

# Evaluating the opportunities, challenges and risks of applying the blockchain technology in tourism: a Delphi study approach

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Received 20 May 2021  
Revised 26 November 2021  
27 February 2022  
18 April 2022  
26 June 2022  
Accepted 30 July 2022

## Abstract

**Purpose** – The purpose of this study is to empirically evaluate the potential of the blockchain technology in tourism. The blockchain technology (BCT) holds potential to contribute significantly to tourism policy and practice. Academic interest in the BCT is rapidly growing with studies looking at the opportunities and challenges of its application. The shortcoming of research on the BCT in tourism has however been in its conceptual nature. The lack of empirical investigations hinders an understanding of how the BCT can be more broadly adopted in tourism, especially from the viewpoint of minimizing its risks.

**Design/methodology/approach** – The initial screening of the opportunities, challenges and risks is undertaken via a systematic literature review. The Delphi study is subsequently applied to empirically confirm what opportunities, challenges and risks can be attributed to the BCT use in tourism. Twelve industry and academic experts have contributed to the Delphi study.

**Findings** – The risks identified have been categorized as societal, technical, financial and legal. Propositions have been made on how these risks can, at least partially, be overcome.

**Originality/value** – To the best of the authors' knowledge, it is the first known attempt to study the BCT from the perspective of academic and industry experts. This research is also one of the first to evaluate the risks of the BCT use in tourism. Most risks are identified as not critical and can be addressed as the BCT develops.

**Keywords** Blockchain technology, Distributed ledger, Cryptocurrencies, Delphi, Blockchain-based tourism

**Paper type** Research paper

技术评估在旅游业中应用区块链技术的机遇、挑战和风险：德尔菲研究方法

## 摘要

摘要 – 研究目的 – 区块链技术 (BCT) 具有为旅游政策和实践做出重大贡献的潜力。随着研究着眼于其应用的机遇和挑战, 对 BCT 的学术兴趣正在迅速增长。然而, 旅游业中 BCT 研究的不足之处在于其概念性。缺乏实证研究阻碍了对如何在旅游业中更广泛地采用 BCT 的理解, 特别是从最小化其风险的角度来看。这项研究代表了第一次从学术和行业专家的角度实证评估 BCT 在旅游业中的潜力的已知尝试。

研究设计/方法/途径 – 机会、挑战和风险的初步筛选是通过系统的文献回顾进行的。德尔菲研究法随后被应用于实证确认哪些机会、挑战和风险可归因于 BCT 在旅游业中的使用。12 位行业 and 学术专家是德尔菲研究法的主要贡献人员。



研究发现 – 已识别的风险分为社会、技术、财务和法律。研究就如何至少部分地克服这些风险提出了建议。

研究原创性 – 从学术和行业专家的角度研究BCT是已知的第一次尝试。该研究也是最早评估 BCT在旅游中使用风险的研究之一。大多数风险被确定为不重要的,可以随着BCT的发展而得到解决。

关键词 区块链技术、分布式账本、加密货币、德尔菲调查法、基于区块链的旅游

文章类型 研究型论文

## 1. Introduction

The blockchain technology (BCT) originated in 2008 with the paper “Bitcoin: A Peer-to-Peer Electronic Cash System” published by Satoshi Nakamoto (a name for an individual or a group). The paper introduced electronic cash transfers performed without third-party control, such as a bank or a banking society (Crosby *et al.*, 2016; Nofer *et al.*, 2017). Subsequently, an open-source application was designed for electronic cash transfers and this application was named the bitcoin. Any user of the bitcoin could join the BCT network (Crosby *et al.*, 2016).

According to Crosby *et al.* (2016), “A blockchain is essentially a distributed database of records, or public ledger of all transactions or digital events that have been executed and shared among participating parties”. This implies absence of centralized control by trusted third parties which are replaced in the BCT with a consensus reached between all participants.

The BCT has gone through three stages in its development: Blockchain 1.0 represents the cryptocurrency application of the BCT (Swan, 2015). Blockchain 2.0 enables the use of smart contracts and extends the scope of the BCT use towards various economic activities, such as health, science and art (Bashir, 2017; Swan, 2015). Blockchain 3.0 advocates the BCT use beyond cash transactions, especially for non-financial purposes (Bashir, 2017). This partially explains why Blockchain 3.0 holds the largest potential for use in tourism and hospitality management (Bashir, 2017; Önder and Gunter, 2020).

The BCT in tourism can be harnessed for designing customer rating and review systems, increasing trust, using alternative payment methods and removing intermediaries (Önder and Treiblmaier, 2018). The BCT can transform tourism by removing fake reviews and increasing transparency, eliminating the middlemen, adding more security to transactions, improving the relationship between hosts and guests and assisting in supply chain management (Filimonau and Naumova, 2019). Payment via cryptocurrencies can facilitate currency exchange at a better rate and solve problems related to the dependency on the locals (Kwok and Koh, 2019; Polasik *et al.*, 2015; Tkatchuk, 2018; Williams, 2017).

There are known cryptocurrencies including Bitcoin, Ethereum, Ripple, Litecoin and Binance (Mnif *et al.*, 2020). Payments via cryptocurrencies by removing intermediaries make hospitality and tourism transactions (such as travel bookings) cheaper and more secure. This is particularly important when payment is made to the organizations located in the overseas as direct payments can eliminate transaction charges. Organizations which offer and accept payments in cryptocurrency are located all over the world (Alternative Airlines, 2020; Barkel *et al.*, 2021).

The cryptocurrency market has been affected positively by COVID-19 (Mnif *et al.*, 2020), and people’s interest on cryptocurrency has increased (Ryan, 2022). From the perspective of tourism and hospitality operators, smart contracts and distributed ledgers can decrease costs and increase business profitability (Turkay *et al.*, 2019). Recently, the use of the BCT has been extended to medical tourism (Balasubramanian *et al.*, 2022; Tyan *et al.*, 2021; Shen and Bai, 2020).

The “diffusion of innovation” theory can explain the BCT use in tourism ([Diffusion of Innovation Theory, 1996](#); [Rodger et al., 1996](#); [Rogers, 2003](#)). According to this theory, the innovation will spread in a social system of the population over time. All people will not adopt a technology at the same time; some will adopt it earlier than others. Rogers highlights five categories of adopters, i.e. innovators (people who like innovation and usually accept its risks and tend to be the first trying innovations), early adopters (opinion leaders who lead on innovation adoption), early majority (people who need to understand how innovation works before adopting it), late majority (people who are sceptical towards innovation, and adopt it after it has been tried by the majority) and laggards (people who are very conservative towards innovation). Currently, it is argued, the BCT may have been adopted in tourism by innovators and possibly early adopters.

Although studies have discussed the prospects of the BCT application in tourism ([Kwok and Koh, 2019](#); [Ozdemir et al., 2019](#); [Pilkington et al., 2017](#)), research lacks an element of empirical investigation as most studies are either conceptual or represented by opinion pieces. Past research has tended to focus on the opportunities of the BCT use in tourism but ignored prospective risks of the BCT application. [Maguire et al. \(2018\)](#) argue that:

[. . .] as a new technology, blockchain brings with it specific risks not relevant to other IT systems. Not factoring blockchain-specific risks into the technology assessment can easily leave companies open to security breaches.

This statement suggests that research should strive to evaluate risks of the BCT use and highlight these risks to potential users. This is because a better understanding of risks can prompt the design of countermeasures that can aid in reducing the negative effect of risk occurrence. For example, Bitcoin is sensitive to (deliberate or accidental) actions of celebrities. For example, a story reported in mass media can be mentioned whereby Elon Musk ruined the value of the Bitcoin by a single tweet in which he claimed, jokingly, that he fell in love with this cryptocurrency ([Browne, 2021](#)). Research should be underpinned by empirical investigation as conceptual works, despite their undeniable value, can be categorized as subjective.

This study adds to the literature on the BCT use in tourism with an empirical investigation of its opportunities, challenges and risks. To this end, the study adopts a method of expert opinion, i.e. a Delphi technique, to answer the following research question: *What are the potential opportunities, challenges and risks of using the BCT in tourism and what risks can be classed as most critical?* Application of the Delphi method offers the benefit of balanced expert judgment about an under-studied subject and provides scope for examining conceptual matters empirically. The findings of this study can encourage the use of the BCT in the tourism industry and increase the chance of BCT acceptance by users. There are user acceptance theories in the information system domain that endeavour to model user technology acceptance in this regard ([Taherdoost, 2018](#)). This current study opens doors to such theories for their application in the domain of tourism and the BCT usage. The next section sets the background to this study.

## 2. Literature review

The field of research on the BCT application in tourism has grown recently, but the number of studies remains small. To evaluate the progress made in academic research on the BCT use in tourism, a systematic literature review was conducted. The literature was searched via the Scopus database. Scopus was used because it is the largest citation database covering more than 21,500 peer-reviewed journals ([Kolle et al., 2018](#)). The following keywords were used in the search:

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*(TITLE-ABS-KEY(Tourism) AND TITLE-ABS-KEY("blockchain")) OR (TITLE-ABS-KEY(travel) AND TITLE-ABS-KEY("blockchain")) OR (TITLE-ABS-KEY(Hospitality) AND TITLE-ABS-KEY("blockchain")) OR (TITLE-ABS-KEY(Leisure) AND TITLE-ABS-KEY("blockchain"))*

The search was undertaken in January 2020. There was no limitation on the publication date and type, and the searched keywords provided 151 results. Two researchers analysed the results by reviewing the title and abstract of each paper, with 34 papers selected for further analysis. The studies were selected on the following grounds:

- the main theme is tourism/hospitality and the BCT;
- published in peer-reviewed journals or proceedings; and
- written in English.

The studies were carefully evaluated, and [Appendix 1](#) presents the evaluation results.

Most studies are represented by conceptual papers aiming to explain what the BCT is about and elaborate on the value the BCT can add to tourism and hospitality management and practice. Some studies promote technical solutions that could be harnessed for the BCT use in the tourism sector ([Arif et al., 2020](#); [Jia-lan et al., 2019](#)). The review of available research shows that the body of knowledge on the BCT application in tourism is yet in early stages of development. According to the "diffusion of innovation" theory ([Rogers, 2003](#)), limited scholarly interest implies that speed at which the BCT ideas spread through global academic and professional tourism communities remains slow. This is concerning as the diffusion of any technology is driven by so-called early adopters represented by a small group of open-minded, often adventurous, innovators ([Strebinger and Treiblmaier, 2022](#)). For example, as [Stankov and Filimonau \(2019\)](#) argue, tourism and hospitality businesses that first uptake novel technologies can set the trends for the rest of the industry to follow. However, one of the key reasons why tourism and hospitality businesses are reluctant to adopt new technologies early is their lack of understanding of various enablers and inhibitors of innovations ([Sharma et al., 2021](#)). This highlights the need for more scholarly investigations of the BCT focusing on the opportunities, challenges and risks of this technology's adoption in tourism.

Some studies have been concerned with the challenges of the BCT use in tourism. Drawing on the literature review, Kwok and Koh pinpointed such challenges as (insufficient) readiness of customers and the market. This was linked to the level of tourist knowledge whereby technology-savvy tourists and industry professionals were considered more suitable for the BCT adoption, but they formed only a small fraction of the population, not all tourists (2019). The literature highlighted that political issues could influence the use of cryptocurrencies ([Kwok and Koh, 2019](#)). There were also concerns about tax regulation, volatility of cryptocurrency value and availability of a wide range of cryptocurrencies and adoption of them ([Kwok and Koh, 2019](#)). There were security and privacy concerns for the BCT use. Energy consumption is another issue ([Kwok and Koh, 2019](#)). [Filimonau and Naumova \(2019\)](#) discussed such issues of the BCT use as limited consumer and business awareness of the BCT and the lack of trust in its potential but also restricted technological uptake, high costs, immature regulation and problems related to the speed of transactions. More recent studies have supported the previous discussion with further secondary evidence ([Cheriyana and Tamarasi, 2021](#); [Önder and Gunter, 2020](#); [Tyan et al., 2020](#)).

The BCT challenges highlighted in the literature can risk the adoption of the BCT by the tourism industry. This emphasizes the need to better understand what risks are attributed to the BCT use in tourism, how these risks can be evaluated and what measures can be put

in place to reduce their occurrence. Research on this topic is however limited. A notable exception is represented by the study by [Nam et al. \(2019\)](#) which focused on possible risks of the BCT use in tourism. They numerated such BCT risks as (in)security, (in)efficiency, cost, energy consumption, (un)scalability, lack of knowledge and understanding, existence of inaccurate information, survival between dominant and new coins, and increasing number of BCT intermediaries ([Nam et al., 2019](#)). While this study should be considered pioneering in this regard, it is based on a literature review and the risks identified in the literature have not been validated empirically. The same shortcoming applies to the study by [Turkay et al. \(2019\)](#) who discussed such risks as security and privacy issues, the lack of widespread validation, regulation problems and possible prohibition of digital currencies.

To summarize, potential risks of the BCT use in tourism are empirically under-studied. Evidence from the domains outside tourism suggests that the BCT can pose significant risks to the industries, thus calling for a better understanding of these risks and countermeasures to reduce their occurrence ([Lu et al., 2019](#); [Swan, 2015](#)). Some studies have outlined potential risks of the BCT use without considering the tourism sector. [Lu et al. \(2019\)](#), by drawing on available studies ([Cao, 2017](#); [Lindman et al., 2017](#); [Surujnath, 2017](#); [Walch, 2015](#)), have enumerated three types of the BCT risks in the oil and gas industry, including operational risks (emerged due to technical and social problems), cyber risks (emerged due to security flaws and design problems) and legal risks (illegal actions) ([Lu et al., 2019](#)). [Yeoh Peter \(2017\)](#) has highlighted the regulatory issues and the related risk of the BCT use, for example. All these risks can occur in the tourism sector; for example, low speed of transaction can delay hotel and tour reservations. In other words, some risks can be common between the different BCT application domains, such as security, as these arise due to the disruptive nature of the BCT ([Zamani et al., 2020](#)).

Importantly, the literature ([Appendix 1](#)) does not accurately distinguish between the risks and challenges of the BCT use in tourism. According to the ISO/Guide 73:2009 ([ISO/Guide 73:2009, 2009](#)), a risk is defined as the “effect of uncertainty on objectives”. Based on this definition, “objectives can have different aspects (such as financial, health and safety, and environmental) and can apply at different levels (such as strategic, organization-wide, project, product and process)”. “Risk is often characterized by reference to potential events and consequences, or a combination of these”, “Risk is often expressed in terms of a combination of the consequences of an event (including changes in circumstances) and the associated likelihood of occurrence” and “Uncertainty is the state, even partial, of deficiency of information related to, understanding or knowledge of, an event, its consequence, or likelihood” ([ISO/Guide 73:2009, 2022](#)). In contrast, according to the Collins dictionary ([Collins dictionary, 2022](#)), “A challenge is something new and difficult which requires great effort and determination”. Based on the Cambridge dictionary’s definition ([Cambridge dictionary, 2022](#)), a challenge is “(the situation of being faced with) something that needs great mental or physical effort in order to be done successfully and therefore tests a person’s ability”.

In this current study, a BCT risk is considered as a potential undesirable and negative effect of the BCT use in tourism. The BCT risk may be a result of the BCT challenges or may co-exist with them. For example, security and privacy flaws will lead to a risk of violation of privacy and security rights in tourism if the BCT were to be adopted within.

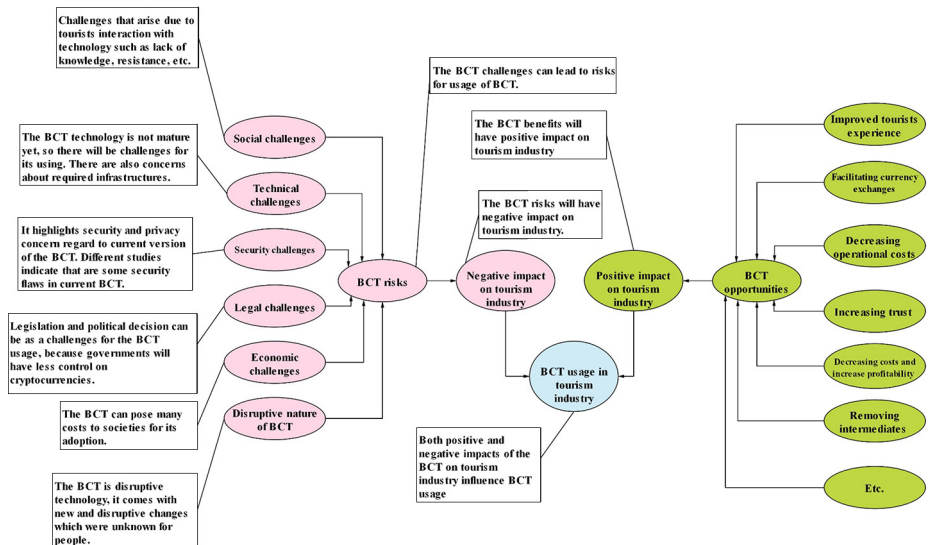
Based on the literature review, five categories of risk can be attributed to the BCT use in tourism. These include social, technical, security related, legal and economic risks. However, due to the disruptive nature of the BCT, there may be some further risks not previously highlighted in the literature. These risks were conceptualized based on their similarity and differences to understand how these risks can be fitted in the above-mentioned categories.

This current study aims to evaluate the already established risks, but also to identify any new, previously unidentified, risks of the BCT use than can occur in the tourism sector. Figure 1 shows the conceptual framework of the current study derived from the literature to inform collection of primary data. It is important to note that the literature does not explicitly differentiate between “avoidable” and “non-avoidable” risks.

In summary, as potential risks of the BCT can negatively impact the development of the tourism sector, it is vital to understand these risks. No research has been undertaken in the field of tourism to evaluate potential risks of the BCT use within the sector. Academic studies published on the topic of the BCT in tourism are either conceptual or reflect (subjective) authors’ opinions. Although some studies have attempted to conceptualize risks of the BCT use in tourism, the concepts proposed have never been empirically tested. This current study will partially fill this important knowledge gap. It will empirically test the opportunities, challenges and risks of the BCT adoption in tourism by seeking expert opinion on their significance. This will be achieved through the application of the method of expert opinion. The study’s methodology is explained next.

### 3. Methodology

Qualitative research aids in understanding human opinions, experiences, attitudes, behaviour and interactions (Pathak *et al.*, 2013). Originally from the field of psychology, to date qualitative research has benefitted various study domains (Pathak *et al.*, 2013), including tourism. Qualitative research does not aim to provide numerical results, but focuses on identifying, explaining and interpreting people’s opinions (Hammarberg *et al.*, 2016). Qualitative research is best suited for projects that deal with the topics not sufficiently studied to date, such as the BCT risks in tourism.



**Figure 1.**  
A conceptual map of risks, challenges and opportunities of the BCT adoption in tourism

**Source:** Compiled on the basis of the literature review. The risks are provisional and will be tested in an empirical investigation (see Figure 2)

A Delphi technique is a method of qualitative research which builds a data set underpinned by a consensus between experts (Schlecht *et al.*, 2021). It makes use of the iterative approach whereby a few rounds of data collection are undertaken with the material collected in each round being systematically analysed and re-applied in subsequent rounds to refine the findings (Helmer, 1983; Lee and King, 2008). The answers collected in the first round, besides the related comments, represent a source for the second round of analysis. Each expert can revise their answer by considering newly collected data. A number of rounds can be held to achieve data saturation (Williamson, 2002). The Delphi method has been previously used in tourism research (Asmelash and Kumar, 2019; Konu, 2015). This study deals with an uncertain payment tool/technology and the systems surrounding it; therefore, the Delphi method is deemed suitable for the current study. The seminal study (Asmelash and Kumar, 2019) has been conducted by the Delphi approach which considered progress of tourism sustainability. Participants were invited to investigate the list of indicators. That study found the tourism industry will not be sustainable without evaluation of its progress. Another seminal study (Konu, 2015) used the Delphi method to investigate developing nature-based tourism products. There are more tourism and hospitality studies based on the Delphi approach (Kim *et al.*, 2021; Thal *et al.*, 2021; Chim-Miki and Batista-Canino, 2018) which showcases the validity of this research tool in new, under-examined research contexts.

An interview schedule was developed based on the literature review and in consultations with academic experts in the design of Delphi studies. The schedule revolved around three major topics, including BCT opportunities, challenges and risks (Appendix 2). The schedule was pretested with three tourism academics and one BCT expert.

A Delphi study starts with a selection of a panel of experts, then the first round of data collection is conducted (Williamson, 2002). Study informants were identified by applying a three-stage approach. In the first stage, a Scopus search was undertaken to identify academics who published on the topic of the BCT in general, but also in the tourism context. In the second stage, a search of websites or weblogs (both academic and industrial ones) that discussed the BCT and its risks was undertaken. The authors of the related posts in such blogs were identified as potential study informants. In the third stage, a snowball method was applied which involved requesting identified informants to introduce the research team to other, prospective experts.

The search identified 81 potential participants. All were invited to the study and a total of 12 experts agreed to participate. The saturation point was considered to understand if this number of experts was sufficient (Marshall, 1996). Saturation was deemed to occur once no new information was found emerging from interviews by applying iterative analysis as suggested by Hennink *et al.* (2017). Twelve experts were deemed sufficient for a Delphi study (Hsu and Sandford, 2012; Shelton *et al.*, 2018) Appendix 3 shows experts information.

Data were collected through multi-round, semi-structured interviews. Interviews were conducted between June and November 2020. Skype was used for interviewing by considering the related guidelines (Krouwel *et al.*, 2019). Interviews lasted between 30 and 60 min.

Thematic analysis was applied to the data collected using the Charmaz coding process and the guidelines by Linneberg and Korsgaard (Charmaz, 2014; Skjott Linneberg Mai and Korsgaard Steffen, 2019). In the first stage, each transcript was read, and the related codes were assigned to word(s)/sentence(s). In the second stage, each created code was reviewed for validity (axial coding). Finally, the codes were grouped under various themes by considering similarities and differences between the emerged word(s)/sentence(s) (Appendix 4). To simplify coding, the MAXQDA tool was used (<https://www.maxqda.com>).

Aligned with [Liamputtong \(2009\)](#), to ensure trustworthiness of findings, data were coded by two researchers independently. The findings of interviews were presented to study informants for approval/confirmation. In total, three rounds of iteration were held until all study informants agreed on the results.

#### 4. Findings and discussion

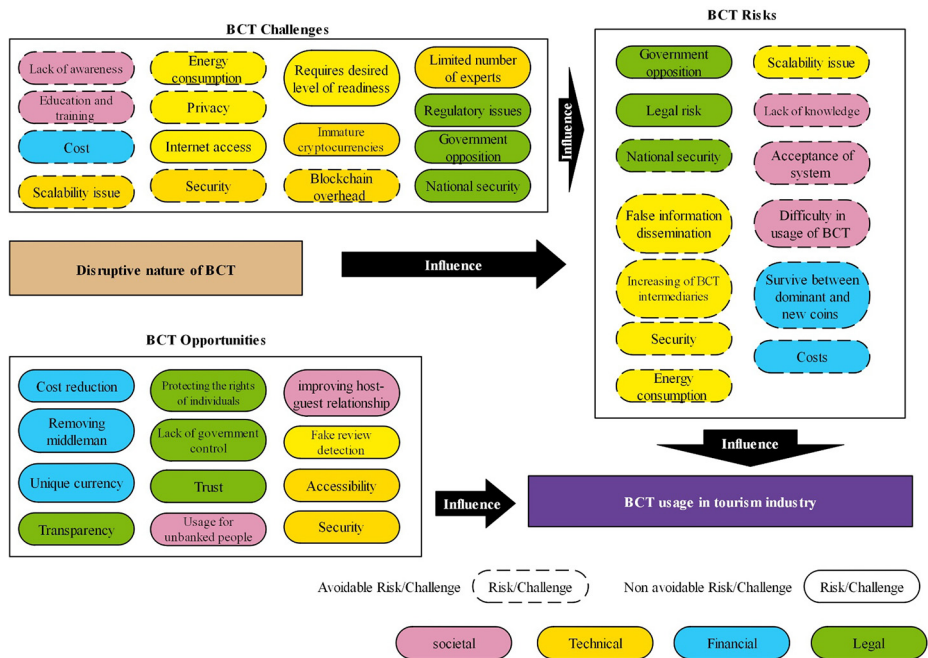
[Figure 2](#) summarizes the research findings. Four major categories have emerged for opportunities, challenges and risks of the BCT use in tourism. These are categorized as technical that relate to the technological side of the system (yellow), societal that are attributed to the interaction of people with the system (pink), legal and governance that are related to the legal (green) and financial (blue) sides of the system.

##### 4.1 Blockchain technology opportunities

The BCT can decrease the cost of overall financial transactions even though these may be disproportionately distributed across the system. This is because the BCT-based networks usually request lower transaction fees than banks for end users. An expert stated that:

For the end user, the cost will probably be lower, and it depends on how (s)he accesses the system, but [in some development cases] for the person who runs the system, the cost will probably increase. (A-5)

In the BCT-based solution, a middlemen will be removed, and the system will be decentralized; “Normally, the system design should be decentralized so that the company is not an intermediary and connects the customer directly to the provider” (A-6). The BCT provides a unique currency to be used all over the world.



**Figure 2.** Results of qualitative data analysis (supports infinite zoom)



This finding is aligned with [Önder and Treiblmaier \(2018\)](#) who discussed the use of cryptocurrencies as an alternative means of payment and a method of removing the middlemen. There are other studies that support this finding and discuss the opportunities of the BCT in decreasing costs ([Kwok and Koh, 2019](#); [Melkić and Čavlek, 2020](#); [Polasik et al., 2015](#); [Tkatchuk, 2018](#); [Williams, 2017](#)).

The BCT will increase trust; in the current system, people must trust third parties such as banks, hotels and service providers. In a BCT-based network, a decentralized network will be created which represents a transformed concept of trust by decentralizing information. In a BCT-based system, smart contracts and available information within the network, plus collective voting systems, can ensure trust equally well or even better than a third party. Transactions are available and trackable in the BCT. This increases transparency and helps to protect tourist rights. Governments cannot have direct control over the tourism sector, so the industry can grow more seamlessly. An expert stated that “I think the purpose of using it [public and permissionless blockchain] was to have a decentralized network instead of a centralized network, and that governments couldn’t have control” (A-1). [Önder and Treiblmaier \(2018\)](#) and [Filimonau and Naumova \(2019\)](#) discussed enhanced transparency and trust in the BCT-based tourism systems. In the SWOT analysis by [Melkić and Čavlek \(2020\)](#), legal opportunities have also been covered.

The BCT can improve host and guest experience and relationships. In some (usually remote) destinations, local tour operators may not have a bank account (unbanked people). In such cases, the BCT can help transfer money. [Melkić and Čavlek \(2020\)](#) spoke about the ease of effecting payment in different business models via cryptocurrencies.

The BCT will have better security compared to traditional systems. For the Bitcoin to be compromised, for example, attackers need to manipulate at least 51% of its nodes which is difficult. An expert stated:

In order to prevent such a problem, the developers make backups for servers, but if someone disables the backup and the attacker removes all data, then the system will fail. But if you have a distributed system, for example, it is a system that is between 10 people instead of one person. When someone wants to attack the server, they’ll have to attack most people on the network, which is difficult. (A-2)

The BCT will identify fake reviews. Smart contracts can validate reviews that belong to specific individuals. In addition, it is possible to develop permissioned or private blockchains, so all users will be authorized in the network, thus preventing fake reviews. A BCT-based tourism system will always provide accessible system without interruption. Traditional systems rely on a unique server or a limited number of servers. But, in a BCT-based tourism system, there are numerous nodes and miners that can be active when other nodes or miners are inactive. The network is difficult to shut down, as its control is not centralized. In the SWOT analysis by [Melkić and Čavlek \(2020\)](#), these opportunities have been discussed. However, there is no evidence pointing at accessibility of the BCT application at all times in their study.

In summary, as shown in [Figure 1](#), the literature covers most of the opportunities highlighted by the experts interviewed in this current study. However, this current research finds a new opportunity (accessibility of the BCT application at all times, usage for unbanked people and unique currency) which is not mentioned in the literature.

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#### 4.2 Blockchain technology challenges

The challenges are represented by industry and public unawareness of the BCT and its potential. Melkić and Čavlek (2020) have discussed this issue as “Nobody has good knowledge of the technology”. The BCT use requires education and training; however, most experts did not think it was critical. Kwok and Koh (2019) and Filimonau and Naumova (2019) spoke of this challenge by reviewing the related literature. However, they did not discuss the level of importance of these challenges. Melkić and Čavlek (2020) established the negative effect of the lack of knowledge and skills. Tyan *et al.* (2020) stated the lack of expertise and knowledge by tourism organizations and tourists as a challenge for the BCT adoption.

The BCT may increase or decrease operational costs, but these cannot be discussed without considering specific cases. However, what is clear is that educators, developers, BCT transactions and smart contracts all pose costs for BCT users. The cost-benefit analysis is required to better understand the exact cost effectiveness of specific BCT projects. Filimonau and Naumova (2019) mentioned the challenge of BCT costs without considering the role of a cost-benefit analysis. Melkić and Čavlek (2020) mentioned variable transaction fees for tourists as a potential weakness of the BCT, but they did not go into detail of how this fee could be calculated.

The BCT use requires permanent internet connection while the internet may not be available in remote destinations. Acceptable internet speed is required to download data from a blockchain network. An expert stated:

[...] blockchain, where information is transferred over the Internet, and therefore, suppose, I have a blockchain account connected to my mobile phone, must always be updated with blockchain, must always be connected to the Internet, and last Method information. Now, if I went to a hut in the forest, that hut and my mobile phone should have a full antenna and the information should be updated. That hut should be a computer that is connected to the blockchain system and has been updated. (A-3)

The literature does not discuss internet bandwidth as a challenge of the BCT use. Melkić and Čavlek (2020) only mentioned the internet as a possible source of technical failures as an umbrella issue for all technical matters. Connection between different blockchains may pose a scalability issue exacerbated by the limited speed of transactions. Filimonau and Naumova (2019) discussed the problem of low transactions without considering available solutions. Melkić and Čavlek (2020) spoke of the lack of system scalability. This current study suggests that the issue can be critical, but it can be resolved with technological enhancements. For example, different blockchains can be used via multi-chains. In addition, the offchain can be used to only store most important data in the blockchain network.

Energy consumption poses another challenge. Energy is required to mine and validate blocks. This energy consumption will be high once the BCT solutions can become truly global. In the literature, Kwok and Koh (2019) and Tyan *et al.* (2020) discussed this challenge. However, this current study adds evidence as to the issue of excessive energy use being overrated. The issue relates to the use of the traditional BCT which requires a proof of work as a consensus mechanism. Newer versions of the BCT make use of other consensus mechanisms, such as a proof of stake, and, therefore, do not require much energy. As one expert claimed “energy consumption depends on what type of blockchain we use. Now, there are lighter blockchains, with lower energy needs” (A-5).

The experts stated that the BCT may lead to privacy violation if privacy policies were not sufficiently encapsulated at the point of development. However, the BCT itself will not violate privacy. Different types of the BCT, such as public or private, can be permissioned or

permission less (Bashir, 2017). This can protect user privacy and specify the desired privacy levels. In addition, hash algorithms can convert data to make it unreadable by others.

The BCT may suffer from security vulnerability. However, as it is a decentralized network, attackers will have to target many nodes instead of a unique server. Security of the BCT relies on this unique feature of its development. However, it must be acknowledged that a BCT with small nodes and miners can be easier to attack compared to a large-scale public BCT with many nodes. Reaching 100% security is impossible. The BCT users can compromise security too; however, this issue persists across all technological chains, including traditional systems. Kwok and Koh (2019) numerated security, privacy and energy consumption for the BCT use as potential challenges, but, as this current study shows, these challenges are solvable. Tyan *et al.* (2020) discussed such challenges as hacks, identity theft, loss of private keys, misplacement of tokens and safeguarding the privacy of personal records. Most cryptocurrencies are not mature yet and suffer from such limitation as transaction speed. Melkić and Čavlek (2020) discussed it as the “The complexity of technology, but also its incompleteness and sophistication”.

The BCT overheads in early versions of the BCT development, such as the Bitcoin, can lead to financial challenges. The limited number of experts and BCT developers can potentially suggest that these important actors can request high salaries for system development. As knowledge grows, this challenge can however be offset by new generations of experts and developers. This will bring the costs down.

Governmental opposition towards the BCT use represents another challenge. As the government does not have control over the BCT and cannot monitor it, it may reject BCT applications in the tourism sector. This may encourage terrorism; “People who are wanted by police such as terrorists can get a hotel without being identified and having banking transaction [in the public permissioned less BCT]” (A-1). Kwok and Koh (2019) spoke of the BCT prohibition by governments; however, they focused on tax regulation, volatility of the cryptocurrency value and availability of a wider range of cryptocurrencies and the adoption of these. However, these challenges are not critical as smart contracts can implement taxation regulation and cryptocurrencies can be converted to each other by developing systems.

There are also regulatory challenges. Information is difficult to erase in the BCT and can only be written in. However, the General Data Protection Regulation (GDPR) does not allow for such treatment of information. In legal claims, it is still unusual to cite the BCT data and the related transactions. Melkić and Čavlek (2020) discussed the GDPR in the context of the BCT challenges. The BCT implementation requires a desired level of readiness to match the requirements and expectations of the tourism sector.

In summary, this current study identified two new challenges of the BCT use in tourism, namely, the limited number of experts and national security concerns. It also provided an understanding of that most of previously established challenges could not be as critical as previously thought given the on-going BCT development. Each expert may work only with a specific type of the BCT and consider specific challenges or risks that may not be available in other versions of the BCT. The challenges (and risks) can therefore be classed as “avoidable” and “non-avoidable” in line with the potential for their resolution with the help of other, newer BCT systems.

#### *4.3 Blockchain technology risks*

The risks of the BCT use in tourism are determined by both the disruptive nature of the BCT and its related challenges. From the legal viewpoint, the BCT systems can be prohibited by governments. Furthermore, governments may want to control the BCT network in fear that

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it will endanger national security. Some legal issues cannot be solved automatically in the BCT network but will require human interference. An expert stated: “Wherever human knowledge and interpretation is needed to resolve disputes, blockchain and smart contract cannot be implemented and must be referred to a third party” (A-3). [Turkay et al. \(2019\)](#) discussed the regulatory challenges of the BCT but did not mention the risks of national security. This risk is avoidable by designing permissioned BCT systems.

If a BCT system is poorly designed, then it may face the scalability risk. As the BCT enables users to only write information in while its deletion is hard or impossible, the BCT can contribute to the dissemination of false information. In the literature, [Nam et al. \(2019\)](#) coined this as the danger of inaccurate information provision. However, the experts argued this would not be overly problematic:

You assume that you are doing something wrong in a blockchain, and you actually add a correction to previous information in blockchain, so you can come and correct it and practically correct the previous writings. (A-3)

This risk is, thus, avoidable.

As other technological systems, the BCT may suffer from security vulnerability, and this was discussed by [Nam et al. \(2019\)](#) and [Turkay et al. \(2019\)](#). However, based on the expert opinions, the risk of the BCT insecurity is lower than in traditional, centralized systems. This risk is, therefore, also avoidable.

It was probed to establish whether the increasing number of BCT intermediaries could pose a risk, but the experts rejected this risk. The literature ([Nam et al., 2019](#)) which highlights the scope for potential occurrence of this risk focused on early versions of the BCT.

Acceptance of the BCT run tourism system and the difficulties in its use may present risks, but these risks can be solved by designing user-friendly interfaces. Such risks are also prevalent in many centralized applications, so they are not exclusively limited to the BCT systems ([Nam et al., 2019](#)). This suggests that traditional technological solutions can be applied to minimize occurrence of this risk in the BCT-run tourism systems.

The cost of the BCT poses a risk but it can be managed by system developers. The system can be designed such that the costs of BCT use are equally split and, therefore, minimal, for both end users and system operators. Survival between the dominant and new coins can pose a risk, such as other currencies, but this risk can be solved by designing BCT as multi-chains that accept different currencies. [Nam et al. \(2019\)](#) highlighted the factor of increased cost as a possible risk for the BCT use but did not present possible solutions.

#### 4.4 Summary

[Figure 2](#) summarizes the findings of the Delphi study. It outlines the opportunities, challenges and risks of the BCT use in tourism as highlighted by the industry and academic experts. It categorizes the opportunities, challenges and risks as societal, technical, financial and legal in line with the main areas of occurrence that they are related to. [Figure 2](#) further divides challenges and risks of the BCT use in tourism. [Figure 2](#) suggests that most challenges and risks can be resolved subject to willingness of policymakers and industry professionals, thus posing no critical issue towards broader BCT adoption in the tourism sector. This can facilitate BCT acceptance by users via using the results of the current study to develop more reliable BCT-based tourism solutions by addressing the challenges and risks. Compared to past research, the current study established the importance of addressing a new risk attributed to national security concerns. The study shed further light on previously identified risks but provided a deeper understanding of why they may occur

and, most importantly, how they can be minimized. The study, thus, contributed to theory and practice of the BCT application in tourism.

## 5. Conclusion

Although past research has highlighted the opportunities and challenges of the BCT use in the tourism sector, it has largely lacked an empirical element. Past research has also neglected the importance of evaluating the BCT risks in tourism and failed to separate risks from challenges. Despite the alleged similarity, risks and challenges represent two different study topics calling for their better investigation. This current study contributed to knowledge with an exploratory evaluation of the potential of the BCT use in the tourism sector undertaken from the viewpoint of BCT industry professionals and academic experts. The study not only identified the BCT risks, categorized and evaluated these risks from the perspective of their criticality, but also provided an insight into how the occurrence of these risks could be minimized.

### 5.1 Theoretical implications

The extent to which users accept specific technologies can be explained by theory of diffusion of innovation. This current study extends the application of this theory towards the domain of the BCT use in tourism and highlights how this theory can aid in understanding the scope for the adoption of the BCT by tourism industry professionals. Theory of diffusion of innovation suggests that business professionals who are prepared to take risks can either greatly succeed or significantly fail in the competitive marketplace. This current study showcases that, in the case of the BCT in tourism, the challenges and risks of this technology adoption are not critical and can be addressed via dedicated managerial measures. This suggests that BCT should be more actively considered for adoption by tourism industry professionals to gain market advantages. Waiting for too long in fear of risks may result in a situation whereby the small number of early adopters of the BCT in tourism will become the market disruptors, leaving the rest of tourism enterprises behind. Policymaking interventions are necessary to broaden the adoption of the BCT in tourism by building industry confidence in the use of this innovation, as discussed earlier in the text. Not only will such interventions increase the number of early adopters of the BCT in tourism, but these interventions can also outline the pathway for the early majority of the industry to engage in the BCT use. Thus, this current study showcases how theory of diffusion of innovation can inform practical measures required to engage the larger number of tourism industry professionals in the BCT.

### 5.2 Practical implications

The findings of the current study can be used in the design of policies encouraging the BCT use in tourism. The study proved empirically that the challenges and risks of applying the BCT in tourism exist, but these are not critical and can be overcome subject to the political will. To solve the challenges and risks of applying the BCT in tourism, appropriate budgets should be allocated by policymakers and this current study highlights the areas in which the budget allocation can be prioritized. Policymakers can also invest in national research and development in line with the priority areas to be addressed within the scope of the BCT challenges and risks in tourism. The findings of the current study can also be used by industry professionals. The uptake of the BCT in tourism is still low; one of the reasons for this low uptake may be in the industry's reluctance to invest in the BCT in fear, or poor knowledge, of the related challenges and risks. This current study provides the reassurance that these challenges and risks can be meaningfully overcome and outlines some potential

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solutions for this to happen. Ultimately, the findings of the current study can encourage tourism industry professionals to invest in the BCT by raising their awareness of the related challenges and risks alongside prospective solutions.

### *5.3 Limitations*

As with many studies, this one had limitations. The key one was attributed to sample size. Finding BCT practitioners working in tourism proved difficult. These challenges in recruitment affected the number of experts who partook in the Delphi study. Having more willing experts on board, representing a broader variety of BCT markets and tourism sub-sectors, could have provided further interesting insights and more detailed results. Another limitation is attributed to the use of the Delphi method which implied certain subjectivity of the findings. Although every effort was made to encourage the experts to express their honest opinion on the subject matter in focus, there was no full guarantee that these efforts succeeded. In Section 2, the relevant publications have been found by searching relevant keywords in citation data bases. It means that literature review is dependent on the searched keywords. The literature review was limited to January 2020 given the Delphi study design dictated finalization of the literature review when interviewing of experts began. The studies conducted on the use of the BCT in tourism after January 2020 may have provided another interesting insight into the topic in focus.

### *5.4 Future research*

There are open questions for future research. Firstly, future empirical studies should be based on quantitative research methods. Secondly, they should seek opinions not only of BCT industry professionals and BCT academics, but also other stakeholders concerned, such as policymakers and end users. Thirdly, a case study approach is warranted if a successful project of the BCT use in tourism can be identified. Fourthly, there is a need for future research on the cost-benefit analysis of the BCT given the financial factor was consistently mentioned as one of the challenges and risks of the BCT use in tourism. Given the diversity of the tourism industry in terms of its geographic penetration and levels of public understanding of the BCT, future research should aim at conducting similar studies in specific tourism markets and industry sub-sectors. For example, a dedicated line of research can target the sub-sector of hospitality, seeking expert opinions on the challenges and risks of the BCT use by small- to medium-sized hospitality businesses. This research line would be particularly beneficial given that hospitality managers are often conservative which can hamper their willingness to use the BCT. Likewise, studies are necessitated to look at the prospects of the BCT use in mature tourism destinations, such as the USA and Europe, but also in the emerging markets, such as those in Asia. This is to account for potential variations in the socio-economic factors, such as education levels, but also cultural differences in perceptions of the BCT among tourism industry professionals. As this study did not aim to understand what tourism organizations would be more likely to adopt the BCT and why, future research should seek opinions of industry professionals on this important question. Such research would be particularly beneficial for small- to medium-sized tourism enterprises which are known to be conservative while constituting the bulk of the market. The determinants of their early adoption of the BCT need to be established and policies need to be designed to trigger these determinants.

## References

- Alternative Airlines (2020), "10 destinations where you can travel to using crypto", available at: <https://medium.com/ustrust/10-destinations-where-you-can-travel-to-using-crypto-55e3482cd83d> (accessed 18 November 2021).
- Arif, Y.M., Nurhayati, H., Harini, S., Nugroho, S.M.S. and Hariadi, M. (2020), "Decentralized tourism destinations rating system using 6AsTD framework and blockchain", *Presented at the 2020 International Conference on Smart Technology and Applications (ICoSTA), IEEE*, pp. 1-6.
- Asmelash, A.G. and Kumar, S. (2019), "Assessing progress of tourism sustainability: developing and validating sustainability indicators", *Tourism Management*, Vol. 71, pp. 67-83.
- Balasubramanian, S., Ajayan, S. and Paris, C.M. (2022), "Leveraging blockchain in medical tourism value chain", in Stienmetz, J.L., Ferrer-Rosell, B. and Massimo, D. (Eds), *Information and Communication Technologies in Tourism 2022*, Springer International Publishing, Cham, pp. 78-83.
- Barkel, C., Kurgun, H. and Groen, B. (2021), "Blockchain in the hospitality and tourism industry", in Cobanoglu, C., Dogan, S., Berezina, K. and Collins, G. (Eds), *Hospitality and Tourism Information Technology*, Vol. 17, University of South FL M3 Center Publishing, p. 4.
- Bashir, I. (2017), *Mastering Blockchain*, Packt Publishing Ltd., UK.
- Browne, R. (2021), "Bitcoin falls after Elon Musk tweets breakup meme", CNBC, available at: [www.cnbc.com/2021/06/04/bitcoin-falls-after-elon-musk-tweets-breakup-meme.html](http://www.cnbc.com/2021/06/04/bitcoin-falls-after-elon-musk-tweets-breakup-meme.html) (accessed 17 November 2021).
- Cambridge dictionary (2022), Available at: <https://dictionary.cambridge.org/dictionary/english/challenge> (accessed 5 July 2020).
- Cao, X. (2017), "Be wary of the legal risks contained in the blockchain", 19 December.
- Charmaz, K. (2014), *Constructing Grounded Theory*, Sage, London.
- Cheriyian, A. and Tamarasi, S. (2021), "Block chain technology: the future of tourism", *Recent Advances in Intelligent Systems and Smart Applications*, Springer, Switzerland AG, pp. 481-490.
- Chim-Miki, A.F. and Batista-Canino, R.M. (2018), "Development of a tourism coepetition model: a preliminary Delphi study", *Journal of Hospitality and Tourism Management*, Vol. 37, pp. 78-88.
- Collins dictionary (2022), Available at: [www.collinsdictionary.com/dictionary/english/challenge](http://www.collinsdictionary.com/dictionary/english/challenge) (accessed 5 July 2020).
- Crosby, M., Pattanayak, P., Verma, S. and Kalyanaraman, V. (2016), "Blockchain technology: beyond bitcoin", *Applied Innovation*, Vol. 2 Nos 6/10, p. 71.
- Diffusion of Innovation Theory (1996), Available at: <https://sphweb.bumc.bu.edu/otlt/mph-modules/sb/behavioralchangetheories/behavioralchangetheories4.html> (accessed 18 October 2020).
- Filimonau, V. and Naumova, E. (2019), "The blockchain technology and the scope of its application in hospitality operations", *International Journal of Hospitality Management*, Elsevier, Vol. 87, p. 102383.
- Hammarberg, K., Kirkman, M. and de Lacey, S. (2016), "Qualitative research methods: when to use them and how to judge them", *Human Reproduction*, Vol. 31 No. 3, pp. 498-501.
- Helmer, O. (1983), *Looking Forward: A Guide to Futures Research*, Sage Publications, Beverly Hills, CA.
- Hennink, M.M., Kaiser, B.N. and Marconi, V.C. (2017), "Code saturation versus meaning saturation: how many interviews are enough?", *Qualitative Health Research*, Vol. 27 No. 4, pp. 591-608, doi: [10.1177/1049732316665344](https://doi.org/10.1177/1049732316665344)
- Hsu, C.-C. and Sandford, B.A. (2012), "The Delphi technique: use, considerations, and applications in the conventional, policy, and on-line environments", *Online Research Methods in Urban and Planning Studies: Design and Outcomes*, IGI Global, USA, pp. 173-192.
- ISO/Guide 73:2009 (2009), available at: <https://www.iso.org/obp/ui/#iso:std:iso:guide:73:ed-1:v1:en> (accessed 5 July 2020).

- Jia-lan, L., Xiao-yu, W., Wan-jun, Y., Zi-chen, W., Huai-lin, Z. and Nai-meng, C. (2019), "Research and design of travel insurance system based on blockchain", *Presented at the 2019 International Conference on Intelligent Informatics and Biomedical Sciences (ICIIBMS), IEEE*, pp. 121-124.
- Kim, J.H., King, B.E. and Kim, S. (2021), "Developing a slow city tourism evaluation index: a Delphi-AHP review of Cittaslow requirements", *Journal of Sustainable Tourism*, pp. 1-23.
- Kolle, S.R., Iranna, S., Vijay Kumar, M. and Parameshwar, G.S. (2018), "Publication trends in literature on ebooks: a Scopus based bibliometric analysis", *Collection and Curation*, Emerald Publishing Limited, Vol. 37 No. 3, pp. 119-127. *Emerald Publishing Limited*,
- Konu, H. (2015), "Developing nature-based tourism products with customers by utilising the Delphi method", *Tourism Management Perspectives*, Elsevier, Vol. 14, pp. 42-54.
- Krouwel, M., Jolly, K. and Greenfield, S. (2019), "Comparing skype (video calling) and in-person qualitative interview modes in a study of people with irritable bowel syndrome – an exploratory comparative analysis", *BMC Medical Research Methodology*, Vol. 19 No. 1, p. 219.
- Kwok, A.O. and Koh, S.G. (2019), "Is blockchain technology a watershed for tourism development?", *Current Issues in Tourism*, Taylor and Francis, Vol. 22 No. 20, pp. 2447-2452.
- Lee, C. and King, B.E. (2008), "Using the Delphi method to assess the potential of Taiwan's hot springs tourism sector", *International Journal of Tourism Research*, Wiley Online Library, Vol. 10 No. 4, pp. 341-352.
- Liamputtong, P. (2009), "Rigour and ethics in qualitative research", *Qualitative Research Methods*, 3rd ed., Oxford University Press, Oxford, New York, NY, Melbourne, pp. 19-40.
- Lindman, J., Tuunainen, V.K. and Rossi, M. (2017), "Opportunities and risks of blockchain technologies – a research agenda", *Proceedings of the 50th HI International Conference on System Sciences*, pp. 1533-1544.
- Lu, H., Huang, K., Azimi, M. and Guo, L. (2019), "Blockchain technology in the oil and gas industry: a review of applications, opportunities, challenges, and risks", *IEEE Access*, IEEE, Vol. 7, pp. 41426-41444.
- Maguire, E., Nagaraj, K., Vries, D. and Wyner, S. (2018), "Realizing blockchain's potential", *KPMG International*, pp. 1-16 available at: <https://assets.kpmg/content/dam/kpmg/xx/pdf/2018/09/realizing-blockchains-potential.pdf> (accessed 19 August 2022).
- Marshall, M.N. (1996), "Sampling for qualitative research", *Family Practice*, Vol. 13 No. 6, pp. 522-526.
- Mnif, E., Jarboui, A. and Mouakhar, K. (2020), "How the cryptocurrency market has performed during COVID 19? A multifractal analysis", *Finance Research Letters*, Vol. 36, p. 101647.
- Nam, K., Dutt, C.S., Chathoth, P. and Khan, M.S. (2019), "Blockchain technology for smart city and smart tourism: latest trends and challenges", *Asia Pacific Journal of Tourism Research*, Taylor and Francis, pp. 1-15.
- Nofer, M., Gomber, P., Hinz, O. and Schiereck, D. (2017), "Blockchain", *Business and Information Systems Engineering*, Vol. 59 No. 3, pp. 183-187.
- Önder, I. and Gunter, U. (2020), "Blockchain: is it the future for the tourism and hospitality industry?", *Tourism Economics*, SAGE Publications Sage, London, England, p. 1354816620961707.
- Önder, I. and Treiblmaier, H. (2018), "Blockchain and tourism: three research propositions", *Annals of Tourism Research*, Elsevier, Vol. 72 No. C, pp. 180-182.
- Ozdemir, A.I., Ar, I.M. and Erol, I. (2019), "Assessment of blockchain applications in travel and tourism industry", *Quality and Quantity*, Springer, pp. 1-15.
- Pathak, V., Jena, B. and Kalra, S. (2013), "Qualitative research", *Perspectives in Clinical Research*, Medknow Publications and Media Pvt Ltd., Vol. 4 No. 3, pp. 192-192.
- Pilkington, M., Crudu, R. and Grant, L.G. (2017), "Blockchain and bitcoin as a way to lift a country out of poverty – Tourism 2.0 and e-governance in the Republic of Moldova", *International Journal of*



- 
- Internet Technology and Secured Transactions*, Inderscience Publishers (IEL), Vol. 7 No. 2, pp. 115-143.
- Polasik, M., Piotrowska, A.I., Wisniewski, T.P., Kotkowski, R. and Lightfoot, G. (2015), "Price fluctuations and the use of bitcoin: an empirical inquiry", *International Journal of Electronic Commerce*, Taylor and Francis, Vol. 20 No. 1, pp. 9-49.
- Rodger, J.A., Pendharkar, P.C. and Bhatt, G.D. (1996), "Diffusion theory and the adoption of software innovation: common errors and future issues", *Journal of High Technology Management Research*, Vol. 7 No. 1, pp. 1-13.
- Rogers, E.M. (2003), *Diffusion of Innovations*, 5th ed., Free Press, available at: <https://books.google.de/books?id=9U1K5LjUOwEC>
- Ryan, H. (2022), "The future of cryptocurrency: 5 experts' predictions after a 'breakthrough' 2021", Time, available at: <https://time.com/nextadvisor/investing/cryptocurrency/future-of-cryptocurrency/> (accessed 13 February 2022).
- Schlecht, L., Schneider, S. and Buchwald, A. (2021), "The prospective value creation potential of blockchain in business models: a Delphi study", *Technological Forecasting and Social Change*, Vol. 166, p. 120601.
- Sharma, M., Sehrawat, R., Daim, T. and Shaygan, A. (2021), "Technology assessment: enabling blockchain in hospitality and tourism sectors", *Technological Forecasting and Social Change*, Vol. 169, p. 120810.
- Shelton, K., Haynes, C.A. and Creghan, K.A. (2018), "Fundamentals of Delphi research methodology", *Handbook of Research on Innovative Techniques, Trends, and Analysis for Optimized Research Methods*, IGI Global, pp. 233-257.
- Shen, Y. and Bai, G. (2020), "Research on application of blockchain in internationalization of china's medical tourism industry", *Presented at the 2020 International Signal Processing, Communications and Engineering Management Conference (ISPCEM)*, pp. 63-67.
- Skjott Linneberg Mai and Korsgaard Steffen (2019), "Coding qualitative data: a synthesis guiding the novice", *Qualitative Research Journal*, Emerald Publishing Limited, Vol. 19 No. 3, pp. 259-270.
- Stankov, U. and Filimonau, V. (2019), "Reviving calm technology in the e-tourism context", *The Service Industries Journal*, Routledge, Vol. 39 Nos 5/6, pp. 343-360.
- Strebinger, A. and Treiblmaier, H. (2022), "Profiling early adopters of blockchain-based hotel booking applications: demographic, psychographic, and service-related factors", *Information Technology and Tourism*, Vol. 24 No. 1, pp. 1-30.
- Surujnath, R. (2017), "Off the chain: a guide to blockchain derivatives markets and the implications on systemic risk", *Fordham J. Corp. and Fin. L*, HeinOnline, Vol. 22 No. 2, p. 257.
- Swan, M. (2015), *Blockchain: Blueprint for a New Economy*, O'Reilly Media, Inc., CA.
- Taherdoost, H. (2018), "A review of technology acceptance and adoption models and theories", *11th International Conference Interdisciplinarity in Engineering, INTER-ENG 2017*, 5-6 October 2017, Tirgu Mures, Romania, Vol. 22, pp. 960-967.
- Thal, K.I., Smith, S.L. and George, B. (2021), "Wellness tourism competences for curriculum development: a Delphi study", *Journal of Teaching in Travel and Tourism*, Vol. 21 No. 3, pp. 205-220.
- Tkatchuk, R. (2018), "Technology is changing the travel industry: here's how", available at: [www.cio.com/article/3252847/technology-is-changing-the-travel-industry-here-s-how.html](http://www.cio.com/article/3252847/technology-is-changing-the-travel-industry-here-s-how.html) (accessed 28 May 2020).
- Turkay, B., Dincer, F.I. and Dincer, M.Z. (2019), "An evaluation of new values in economy and their impacts on future transformation in tourism", *Procedia Computer Science*, Elsevier, Vol. 158, pp. 1095-1102.
- Tyan, I., Guevara-Plaza, A. and Yagüe, M.I. (2021), "The benefits of blockchain technology for medical tourism", *Sustainability*, Multidisciplinary Digital Publishing Institute, Vol. 13 No. 22, p. 12448.
-

- Tyan, I., Yagüe, M.I. and Guevara-Plaza, A. (2020), "Blockchain technology for smart tourism destinations", *Sustainability*, Multidisciplinary Digital Publishing Institute, Vol. 12 No. 22, p. 9715.
- Walch, A. (2015), "The bitcoin blockchain as financial market infrastructure: a consideration of operational risk", *NYUJ Legis. and Pub. Pol'y*, HeinOnline, Vol. 18 No. 4, p. 837.
- Williams, R.C. (2017), "Prospects for blockchain-based settlement frameworks as a resolution to the threat of de-risking to Caribbean financial systems", *Economic Commission for Latin America and the Caribbean (ECLAC)*, pp. 1-23.
- 
- Williamson, K., *et al.* (2002), "Chapter 12 - the Delphi method", in Williamson, K., Bow, A., Burstein, F., Darke, P., Harvey, R., Johanson, G. and McKemish, S., (Eds), *Research Methods for Students, Academics and Professionals*, 2nd ed., Chandos Publishing, Wagga Wagga, New South Wales, pp. 209-220.
- Yeoh, P. (2017), "Regulatory issues in blockchain technology", *Journal of Financial Regulation and Compliance*, Emerald Publishing Limited, Vol. 25 No. 2, pp. 196-208.
- Zamani, E., He, Y. and Phillips, M. (2020), "On the security risks of the blockchain", *Journal of Computer Information Systems*, Taylor and Francis, Vol. 60 No. 6, pp. 495-506.

No.	Source	Paper type (conceptual/empirical)	Geographical focus of analysis	Tourism sector	Research method	Discussion about the BCT risks?	Main research topic	Key finding
1.	<a href="#">Pilkington et al. (2017)</a>	Conceptual	Moldova	Tourism and travel	Literature review	No	They discussed the potential of the BCT for the tourism industry in the Republic of Moldova	They concluded that the BCT and cryptocurrencies can enhance the socioeconomic development of the destination
2.	<a href="#">Onder and Treiblmaier (2018)</a>	Conceptual-research note	Global	Tourism (payment, consumer review, tourism market, etc.)	Personal opinion	No	This Research Note presents three propositions for future research in the domain of tourism including trustworthy rating and review system, increasing trust by using cryptocurrencies and disintermediation by removing intermediates	Providing three propositions for future research
3.	<a href="#">Mofokeng and Matima (2018)</a>	Conceptual	Global	Tourism (mainly marketing)	Literature review	Discussed challenges	They discussed usage of both virtual reality and the BCT to transform tourism industry	They indicated that virtual reality and the BCT technologies lead to additional revenues
4.	<a href="#">Velošo et al. (2019)</a>	Conceptual	Global	Tourism sector (mainly crowdsourced repositories)	Literature review	No	This study discusses usage of distributed ledger/block chain to ensure trust in the tourism crowdsourcing platforms	Providing open issue and line for future research about trust in the tourism crowdsourcing platforms
5.	<a href="#">Filimonau and Naumova (2019)</a>	Conceptual	Global	Hospitality operations	Literature review	Discussed challenges	This paper discusses how the BCT will transform tourism industry	It provides a framework for prospective use of the BCT in this industry
6.	<a href="#">Turkay et al. (2019)</a>	Conceptual	Global	Tourism	Literature review	Yes	They inspected effect of the BCT on tourism industry at the conceptual level	Providing positive and negative impact of the BCT on tourism industry

(continued)

**Table A1.**  
List of literature

Table A1.

No.	Source	Paper type (conceptual/empirical)	Geographical focus of analysis	Tourism sector	Research method	Discussion about the BCT risks?	Main research topic	Key finding
7.	Bodkhe <i>et al.</i> (2019)	Empirical	Global	Smart tourism and hospitality management (by emphasis on the payment)	Development of a framework	No	Providing a framework for using the BCT in tourism	They proposed a framework, called "BloHosT". It allows tourists to interact with stakeholders by using a single wallet identifier. They believed that BloHosT has more return of investment than traditional frameworks. The proposed BCT-based platform to store origin provenance for food data
8.	Baralla <i>et al.</i> (2019)	Empirical	Global	Food supply chain	Development of a platform	No	They proposed a BCT-based platform to store origin provenance for food data. They also developed a system which ensure transparency and reliability to all stakeholders in food supply chain	
9.	Nam <i>et al.</i> (2019)	Conceptual	Global	Smart city/tourism	Literature review	Yes	This paper introduces the BCT and ways which it will influence tourism and smart city	This paper provides discussion on the BCT, its benefits and risks
10.	Kizildag <i>et al.</i> (2019)	Conceptual	Global	Hospitality and tourism industry	Literature review	Discussed challenges	They discussed the BCT and its potential for hospitality and tourism	They indicate that which functions of the BCT can cover core operational and business functions of tourism sector
11.	Kwok and Koh (2019)	Conceptual	Small island economies	Tourism industry	Literature review	Discussed challenges	This research letter discussed potential and challenges of the BCT adoption in the small island economies	This research letter discussed potential and challenges of the BCT adoption in the small island economies

(continued)

No.	Source	Paper type (conceptual/ empirical)	Geographical focus of analysis	Tourism sector	Research method	Discussion about the BCT risks?	Main research topic	Key finding
12.	<i>Ozdemir et al. (2019)</i>	Empirical	Global	Travel and tourism industry	Literature review and secondary data analysis	No	This paper discusses the BCT applications in the tourism industry	It provides criteria for policymakers to compare different applications
13.	Reyes- Menendez <i>et al. (2019)</i>	Conceptual	Global	Tourism industry	Literature review	No	They studied the identification of fake reviews in the tourism industry by conducting literature review	They named the BCT as the technology to prevent fake review
14.	<i>Jia-lan et al. (2019)</i>	Empirical	Global	Tourism industry (insurance)	Technical development	No	Designing of a travel insurance system	Usage of the BCT for designing of a travel insurance system
15.	<i>Nuryyev et al. (2020)</i>	Empirical	Taiwan	Tourism and hospitality SMEs (mainly payment section)	Quantitative (technology acceptance model and Structural equation modelling)	Discussed challenges	They studied factors which could influence usage of cryptocurrencies in the tourism industry in Taiwan	They conclude that strategic orientation, owner/managers personal characteristics and social influence have a strong effect on the intention to adopt new technology. In addition, perceived usefulness mediates the effects of strategic orientation and social influence, and perceived ease of use mediates the effect of self-efficacy on the intention to adopt cryptocurrency payments

(continued)

Table A1.

Table A1.

No.	Source	Paper type (conceptual/empirical)	Geographical focus of analysis	Tourism sector	Research method	Discussion about the BCT risks?	Main research topic	Key finding
16.	Lime <i>et al.</i> (2020)	Conceptual	Global	Hospitality and tourism	Literature review	No	This case study discussed value creation by using big data in tourism sector. They mentioned the BCT for creation of reciprocal big data value and management of data ownership	Four types of reciprocal big data value creation in the tourism domain are proposed
17.	Rashideh (2020)	Empirical	Global	Tourism	Qualitative method	No	This qualitative study developed a framework for using the BCT in the tourism industry	The study results indicate that BCT will eliminate mediators in tourism industry's supply chain
18.	Zeren and Demirel (2020)	Conceptual	Global	Financial system	Literature review and content analysis	No	The paper focus on the use of smart contract for payment in the tourism industry and try to provide a base for such systems	Introduction on the smart contracts
19.	Valeri (2020)	Conceptual	Global	Tourism	Literature review	Discussed challenges	Valeri in a paper did a review on progress of the BCT in tourism sector	It shows current status of research and provides guidelines for future research
20.	Ereç <i>et al.</i> (2020)	Empirical	Croatia and Macedonia	Tourism industry	Analysing secondary data and information	Discussed challenges	They discussed the potential of the BCT in tourism industry. Also, they discussed the current status of the BCT in the Republic of Croatia and the Republic of Macedonia in the tourism sector	Presenting current status of the BCT in the Republic of Croatia and the Republic of Macedonia in the tourism sector
21.	Tham and Sigala (2020)	Conceptual	Global	Tourism industry	Literature review	Discussed challenges	By using literature review, they state role of the BCT and cryptocurrencies as the enabler for sustain tourism development	The BCT and cryptocurrencies will improve trust, democratize participation in economic systems and redistribute power among actors

(continued)

No.	Source	Paper type (conceptual/ empirical)	Geographical focus of analysis	Tourism sector	Research method	Discussion about the BCT risks?	Main research topic	Key finding
22.	Valeri and Baggio (2020)	Conceptual	Global	Tourism industry	Viewpoint	Discussed challenges	The paper discusses the BCT adoption in tourism sector	Drivers and drawbacks of the BCT adoption in tourism sector and direction for future research
23.	Bolici <i>et al.</i> (2020)	Empirical	Global	Tourism industry	Social network analysis	No	The paper discusses technology diffusion in tourism sector by considering the BCT as the case and social media as the source of information	Some central node (participant in social media) have key role in information dissemination or influencing others
24.	Thees <i>et al.</i> (2020)	Conceptual	Global	Tourism industry	Content analysis	Discussed challenges	Examination of the BCT implications in tourism sector	The BCT will make traveling is streamlined, but there will be obstacles
25.	Tvan <i>et al.</i> (2020)	Conceptual	Global	Tourism industry	Literature review	Discussed challenges	Discussing advantage and challenges of usage of BCT in tourism sector	The BCT will enhance tourism experience, provide better privacy, benefits for local communities and rewarding sustainable behaviour
26.	Arif <i>et al.</i> (2020)	Empirical	Global	Tourism industry (rating system for destination, tour, etc.)	Technical development	No	The paper discusses development of tourism destination rating system	It provides a tourism destination rating system

(continued)

Table A1.

Table A1.

No.	Source	Paper type (conceptual/empirical)	Geographical focus of analysis	Tourism sector	Research method	Discussion about the BCT risks?	Main research topic	Key finding
27.	Vinod (2020)	Conceptual	Global	Travel	Literature review	Discussed challenges	The paper discusses adoption of the BCT for travel	The discussion about the BCT adoption
28.	Melkić and Cavlek (2020)	It uses secondary data, please see related publication to see it is empirical or conceptual?	Global	Tourism industry	literature review- semi-structured SWOT analysis	Discussed challenges	The paper does SWOT analysis on impact of the BCT on tourism sector	Paper highlights most strengths and weaknesses of the BCT usage in tourism sector
29.	Önder and Gunter (2020)	Conceptual	Global	Tourism industry	Literature review	Discussed challenges	Discuss impact of the BCT on tourism sector	The paper identifies potential use cases of the BCT in tourism sector and its usage for COVID-19
30.	Irannezhad and Mahadevan (2020)	Empirical	Global	Tourism industry	Case-study approach	Discussed challenges	This paper examines impacts, advantages and challenges of the BCT in the tourism sector	Provide discussion about useful features of the BCT and provide direction for future research
31.	Khanna <i>et al.</i> (2020)	Conceptual	Global	Hospitality industry	Literature review	No	Paper explores major application of the BCT in the hospitality industry	An overview on available literature in the term of bibliometric
32.	Amnountolas and Chiffer (2021)	Conceptual	Global	Tourism industry (mainly online travel agencies)	Literature review	Discussed challenges	The paper discusses usage of the BCT in tourism sector from view of online travel agencies	Provide two research propositions about usage of the BCT by online travel agencies as future studies

(continued)



No.	Source	Paper type (conceptual/ empirical)	Geographical focus of analysis	Tourism sector	Research method	Discussion about the BCT risks?	Main research topic	Key finding
33.	Joo <i>et al.</i> (2021)	Conceptual	Global	Tourism industry	Literature review	No	It inspects application of the BCT for sustainable tourism ecosystems	Discussion about usage of the BCT for tourism sector besides introduction on some of available applications
34.	Cherivan and Tamilarasi (2021)	Conceptual	Global	Tourism industry	Literature review	Discussed challenges	Discussion about application of the BCT in tourism sector and related challenges	This paper provides brief overview on usage of the BCT in tourism sector

Table A1.

- Ampountolas, A. and Chiffer, E. (2021), "Will blockchain shift Online Travel Agencies toward growth or to an end?", *Tourism Economics*, SAGE Publications Sage UK: London, England, pp. 1-6, doi: 10.1177/1354816620985371.
- Arif, Y.M., Nurhayati, H., Harini, S., Nugroho, S.M.S. and Hariadi, M. (2020), "Decentralized tourism destinations rating system using 6AsTD framework and blockchain", Presented at the 2020 International Conference on Smart Technology and Applications (ICoSTA), IEEE, pp. 1–6.
- Baralla, G., Ibba, S., Marchesi, M., Tonelli, R. and Missineo, S. (2019), "A blockchain based system to ensure transparency and reliability in food supply chain", in Mencagli, G.B. Heras, D., Cardellini, V., Casalicchio, E., Jeannot, E., Wolf, F., Salis, A., *et al.* (Eds), *euro-Par 2018: Parallel Processing Workshops*, Springer International Publishing, Cham, pp. 379–391.
- Bodkhe, U., Bhattacharya, P., Tanwar, S., Tyagi, S., Kumar, N. and Obaidat, M. (2019), "Blohost: blockchain enabled smart tourism and hospitality management", Presented at the 2019 International Conference on Computer, Information and Telecommunication Systems (CITS), IEEE, pp. 1–5.
- Bolici, F., Acciarini, C., Marchegiani, L. and Pirolo, L. (2020), "Innovation diffusion in tourism: how information about blockchain is exchanged and characterized on twitter", *The TQM Journal*, Vol. ahead-of-print No. ahead-of-print, doi: 10.1108/TQM-01-2020-0016.
- Cheriyana, A. and Tamarasi, S. (2021), "Block chain technology: the future of tourism", In: Al-Emran M., Shaalan K. and Hassanien, A. (Eds), *Recent Advances in Intelligent Systems and Smart Applications. Studies in Systems, Decision and Control*, Vol. 295, Springer, Cham, doi: 10.1007/978-3-030-47411-9\_26.
- Erceg, A., Damoska Sekuloska, J. and Kelić, I. (2020), "Blockchain in the tourism industry – a review of the situation in croatia and macedonia", Vol. 7, Informatics, Multidisciplinary Digital Publishing Institute, pp. 1-16.
- Filimonau, V. and Naumova, E. (2019), "The blockchain technology and the scope of its application in hospitality operations", *International Journal of Hospitality Management*, Vol. 87, p. 102383, doi: 10.1016/j.ijhm.2019.102383.
- Irannezhad, E. and Mahadevan, R. (2020), "Is blockchain tourism's new hope?", *Journal of Hospitality and Tourism Technology*, Vol. 12 No. 1, pp. 85-96, doi: 10.1108/JHTT-02-2019-0039.
- Jia-lan, L., Xiao-yu, W., Wan-jun, Y., Zi-chen, W., Huai-lin, Z. and Nai-meng, C. (2019), "Research and design of travel insurance system based on blockchain", Presented at the 2019 International Conference on Intelligent Informatics and Biomedical Sciences (ICIIBMS), IEEE, pp. 121–124.
- Joo, J., Park, J. and Han, Y. (2021), "Applications of blockchain and smart contract for sustainable tourism ecosystems", in Suma V., Bouhmala N. and Wang, H. (Eds), *Evolutionary Computing and Mobile Sustainable Networks. Lecture Notes on Data Engineering and Communications Technologies*, Vol. 53, Springer, Singapore, doi: 10.1007/978-981-15-5258-8\_71.
- Khanna, A., Sah, A., Choudhury, T. and Maheshwari, P. (2020), "blockchain technology for hospitality industry", presented at the European, Mediterranean, and Middle Eastern Conference on Information Systems, Springer, pp. 99–112.
- Kizildag, M., Dogru, T., Zhang, T.C., Mody, M.A., Altin, M., Ozturk, A.B. and Ozdemir, O. (2019), "Blockchain: A paradigm shift in business practices", *International Journal of Contemporary Hospitality Management*, Vol. 32 No. 3, pp. 953-975, doi: 10.1108/IJCHM-12-2018-0958.
- Kwok, A.O. and Koh, S.G. (2019), "Is blockchain technology a watershed for tourism development?", *Current Issues in Tourism*, Taylor and Francis, Vol. 22 No. 20, pp. 2447–2452.
- 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*, Elsevier, Vol. 80, p. 104106.
- Melkić, S. and Čavlek, N. (2020), "The impact of blockchain technology on tourism intermediation", *Tourism: An International Interdisciplinary Journal*, Institut za turizam, Vol. 68 No. 2, pp. 130–143.

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*, Vol. 7 No. 3, pp. 1-14

Nam, K., Dutt, C.S., Chathoth, P. and Khan, M.S. (2019), "Blockchain technology for smart city and smart tourism: latest trends and challenges", *Asia Pacific Journal of Tourism Research*, Taylor and Francis, pp. 1–15.

Nuryyev, G., Wang, Y.-P., Achyldurdyeva, J., Jaw, B.-S., Yeh, Y.-S., Lin, H.-T. and Wu, L.-F. (2020), "Blockchain technology adoption behavior and sustainability of the business in tourism and hospitality SMEs: an empirical study", *Sustainability*, Multidisciplinary Digital Publishing Institute, Vol. 12 No. 3, p. 1256.

Önder, I. and Gunter, U. (2020), "Blockchain: is it the future for the tourism and hospitality industry?", *Tourism Economics*, SAGE Publications Sage UK: London, England, p. 1354816620961707, doi: 10.1177/1354816620961707.

Önder, I. and Treiblmaier, H. (2018), "Blockchain and tourism: three research propositions", *Annals of Tourism Research*, Elsevier, Vol. 72 No. C, pp. 180–182.

Ozdemir, A.I., Ar, I.M. and Erol, I. (2019), "Assessment of blockchain applications in travel and tourism industry", *Quality and Quantity*, Vol. 54, pp. 1–15.

Pilkington, M., Crudu, R. and Grant, L.G. (2017), "Blockchain and bitcoin as a way to lift a country out of poverty – tourism 2.0 and e-governance in the Republic of Moldova", *International Journal of Internet Technology and Secured Transactions*, Inderscience Publishers (IEL), Vol. 7 No. 2, pp. 115–143.

Rashideh, W. (2020), "Blockchain technology framework: current and future perspectives for the tourism industry", *Tourism Management*, Elsevier, Vol. 80, p. 104125.

Reyes-Menendez, A., Saura, J.R. and Filipe, F. (2019), "The importance of behavioral data to identify online fake reviews for tourism businesses: A systematic review", *PeerJ Computer Science*, PeerJ Inc., Vol. 5, p. e219.

Tham, A. and Sigala, M. (2020), "Road block (chain): bit (coin) s for tourism sustainable development goals?", *Journal of Hospitality and Tourism Technology*, Vol. 11 No. 2, pp. 203-222, doi: 10.1108/JHTT-05-2019-0069.

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*, Vol. 26, pp. 2602–2602.

Turkay, B., Dincer, F.I. and Dincer, M.Z. (2019), "An evaluation of new values in economy and their impacts on future transformation in tourism", *Procedia Computer Science*, Elsevier, Vol. 158, pp. 1095–1102.

Tyan, I., Yagüe, M.I. and Guevara-Plaza, A. (2020), "Blockchain technology for smart tourism destinations", *Sustainability*, Multidisciplinary Digital Publishing Institute, Vol. 12 No. 22, p. 9715.

Valeri, M. (2020), "Blockchain technology: adoption perspectives in tourism", *Entrepreneurship and Organizational Change*, Springer, pp. 27–35.

Valeri, M. and Baggio, R. (2020), "A critical reflection on the adoption of blockchain in tourism", *Information Technology and Tourism*, Vol 21, Springer, pp. 1–12.

Veloso, B., Leal, F., Malheiro, B. and Moreira, F. (2019), "Distributed trust and reputation models using blockchain technologies for tourism crowdsourcing platforms", *The 10th International Conference on Emerging Ubiquitous Systems and Pervasive Networks (EUSPN-2019)/The 9th International Conference on Current and Future Trends of Information and Communication Technologies in Healthcare (ICTH-2019)/Affiliated Workshops*, Vol. 160, pp. 457–460.

Vinod, B. (2020), "Blockchain in travel", *Journal of Revenue and Pricing Management*, Springer, Vol. 19 No. 1, pp. 2–6.

Zeren, S.K. and Demirel, E. (2020), "Blockchain based smart contract applications in tourism industry", *Digital Business Strategies in Blockchain Ecosystems*, Springer, pp. 601–615, doi: 10.1007/978-3-030-29739-8\_28.

Question	Rationale	Source (if applies)	Section
Based on your expert knowledge, what benefits exist for the blockchain technology use in tourism	To establish the opportunities provided by the blockchain technology in tourism		The BCT benefits
PROBE removing fake reviews, increasing transparency, removing middleman, security, improving the relationship between hosts and guests, and effects on supply chain	To gather experts' opinions about mentioning the BCT benefits in tourism literature	Blockchain technology (BCT) has potential to transform tourism and hospitality industry by removing fake reviews and increasing transparency in the digital communication channels of marketing, revolving sharing economy by removing middleman, providing more security in the transactions, improving the relationship between hosts and guests, assisting supply chain management in the hospitality industry, etc. (Filimonau and Naumova, 2019)	The BCT benefits
PROBE tourists experience, Payment, operational costs	To gather experts' opinions about mentioned the BCT benefits in tourism literature	The BCT can improve tourists experience through analysing their previous transactions and recommending desired services. Payment via cryptocurrencies will be hassle-free by facilitating currency exchanges. BCT will solve problem related to dependency to local banks and provides better and robust compliance monitoring. It also will decrease operational costs (Kwok and Koh, 2019; Polasik <i>et al.</i> , 2015; Tkatchuk, 2018; Williams, 2017). Cryptocurrencies make possible purchase with same currency in the different countries, and due to their features lead to evolution of tourism industry. Smart contracts and distributed ledgers will decrease costs	The BCT benefits

(continued)

**Table A2.**  
Interview schedule

## Blockchain technology in tourism

Question	Rationale	Source (if applies)	Section
Based on your expert knowledge, what challenges exist for the blockchain technology use in tourism	To establish the challenges provided by the blockchain technology in tourism	and increase profitability (Turkay <i>et al.</i> , 2019)	The BCT challenges
PROBE desired level of readiness, market maturity for adoption, tourist knowledge, political issues (control of governments, tax regulation), wide range adoption, security, privacy, energy consumption, lack of awareness, trust to its potential, limited technological uptake, costs, regulation, and problem related to speed of transactions,	To gather experts' opinions about mentioned BCT challenges in tourism literature	Some potential challenges for usage of BCT in tourism; customers and tourist should have desired level of readiness and market should be mature for adoption of BCT. This affected tourist knowledge, and usually technology-savvy tourist will use technology. They only form parts of population not all tourists. The political issues may influence usage of cryptocurrencies as these currencies are not under control of governments. There are also concerns about tax regulation, volatility of cryptocurrency value and availability of wide range of cryptocurrencies and adoption of them. There are also security and privacy concerns for usage of BCT. The energy consumption is another issue which requests usage of renewable energy (Kwok and Koh, 2019). Filimonau and Naumova discussed main issues of using BCT in hospitality management such as lack of awareness and trust to its potential, limited technological uptake, costs, regulation and problem related to speed of transactions. They also discussed possible solutions (Filimonau and Naumova, 2019)	The BCT challenges
Based on your expert knowledge, what Risks will be existing after adoption of blockchain technology in tourism sector	To understand the potential risks provided by the blockchain technology in tourism		The BCT risks

(continued)

**Table A2.**

Question	Rationale	Source (if applies)	Section
PROBE security, efficiently, cost of BCT, energy consumption, scalability issue, lack of knowledge and understanding, existence of inaccurate information, survive between dominant and new coins, increasing number of BCT intermediaries, lack of widespread validation and information, regulation problems, possible prohibition of digital currencies	To gather experts' opinions about mentioned BCT risks in tourism literature	They numerate blockchain risks including security, efficiently, cost of BCT, energy consumption, scalability issue, lack of knowledge and understanding, existence of inaccurate information, survive between dominant and new coins, increasing number of BCT intermediaries, etc. (Nam <i>et al.</i> , 2019). Turkay <i>et al.</i> (2019) discussed negative impact of BCT and new technologies on the tourism sector including security and privacy issues, lack of widespread validation and information, regulation problems and possible prohibition of digital currencies	The BCT risks

Table A2.

Appendix 3

Participant code	Gender	Highest degree	Country of residence	Length of experience in working with the BCT (years)	Keywords that describe the field of expertise	Academic	Industry professional
A-1	Male	PhD	UK	2	Blockchain, financial, artificial intelligence	*	
A-2	Male	PhD	Belgium	3	Cryptography, zero-knowledge proofs, blockchains, smart contract systems	*	
A-3	Male	PhD	USA	3	IoT, blockchain, embedded system, security, payment		*
A-4	Male	PhD	UK	2	Privacy, IoT, blockchain, business process model, GDPR	*	
A-5	Male	PhD	Australia	4	Internet of Things, network security, privacy, blockchain, tax, energy, smart city, tourism and travel	*	
A-6	Male	MSc	Iran	2	Blockchain, innovation, business model, cryptocurrencies		*
A-7	Male	PhD	Australia	2	Cryptography, blockchain, information security, micropayment, cryptocurrency, bitcoin, travel		*
A-8	Male	MSc	Switzerland	4	Blockchains, IoT, smart contracts, supply chain, bitcoin		*
A-9	Male	PhD	Norway	3	Blockchain, management, supply chain, smart contract, travel, tourism, bitcoin	*	
A-10	Male	PhD	Iran	3	Blockchain, management, tourism, travel, business model		*
A-11	Male	PhD	Iran	4	Blockchain, marketing, tourism	*	
A-12	Male	PhD	Iran	2	Blockchain, payment, tourism, hospitality, reservation		*

Blockchain technology in tourism

**Table A3.**  
Expert information

No.	Category	Factor	No.r of experts who stated this factor		
1.	The BCT opportunities	Fake review detection	4		
		Trust	4		
		Security	4		
		Cost reduction	3		
		Protecting the rights of individuals	3		
		Removing middleman	2		
		Transparency	2		
		Lack of government control	2		
		Accessibility	2		
		Improving host–guest relationship	2		
		Unique currency	1		
		Usage for unbanked people	1		
		2.	The BCT challenges	Cost	6
				Scalability issue	6
				Education and training	5
Security	5				
Privacy	5				
Regulatory issues	4				
Energy consumption	2				
Internet access	2				
Blockchain overhead	2				
Limited number of experts	2				
Requires desired level of readiness	1				
Immature cryptocurrencies	1				
Government opposition	1				
National security	1				
Lack of awareness	1				
3.	The BCT risks	Costs	4		
		Legal risk	4		
		Energy consumption	3		
		Government opposition	2		
		National security	2		
		False information dissemination	2		
		Security	2		
		Increasing of the BCT intermediaries	1		
		Survive between dominant and new coins	2		
		Scalability issue	1		
		Lack of knowledge	1		
		Acceptance of system	1		
		Difficulty in usage of the BCT	1		

**Table A4.**  
Categories and  
related code

### About the authors

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