the studies in found in the Scopus database they were 45, whereas those in Web of science and Science direct were 4 and 6 respectively. After eliminating papers that did not fit criteria previously chosen, their number decreased to 25- Scopus, 4 - Web of Science and 6 - Science Direct. India is the nation with the most paper (4) published in this field, followed by Australia (3), Austria (3), United the Kingdom (3), USA (3), Italy (2), Russian Federation (2), Taiwan (2), Turkey (2) and other countries (4). The trend of publications indicates that research interest in topic has dramatically increased in the

last five years from 2017 (1 study) to 2020 (15 studies). In the last 3 months of 2021, 5 works have already been published.

Table no. 1. Number of papers found in the principal scientific literature databases using a specific group of keywords as on 31st March 2021

Keywords	Database		
	Scopus	**Web of Science/Clavirate**	**Science Direct**
Blockchain AND tourism AND industry:			
Before selection	45	4	6
After selection	**25**	**4**	**6**
Blockchain AND vacation AND industry:			
Before selection	1	0	0
After selection	**0**	**0**	**0**
Blockchain AND leisure AND industry:			
Before selection	6	0	0
After selection	**0**	**0**	**0**
Blockchain AND holiday AND industry:			
Before selection	42	0	0
After selection	**0**	**0**	**0**

Also, from the SLR emerge that only the term tourism was useful for the analysis since no papers were found using the others keywords.

Second review objective

In this section we analyzed the potential application of BC technology in the tourism sector and its advantage and future challenges. Presently, the introduction of new technologies (e.g., such as smart sensors, big data, machine learning) has launched new tourism business model called "smart tourism" (SmT) which uses different tools to improve connectivity, exchange information and mapping costumers' choices (Yadav, et al., 2021). However, the introduction of SmT poses some questions about privacy, security and management of data by intermediary companies. For ensuring data authenticity, avoiding manipulation from unethical stakeholders, and protecting costumers' privacy the BC technology might be a tool for solving these questions (Line, et al., 2020). Some travel compagnies, in fact, such as LockTrip, Globaltourist, Winding Tree (Yadav, et al., 2021) and Travel Chain (Line, et al., 2020) have carried out a platform or a system based on BC technology for protecting both their privacy and that of customers. For instance, Travel Chain has created a BC platform where travelers share safety their information such as gender, age, purchases, location, stays in accommodations, search history and other activities (Line et al., 2020). In exchange for this information, consumers receive a voucher, which can be spent for booking flights or hotels as well as renting a car. Also, tourist destinations can benefit from a digital ledger because it provides an immutable reputation and rating system where review data cannot be removed or altered by fake accounts (Karode, et al., 2020). In such a way, the online review system will increase its reliable thanks to a reputable and immutable information system of a tourist destination (Irannezhad and Mahadevan, 2020). As results BC technology can contribute to: a) obtain costumers true data; b) protect their personal data in a distributed ledger, c) offer a reliable review of a tourist service, and; d) offer empowering costumers by enabling them to own and control their personal information.

BC could also simplify and accelerate the procedure of travelers. In fact, during their journeys they are constantly requested their identification from booking airplane seat to hotel check-in. These processes can be easily done by applying blockchain so as digital identification by using secure biometric identity system (Line et al., 2020). This procedure can reduce potential security risks, such as terrorism or criminal attacks, revealing who travel with false documents. Rashideh (2020) illustrates the Sita company, leading specialist in application of new technologies in air transport sector (i.e., blockchain, communications and information technology, artificial intelligence, etc.), which has implemented a technology based on blockchain and secure biometric identity system that allows tourists do not use identification cards, passports, or drivers' licenses but wearable or mobile tool during their journeys.

Also Explore carries out a similar service consisting in two-step authentication which prevents data leakage and its possible misuse. This is done by using smart contracts that allow access for only legitimate sources like passport offices, so that can add visa approval (Yadav et al., 2021). Smart contracts, is one of another area of application of BC in the tourism industry.

Tourism sector is characterized by a fragmented business nature with a high number of contracts and transactions among several actors, often lead to several security issues, disputes among parties, delay and high cost (Irannezhad and Mahadevan, 2020). The introduction of smart contracts has contributed to decreasing these issued. Its aim, in fact, is that to meet the consumer directly with the service providers by eliminating the intermediary from the tourism market, reducing thus cost, improving efficiency and accelerating services request by the travels (Karagoz Zeren and Demirel, 2020). Usually, in the traditional travel industry, intermediary have a fundamental role since it provide a service for clients and producers consisting in reservations and payments of airplane ticks, restaurant or hotel accommodations. For these services tour operator takes commission feeds. Thus, using cryptocurrency (i.e., Bitcoins, Ethereum, etc.) as a payment method and smart contract for business dealings or transactions between parties, travelers and producers can saving extra charges associated with intermediary services. However, the use of cryptocurrency for payment system depends on both internal and external companies' factors such as: 1) personal characteristics of owner/managers; 2) perceived ease of use; 3) perceived usefulness (Nuryyev, et al., 2020).

Currently, the use of cryptovalutes to purchase travel products is increasing worldwide (Ozdemir, et al., 2020). Examples in the tourism industry that accept cryptocurrency as a payment include CheapAir, Expedia, One Shot Hotels, and Webjet (Önder and Treiblmaier, 2018). In particular, Tourism Union International (TUI) a German-based travel company using blockchain technology and related cryptocurrencies has implemented a process for their clients to book and pay for their reservations or for obtaining other services (Rashideh, 2020). Moreover, TUI intends to solve other problems such as lack of transparency about the hotel's capacities, different rates at different source markets, manual communications and loss of information, introducing smart contract associate with BC technology (Irannezhad and Mahadevan, 2020). Some others private companies upcoming examples who are introducing this technology are Travelflex, Tripago, Roomdao (Yadav, et al., 2021), CryptoBnB application by AirBnB, UBER (Irannezhad and Mahadevan, 2020), Singapore airline (KrisPay project), Aeron (Karagoz Zeren and Demirel, 2020). Some public promotion tourism agencies have also started using cryptocurrencies to promote its local tourism industry. Specifically, Kwok and Koh (2019) underline that the small islands could take advantage from introducing digital ledger in the tourism sector. They affirm, in fact, the small territories due to their economies principally base on accommodation and tourism services they could be more receptive to this technology so that improving their services and product qualities. Consequently, they could enable to pass developed economies thanks to efficient leisure innovative services offered. For instance, in 2018 the Caribbean Aruba island launched a platform base on BC technology which help to connect the customers with the major airlines (i.e., Lufthansa and Air New Zealand) and hotels present on the island (Irannezhad and Mahadevan, 2020). Moreover, the small and poor territories often due to high corruption rate need a trusted system to over-come this plague. Ozdemir, et al., (2019), state that the adoption in Moldova of a digital ledger technology might eliminate the corruption, so increasing population income. Thus, BC could help shifting away from a restricted and fragmented nature of tourism business ecosystems to one more inclusive which allows providing equal opportunities to both bigger and small tourism players (Tham and Sigala, 2020).

The use of BC technology in the travel industry concerns also airlines companies. Lufthansa, Austrian Airlines, Swiss Air, Air New Zealand, Brussels Airlines and Eurowings are exploring the use the blockchain for their company to reduce human errors in their processing such as overbooking, double-booking, cutting reconciliation cost, etc. For instance, BC could be extraordinarily tool in monitoring the movement of baggage in airport preventing its stealing, lost, breaking or manumission. Yearly, airline companies spent 500 million dollars for these problems. A shared distributed ledger among different airports could allow accurately tracing bags as they move with a traveler throughout their journey, identify their mishandling or lost within airports (Irannezhad and Mahadevan, 2020). BC also offers the possibility for implementing interoperability. This could be used in the redemption of loyalty

points and airline miles, simplifying processes among all partners participants, enabling efficient payment to firms or travelers which are part of the loyalty scheme (Irannezhad and Mahadevan, 2020).

This new technology can synchronize and integrate inter-firm and intra-firm transactions in one-stop shop for tourists improving transparency, traceability and traceability of the service provide by hotel, airline company, car rental, etc. It can give connectivity among different tourist industry actors without a need for centralizing data in one single system. Also, in one-stop shop costumers could find all information that they need continuously updated (Irannezhad and Mahadevan, 2020). According to Treiblmaier and Önder (2018) reduction in transaction cost due to BC technology implementations, will have a substantial impact on organizational structures of tourism ecosystem, decreasing yield cost in some areas and increases in others. In any case its use could have a positive impact on the overall productivity of companies and organizations by better automating and reducing the load of routine processes (Valeri and Baggio, 2020).

Currently, BC is used in different economic sectors for automatic update of discounts, incentives and rewards. If it is applied in the tourist sector could help customers found less costly offers. This could be useful for hiring/renting cars, booking flights and hotels, and purchasing insurance in a more effective manner due to the flow of information is instantaneous. With this tool, travelers would participate actively to play is journey and if they cannot travel owing to some circumstances, they will exchange their bookings reducing cost (Irannezhad and Mahadevan, 2020). Some decentralized applications (DApps) connected with BC technology and currently in use are Travala and TravelCoin Foundation (Yadav et al., 2021). Moreover, BC could be also enabling the service providers to check the authenticity of the customers, so as to propose them tailored discounts or speed up rewards delivery (Rashideh, 2020).

Another potential application of BC is in the travel booking agencies. Since 2016 the Australian travel booking company called Webjet has adopted BC technology among its partners (e.g., European travel agency Thomas Cook, China's DidaTravel, Indonesia's Mitra Global and Singapore's Far East Hospitality) to minimize the costly errors that often occur in various stages of booking (Irannezhad and Mahadevan, 2020). Also, tourism associate with wine and food tasting might advantage from BC technology application. Food and beverage produced in specific territories, in fact, are becoming a good "recipe" to attract tourist and to promote an area. However, for this type of tourism to succeed it is fundamental assure that all food provenance is clearly certified. In this regard, Baralla et al., 2021 have developed system based on blockchain-based platform and smart contracts for tracking food items with transparency, efficiency and trustworthiness. The authors then have applied this system to some local products from Sardinia (Italy), in order to assure share information among all the actors involve in the food supply chain. In particular, thanks to the blockchain public ledger, tourists can access to the detailed information of a product, verifying its provenance and characteristics. Thus, this technology offering huge potential growth for local territories, cities, regional, and national economies.

The virtual reality market seems to be the next frontier in digital marketing and the tourism industry. Although it is still in early state the association between merged reality and distributed ledger technologies, is bound to revolutionize and disrupt the tourism business sector in the next years. A study carried out by Mofokeng and Matima (2018), suggest that this association of technologies can positively impact the tourism industry, providing an additional revenue.

In the table 2 are summarized the of BC intervention areas in hospitality and tourism industry.

Regarding future challenges on full adoption and expansion of BC technology in the tourism industry there is a need for creating a central agency which maintain a consistent network among the stakeholders while, at the same time, preventing the occurrence of any illegal activities (Rashideh, 2020). However, according to Irannezhad and Mahadevan (2020) the centralization of information could lead to new oligopolies or monopolies in tourism industry.

Table no. 2. BC intervention areas, mechanism involved and beneficiaries in tourism industry.

Intervention areas	Mechanism involved	Beneficiaries
Costs and speed efficiency	Reduce cost by implementing smart contracts elimination of paper records, manual communication and intermediary cost.	Customers and service providers
Improve the intra-firm processes	Enable to reduce human errors, double booking or baggage handling, manual and paper-based communication.	Airline companies
Enable integration, transparency, tracking and tracing	One-stop shop for customers by bundling several types of travel and tourism services	Customers
Inter-operability	Inter-operability of loyalty reward points and other services such as Wi-Fi	Airline companies
Enable trust and authenticity	Provide an immutable reputation and rating system where review data cannot be removed or altered and voting on the popularity of a destination can be compromised through fake accounts	Customers and tourist destination
Enabling the sharing economy	Provide the new type of peer-to-peer market without the need for intermediaries and expand the market by bundling several types of travel and tourism services.	Customers and destination tourists
Risk reduction	Address the holistic source of risk of fake identities, profiles and services such as verifying the provenance of rental accommodation ownership and validating the identities of individuals. Increase privacy by separating public and private keys and reduce the hacking threads given that the information is not stored with one company per se	All the stakeholders of the tourist industry
Food and wine tourism	A blockchain platform could guarantee the origin and provenance of food items in wine and food tourism context	Customers and food and wine industry

Source: modified from Irannezhad and Mahadevan, 2020

Another issue underline by Rashideh (2020) is that the adopting this technology requires substantial collaboration among tourism stakeholders such as governments, tourists, businesses and destination marketing organizations, but often this is not easy. Nevertheless, if BC is not fully recognized by tourism companies as well as stakeholders are not familiar with the use of this technology, changes in the industry sector will be very limited (Melkic and Čavlek, 2020). This problem has been underlined by Erceg et al. (2020) in a study carried out in Macedonia and Croatia where the diffusion of this technology is restricted for lacking of: a) national system regulation; b) awareness of the tourist actors in relation to the importance of BC technology; c) infrastructure and connectivity to implement blockchain ecosystem. Specifically, if this last aspect is not improved in many countries the introduction of this technology is destined to fail (Rana et al. 2021). However, Önder and Gunter (2020) state that the current COVID-19 pandemic could trigger a boost in digitization worldwide and consequently also to the implementation of BC technology.

Also, BC technology is not free from hackers' attacks. Irannezhad and Mahadevan (2020) underline that if there are flaws in the code associate with a smart contract it may be exploited by hackers to send its contents to their own accounts. This is particularly dangerous if these smart accounts are used to store large amounts of money or contain confidential information.

The loss or stolen of a blockchain user's private key is another issue since is hard in the cyber world to recovery it. Although it is necessary to implement a legislation against the previously mentioned risks, some scholars state that this may stifle the growth of blockchain. According to Thees et al. (2020) although currently there are any common regulations worldwide, each country is reacting differently in terms of legal regulations and frame conditions. Also, it is unclear whether legislation should precede the full adoption of BC or vice versa. These problems remain open, and only the time could tell us if this technology is suitable for the development of this sector.

Conclusions

With the growing dependence of the economy of many countries on the tourism industry there is an urgent need to improve this sector. However, whilst the innovation technologies enhance the quality of

tourism services offered on the other hands jeopardizes their data privacy and security. Distributed ledger technology could lead to improve transparency and safety in tourism services, encourage new market types where the action of the intermediation on the tourism industry is reduced. In this paper has been presented a SLR on the application of the BC technology on the tourism industry. The study has emphasized not only the advantages of blockchain technology, but also the disadvantages connected to its implementation in the tourism industry.

Results underline the early stage of the implementation of this technology which corresponds a limited number of studies. Moreover, the SRL show that all sectors of the hospitality and tourism industry can be positively affected by the BC technology. In particular could be a gamechanger tool in the tourism industry given its ability to improve several important aspects of this sector such as safety, transparency, immutability, inter-operability, peer-to-peer transaction. Moreover, it can help reducing cost for the stakeholder and in particular for tourists, as well as the risk of fake identities or fake review data. However, beside advantages some challengers have been identified. These are many and require a huge economic and scientific efforts to be sole, but the results could advantage many actors of tourism sector. To do so, future studies have the task to solve these problems, which concern private and public administrators as well as scholars. The former has the task of accelerating the implementation of BC technology in the tourism business ecosystem. This could be done facilitating the introduction of BCT in national regulations. About the scholars, they have to contribute to improve continuously services tourism so that to develop all the territories and particularly those disadvantaged.

Finally, we underline that it is not excluded that the choice of criteria may not have contributed identified all articles regarding the topic analyzed. Nevertheless, although this limit we believe that results are important to drive other researchers in identifying other papers on this subject.

References

Baralla, G., Pinna, A., Tonelli, R., Marchesi, M. and Ibba, S., 2021. Ensuring transparency and traceability of food local products: A blockchain application to a smart tourism region. *Concurrency Computation*, 33(1), pp.1-18.

Booth, A., Sutton, A., Papaioannou, D., 2016. *Systematic Approaches to a Successful Literature Review*, 2nd ed. London, UK.: Sage Publications.

Buhalis, D., 2019. Technology in tourism-from information communication technologies to eTourism and smart tourism towards ambient intelligence tourism: a perspective article. *Tourism Review*, 75(1), pp.267-272.

Christofi, M., Vrontis, D., Thrassou, A. and Shams, S.R., 2019. Triggering technological innovation through cross-border mergers and acquisitions: A micro-foundational perspective. *Technological Forecasting and Social Change*, 146, pp.148-166.

Cui, Q., Xia, Y., Wu, Q. Qing Chang, Q., Niu, K. and Zhao, Y., 2021. A meta-analysis of the reproducibility of food frequency questionnaires in nutritional epidemiological studies. *International Journal of Behavioral Nutrition and Physical Activity*, 18(12), https://doi.org/10.1186/s12966-020-01078-4.

Erceg, A., Sekuloska, J.D. and Kelic, I., 2020. Blockchain in the tourism industry - A review of the situation in Croatia and Macedonia. Informatics, 7(1), pp.1-16.

Giungato, P., Rana, R.L., Tarabella, A. and Tricase, C., 2017. Current Trends in Sustainability of Bitcoins and Related Blockchain Technology. *Sustainability*, 9, Article number: 2214.

Irannezhad, E. and Mahadevan, R., 2020. Is blockchain tourism's new hope? *Journal of Hospitality and Tourism Technology*, 12(1), pp.85-96.

Karode, T., Werapun, W. and Arpornthip, T., 2020. Blockchain-based global travel review framework. *International Journal of Advanced Computer Science and Applications*, 11(8), pp.90-99.

Karagoz Zeren, S. and Demirel, E., 2020. Blockchain Based Smart Contract Applications. In: *Digital Business Strategies in Blockchain Ecosystems - Transformational Design and Future of Global Business* (Umit Hacioglu Editor). Springer Nature AG, Switzerland, doi:10.1007/978-3-030-29739-8_28.

Kwok, A.O.J. and Koh, S.G.M., 2019. Is blockchain technology a watershed for tourism development? *Current Issues in Tourism*, 22(20), pp.2447-2452.

Leonidou, E., Christofi, M., Vrontis, D. and Thrassou, A., 2018. An integrative framework of stakeholder engagement for innovation management and entrepreneurship development. *Journal of Business Research*, 119, pp.245-258.

Line, N.D., Dogru, T., El-Manstrly, D., Buoye, A., Malthouse, E. and Kandampully, J. 2020, Control, use and ownership of big data: A reciprocal view of customer big data value in the hospitality and tourism industry. *Tourism Management*, 80, Article number: 104106.

Melkic, S. and Čavlek, N., 2020. The impact of blockchain technology on tourism intermediation. *Tourism: An International Interdisciplinary Journal*, 68(2), pp.130-143.

Nuryyev, G., Wang, Y., Achyldurdyyeva, J., Jaw, B., Yeh, Y., Lin, H. and Wu, L., 2020. Blockchain technology adoption behavior and sustainability of the business in tourism and hospitality SMEs: An empirical study. *Sustainability,* 12(3), Article number: 1256.

Mofokeng, N.E.M. and Matima, T.K., 2018. Future tourism trends: Virtual reality based tourism utilizing distributed ledger technologies. *African Journal of Hospitality, Tourism and Leisure*, 7(3), pp.1-14.

Önder, I., and Treiblmaier, H., 2018. Blockchain and tourism: Three research propositions. *Annals of Tourism Research*, 72, pp.180-182.

Önder, I. and Gunter, U., 2020. Blockchain: Is it the future for the tourism and hospitality industry? *Tourism Economics*. pp.1–9.

Ozdemir, A.I., Ar, I.M. and Erol, I., 2020. Assessment of blockchain applications in travel and tourism industry. *Quality and Quantity*, 54(5-6), pp.1549-1563.

Rana, R.L., Tricase, C. and De Cesare, L., 2021. Blockchain technology for a sustainable agri-food supply chain. *British Food Journal*, Vol. ahead-of-print No. ahead-of-print, https://doi.org/10.1108/BFJ-09-2020-0832.

Rashideh, W., 2020. Blockchain technology framework: Current and future perspectives for the tourism industry. *Tourism Management*, 80, Article number: 104125.

Tham, A. and Sigala, M., 2020. Road block(chain): Bit(coin)s for tourism sustainable development goals? *Journal of Hospitality and Tourism Technology*, 11(2), pp.203-222.

Thees, H., Erschbamer, G. and Pechlaner, H., 2020. The application of blockchain in tourism: Use cases in the tourism value system. *European Journal of Tourism Research*, 26, pp.1-21.

Treiblmaier, H., 2018. The impact of the Blockchain on the supply chain: a theory-based research framework and a call for action. *Supply Chain Management*, 23(6), pp.545-559.

Treiblmaier, H. and Önder, I., 2018. The impact of blockchain on the tourism industry: A theory-based research framework. In *Business transformation through blockchain: Volume II*, (Edited by Treiblmaier H. and Beck R.), Springer Nature Switzerland AG, pp.3-21.

Tyan, I., Yagüe, M.I. and Guevara-Plaza, A., 2020. Blockchain technology for smart tourism destinations. *Sustainability,* 12(22), Article number: 9715.

Valeri, M. and Baggio, R., 2020. A critical reflection on the adoption of blockchain in tourism. *Information Technology and Tourism*, doi:10.1007/s40558-020-00183-1

Vrontis, D. and Christofi, M., 2019. R&D internationalization and innovation: a systematic review, integrative framework and future research directions. *Journal of Business Research*, 128, pp.812-823,

Yadav, J.K., Verma, D.C., Jangirala, S. and Srivastava, S.K., 2021. An IAD type framework for Blockchain enabled smart tourism ecosystem. *The Journal of High Technology Management Research*, Article number: 100404.

Wei, C., Wang, Q. and Liu, C., 2020. Research on construction of a cloud platform for tourism information intelligent service based on blockchain technology. *Wireless Communications and Mobile Computing*, 2020, https://doi.org/10.1155/2020/8877625.