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REVIEW

Reshaping the future of tourism & hospitality industry through blockchain technology: a systematic literature review

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Abstract

Blockchain is an emerging technology, and despite the growing literature on the topic, research on the use of blockchain in the tourism and hospitality industry is still fragmented. Therefore, further research is needed to explore blockchain's applications, benefits, and obstacles from the perspective of businesses and consumers. This article aims to systematically review the extant blockchain-related literature and understand how this technology can be applied to optimise tourism and hospitality products and enhance tourist experiences. Following PRISMA guidelines, 98 peer-reviewed articles were deemed relevant to this study through a search in Scopus and Web of Science platforms. As a result of mapping research on blockchain in tourism and hospitality industry using Bibliometrix, a framework focused on applications, benefits and obstacles was developed. Findings can be used as a guide by researchers to advance the topic, as well as by stakeholders and policymakers in the field. Managers in tourism and hospitality should understand how to incorporate blockchain in businesses better, and policymakers should endeavour to develop clear regulations, especially for cryptocurrency use, which can lead to an increase in the adoption of blockchain in tourism and hospitality companies.

Keywords Blockchain technology · Smart tourism · Tourism · Hospitality · Systematic literature review

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1 Introduction

The growth of Internet use has impacted many sectors within the tourism and hospitality industry (THI), influencing tourists' behaviour and facilitating the search and sharing of information (Sun et al. 2022). The correct use of technology is crucial for relevant (disruptive) innovation, enhancing tourism and hospitality services and tourists' experiences, while improving targeted marketing and management functions (Buhalis et al. 2019; Liu et al. 2023).

Specifically, the process of optimising the use of blockchain technology (BCT) can give an edge over competitors and strengthen the business structure (Treiblmaier 2022). According to Voshmgir (2020), BCT has contributed to the emergence of a new evolutionary phase of the Internet, commonly referred to as Web 3.0. This stage emphasises decentralisation and security, which in turn enhances communication and transactions within the digital environment. Treiblmaier (2018) defines blockchain as a "digital, decentralised and distributed ledger in which transactions are logged and added in chronological order to create permanent and tamperproof records" (p. 547). Blockchain is also described as a linked series of blocks, and each block in this chain contains data that refer to a transaction recorded in chronological order that cannot be edited or destroyed. Once new data is added, a new block appears in the chain, and as much data is added, the chain gets longer (Bodkhe et al. 2020).

The complexity of blockchain is visible due to its many features and range, including distributed database, peer-to-peer exchange, transparency with anonymity, immutable data, smart contracts, and decentralised systems (Aghaei et al. 2021). Trust and transparency have indispensable potential in distributed applications based on BCT (Razzaq et al. 2023). Treiblmaier (2022) recommends focusing on specific technological implementation and the goals of BCT rather than on BCT in general to explore better, explain and predict the implications of blockchain in the tourism industry.

Despite the growing research interest in this topic in the context of THI, considering its increasing applications in specific sectors (e.g. airlines, accommodation), studies are still fragmented (Jain et al. 2023). In this vein, some systematic literature reviews have been conducted to help map research on blockchain in the context of THI by adopting specific foci: enablers and constraints (Acikgoz et al. 2024), advantages and disadvantages (Rana et al. 2022), potential use in THI in specific areas (Castillo et al. 2023c; Kashem et al. 2023; Puri et al. 2023), impacts from sustainability and customer experience perspectives (Castillo et al. 2023a; 2023b), gaps in technology awareness and research directions (Jain et al. 2023), and benefits and obstacles of BCT in a sharing economic context (Muharam et al. 2024).

Our research aims to systematically map BCT in THI, contributing to advancing knowledge in this area in different ways. First, it presents an up-to-date systematic analysis covering indexed journal articles published until August 2024. Second, apart from a thematic analysis, our review offers a visualisation of a co-occurrence network, providing an overview of the main clusters of topics being studied within BCT, which helps depict trends in research and angles that have not been covered, making research gaps visible. Third, the benefits and obstacles to using BCT and the methodological approaches and theories used in published research are identified.

Distinguishing from previous reviews, this study presents a framework that separately depicts business and consumer perspectives. This framework aims to assist researchers and professionals in understanding the current utilization of BCT and provides recommendations to support its adoption. This approach makes opportunities for future research visible, providing a platform for exciting research avenues. Additionally, the findings can be useful for stakeholders and policymakers by aiding them in better-incorporating blockchain into their strategies and decisions.

2 Methodology

This study aims to review published articles on BCT in THI systematically. A systematic review is an adequate method for examining and mapping existing research (Post et al. 2020). Systematic reviews can lead to new directions and give a vision for future research. This type of review allows replication by following a rigorous process, and the method is considered helpful for identifying research gaps that demand future research (Agapito et al. 2022; Pickering and Byrne 2014).

A research protocol was defined to address the research objective. Web of Science (WoS) and Scopus were the scientific databases selected to search for relevant publications. In line with the methodology used in other reviews (Agapito et al. 2022; Law et al. 2014), books, research notes, literature review studies, conference proceedings, theses, business reports, and other publications were excluded from the review. Only peer-reviewed journal articles published until August 2024 were considered. First, one researcher selected the articles, and then the selection was validated by two other researchers independently (Petticrew and Roberts 2006). The process ended when an accord was reached between the researchers. This process was concluded on August 13, 2024.

The search was conducted directly in WoS and Scopus online databases in titles, abstracts, and keywords using the search string ("tourism" or "travel" or "hotel" or "hotels" or "hospitality" or "leisure" or "vacation" or "holiday") and "blockchain". Search filters included: type of document (journal article) and language (English) without date limitation. The search resulted in 369 and 273 records in WoS and Scopus, respectively. Of these 642 results, 178 duplicate records were excluded using RStudio software.

The review followed PRISMA guidelines (Page et al. 2021). In the first phase of the screening process, a brief analysis of each article's title, abstract and keywords was performed. In so doing, 156 of 464 articles were selected to take forward, and the remaining articles were excluded because their focus was not centred on both BCT and tourism. The 156 publications were assessed for eligibility by reading the full texts. Five articles were not available, one article did not provide a clear methodology, and nine articles were systematic literature reviews. The focus of forty-three articles was not centred on BCT from tourism or hospitality perspective. For these reasons, these documents were excluded. This process resulted in 98 journal articles for the systematic review. In line with previous research using the systematic review processes following PRISMA guidelines (Page et al. 2021), the selection process of publications to review can be observed in Fig. 1.

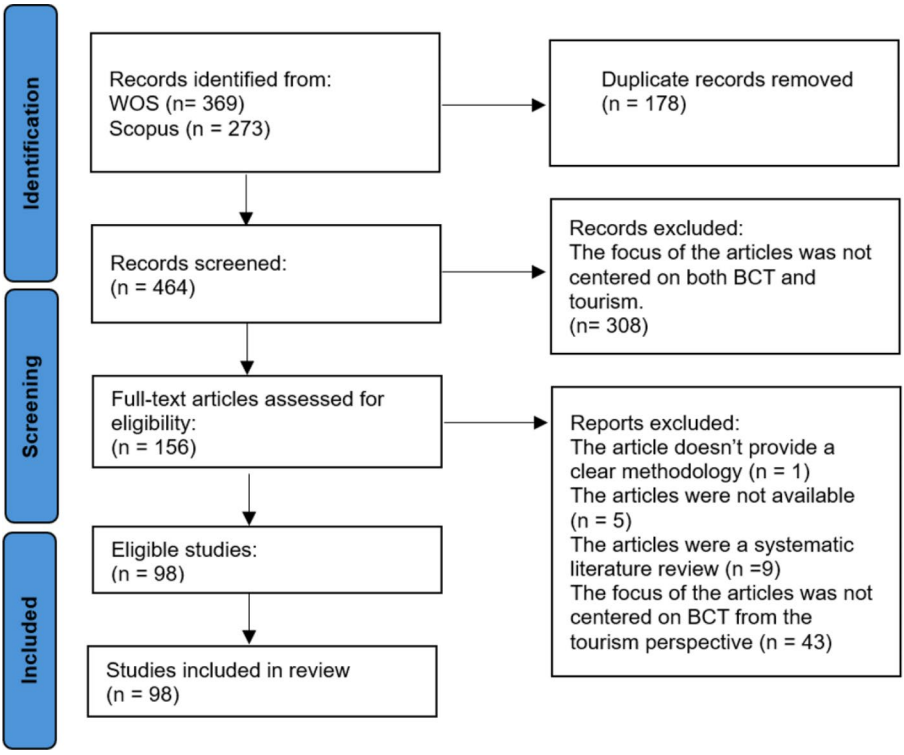

Fig. 1 PRISMA flowchart for article selection

To analyse the distribution of article sources, year of publishing and evaluative bibliometric outputs (descriptive analysis), as well as relational outputs (Benckendorff and Zehrer 2013), Bibliometrix (Biblioshiny) software from 'R package' was used (Aria and Cuccurullo 2017). Relational analysis was conducted using authors' keywords co-occurrence, which is related to the number of times one author's keyword closely relates to another publication in the sample. This conceptual structure is associated with a lexical analysis based on co-occurrences. It generates a network of themes (clusters) that can aid researchers in depicting research trends (Koseoglu et al. 2016). Data pre-processing of authors' keywords was undertaken to achieve more accurate results in the co-occurrence network (e.g., putting singular and plural forms of the same terminologies into one). As recommended in the literature, bibliometric analyses were combined with manual analyses for topical analysis. Following the approach used in previous reviews (e.g., Jain et al. 2023), a thematic analysis was conducted to depict research topics on BCT in THI addressed in the sample articles under analysis (one researcher first identified the topics based on literature, a process validated by two other researchers independently).

3 Findings

3.1 Distribution of article sources

As blockchain is an emerging technology, researchers are exploring how it could impact and improve industries such as THI. Figure 2 shows the distribution of articles per journal. The results show that journals cover tourism, technology, and management disciplines.

3.2 Distribution of articles per year and geographically

According to the protocol used in this research, the first articles on BCT in tourism were published in 2018 (Mofokeng and Matima, 2018a; Mofokeng and Matima 2018b; Önder and Treiblmaier 2018). The number of articles increased from 3 in 2018 to 24 in 2023. At the moment of analysis, 14 papers have been published in 2024 as Fig. 3 illustrates the publication's evolution from 2018 to 2024. The articles were developed in different geographical areas (according to the author's institutional affiliations), as demonstrated in Fig. 4. The most productive countries on the topic are China, United States, Austria, Australia, India, Italy, Thailand, Russia, Turkey, France and Spain.

3.3 Co-occurrence network

Three clusters of selected keywords were identified using Bibliometrix (Biblioshiny) software, as detailed by Aria and Cuccurullo (2017). Figure 5 portrays the co-occurrence network considering the authors' keywords allocated to each article. The first cluster (depicted in blue) has the largest number of keywords (13) and presents the articles related to the innovation and the impact of BCT and its adoption in the dif-

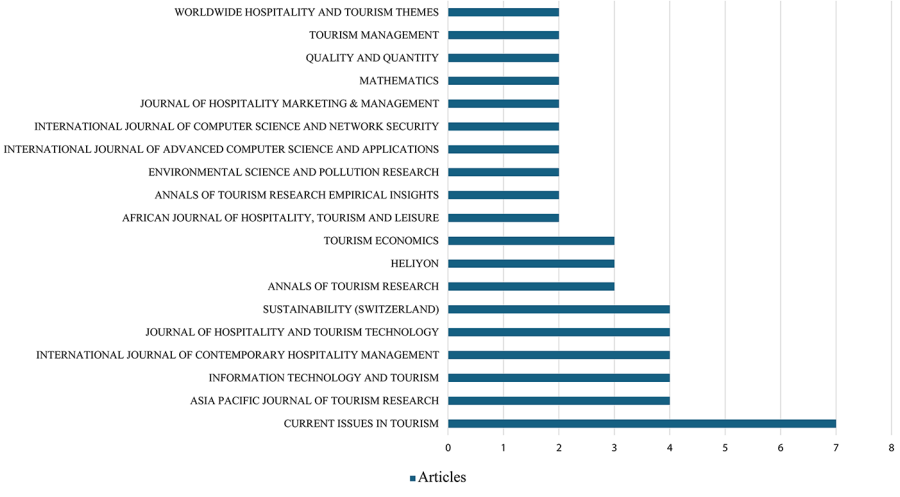

Fig. 2 Distribution of articles per journal

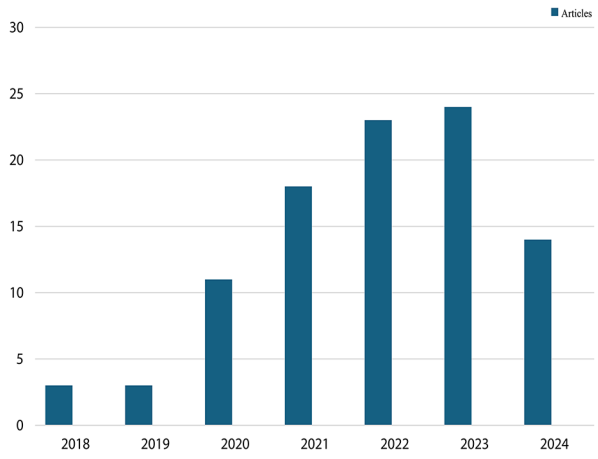

Fig. 3 Article publication evolution

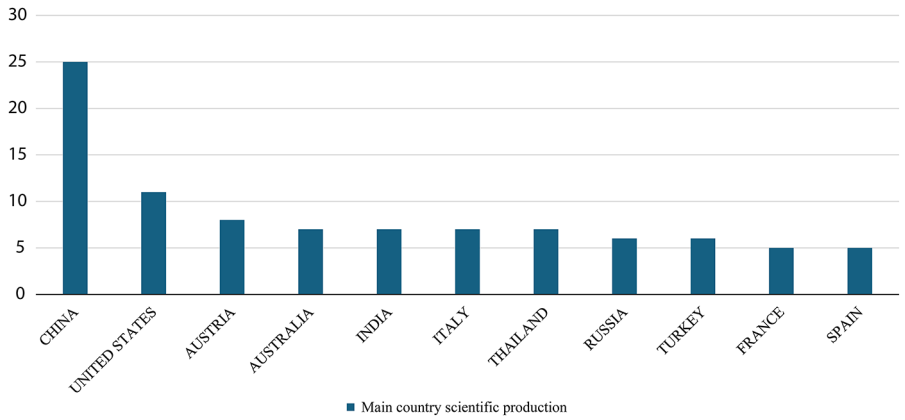

Fig. 4 Main country scientific production

ferent sectors of THI (e.g., accommodation, food and beverage, airlines). The second cluster (depicted in green) contains 7 keywords and represents topics related to the adoption of tokens like non-fungible tokens (NFTs) and cryptocurrencies. The third cluster (depicted in red) contains 4 keywords connected to the impact of BCT in the industry in relation to the intermediaries and their business model.

3.4 Most cited articles

The most cited articles on BCT in THI are presented in Fig. 6. In our sample, the most cited article was published in 2018 (Önder and Treiblmaier 2018). These articles are addressed in the next section, within topical analysis.

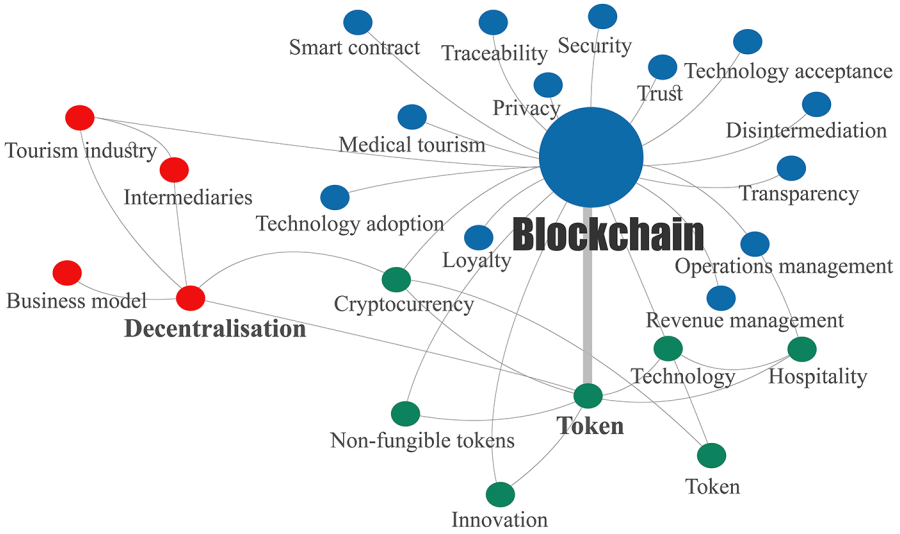

Fig. 5 Co-occurrence network based on keywords about BCT in THI

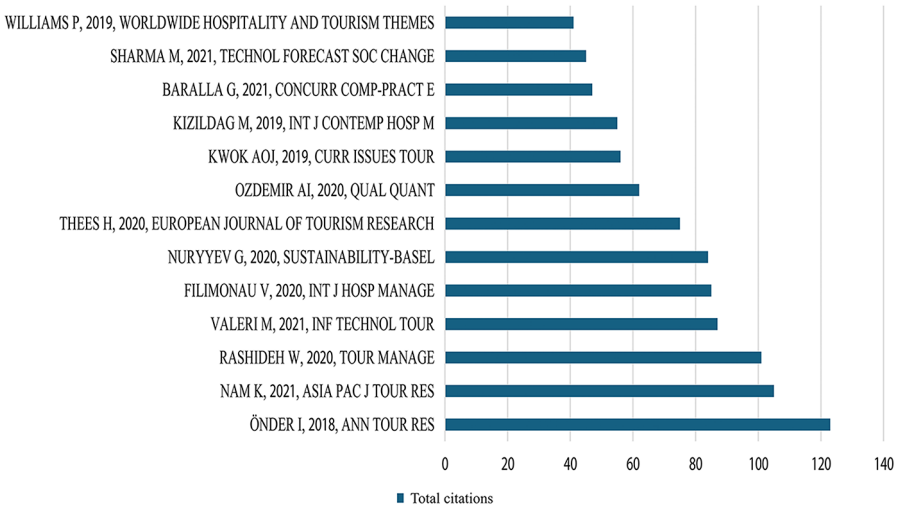

Fig. 6 Most cited articles

3.5 Topical analysis of the articles

A growing number of researchers gained interest in BCT's development in THI. Table 1 lists the topics related to the applications and features of BCT in THI. Appendix 1 shows more details about the 98 selected articles.

The thematic categories were identified by examining each article, focusing on identifying key themes under analysis regarding BCT within THI. The 98 articles were organised into five main topics: Benefits and obstacles (40%), relate to advan-

Table 1 Topics around BCT in THI

Topics	Number of articles	%
Benefits and obstacles	39	40
Disintermediation and intermediaries	19	19.5
The tokens	19	19.5
The adoption and the intention of accepting BCT	12	12
Smart contracts	9	9
Total	98	100

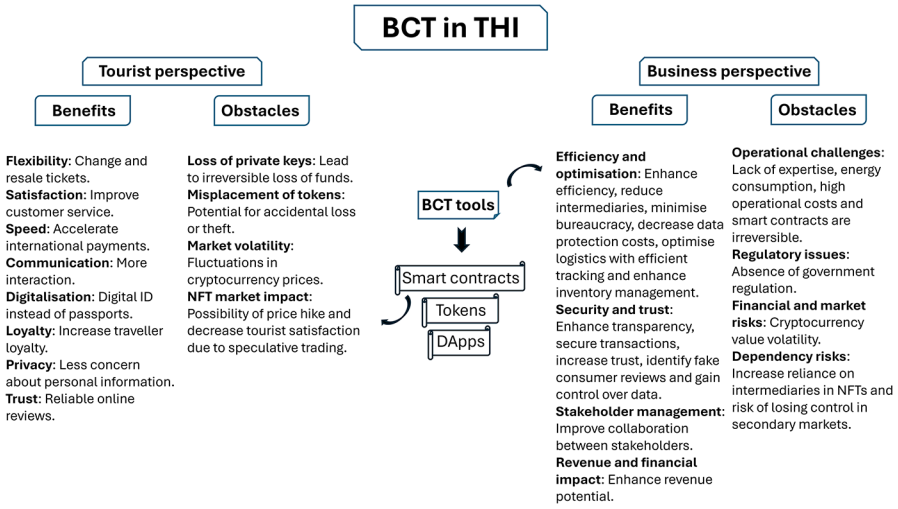

Fig. 7 A framework for the use of BCT in THI

tages (e.g., increase the security of the transactions) and limitations (e.g. lack of knowledge) of BCT adoption in THI; disintermediation and intermediaries associate with BCT's impact on intermediates and the potential of decentralised applications (19.5%); tokens refer to the utilisation of cryptocurrencies or NFTs (19.5%); adoption and intention to accept BCT relate to the intention of BCT adoption from the perspectives of tourists or stakeholders (12%); and smart contracts are depicted as a core blockchain tool (9%).

Next, we provide a detailed analysis of the reviewed articles considering the identified topics. As a result, we present a framework summarising the benefits and obstacles regarding using BCT in THI from business and consumers' perspectives as illustrated in Fig. 7.

3.6 Benefits and obstacles

3.6.1 Business perspective

The research by Willie (2019) introduces BCT in the tourism industry, particularly within the accommodation sector. It discusses applications such as revenue management, inventory management, and enhancing guest history. BCT also offers innovative benefits for travel agents, including secure information transfer and improved transaction security, reducing incidents of lost or stolen records and transactions. Additionally, restaurants can leverage BCT by employing smart contracts to facilitate secure exchanges of property, wealth, and inventory – providing a safe digital environment for transactions in the hospitality and tourism food service sector. Early adopters of blockchain in the tourism industry gain advantages such as new product offerings, eliminating dependency on intermediaries and allowing control over their data (Maythu et al. 2024). BCT could significantly alter the role of intermediaries in the tourism sector. The technology creates more equality and reduces barriers to entry and exit for all intermediaries, leading to a shift from global players to a wider variety of stakeholders (Thees et al. 2020).

According to Valeri and Baggio (2021), the benefits of implementing BCT in tourism include time-saving procedures, reduced bureaucratic delays, decreased data protection costs, minimised errors and human interventions, and the establishment of new relational dynamics. Kwok and Koh (2019) state that BCT can be applied in several domains in the tourism industry, providing better customer experience, reservation and ticketing, identity management, loyalty programmes, digital payment, credential management, and inventory management. According to Vinod (2020), blockchain could also have a positive impact on revenue management. On the other hand, Ukhina et al. (2022) state that the advantage of implementing BCT in the tourism industry is automation, which can enhance profit and decrease costs. This potential should motivate stakeholders to consider BCT.

In addition, BCT could enhance transparency and efficiency (Cheng 2023), which could turn into a competitive advantage (Sarfraz et al. 2023). Guan et al. (2023) propose a framework that combines blockchain and the Internet of Things to secure hotel data while improving customer service. Filimonau and Naumova (2020) advocate that BCT holds the largest potential for application in the context of hospitality, including increasing transparency of digital communication channels in hospitality marketing by detecting fake consumer reviews, revolutionising sharing economy applications, and contributing significantly to the management of the industry's supply chain, especially in terms of food procurement. Hospitality operators may proactively be facilitators in informing the public about blockchain benefits, potentially enabling wider adoption among food businesses for streamlined communication signals like product labels (Cozzio et al. 2023).

BCT participates in developing smart tourism destinations by enhancing the tourism experience and providing accurate information for personalised services (Tyan et al. 2020). Gamidullaeva et al. (2023) suggest a design concept of a recommendation system based on BCT to ensure information security of the data collected from travellers and provide personalised services. On the other hand, Viano et al. (2022)

propose a "wallet app" based on BCT to support financial inclusion and collaborative welfare and economy models in local communities. It can also act as a tool for innovating local development policies and service co-production in the tourism sector.

BCT could improve the sustainability performance of organisations in THI (Chaudhuri et al. 2023). Indeed, Pranita et al. (2023) reinforce that BCT and smart technology can contribute to the sustainability of the tourism industry by combining resources from different stakeholders, including enhancing tracking luggage in the airline industry, implementing digital identity to replace passports, and improving stakeholder coordination. Despite the great potential for BCT, real-world application within THI still needs to be improved due to its novelty. Furthermore, Sarhadi et al. (2023) indicate that BCT positively impacts the entrepreneurial and marketing capabilities and the marketing performance of active hospitals in the Iranian health tourism sector and aids in securing and effective data management within the healthcare system.

Conversely, BCT has limitations related to data storage and management, as data cannot be deleted or modified once entered. Smart tourism destinations could face obstacles due to conceptual complexity and lack of expertise in adopting this technology. Moreover, other limitations exist, like the cost and energy consumption concerns related to adopting BCT (Tyan et al. 2020) and the extra operational costs (Dadkhah et al. 2022).

BCT is still in its infancy (Liu et al. 2023), and its deployment in the tourist sector is still in the learning and convincing phase (Cheng 2023). According to Ukhina et al. (2022), the main problems of implementing BCT in the tourism industry are related to reaching a consensus and the costs involved in implementing BCT technology. Also, there has yet to be a legal framework regulating blockchain use, and the tourism industry personnel still need to be ready to adopt it. Özgit and Adalıer (2022) revealed a lack of knowledge and understanding of how stakeholders can use BCT due to traditional operational concerns and limited policy development, causing THI to lag in adopting innovative technologies like BCT. Local tourism service providers may be uncertain about which cryptocurrency will be used (Kizildag et al. 2019; Kwok and Koh 2019).

The lack of technical maturity and interoperability can negatively impact blockchain applications in THI. However, the execution of this technology is still at the knowledge and conviction stages (Erol et al. 2022; Saraf et al. 2023). In addition, Liu and Dong (2021) stress that training programmes and education participation that help employees recognise and prepare for new technology applications will be crucial.

Integrating BCT into smart tourism increases complexity due to sophisticated technology, but it also decreases complexity due to expected disintermediation. Airlines and land transport will reduce transaction costs, while hotels expect increased profits due to disintermediation and easy maintenance of guest databases but may lose cancellation fees. However, airlines and land transport can manage luggage tracking, and hotels can improve supply chain management by reducing inventory. The adoption of BCT will not lead to a win-win for all involved stakeholders, but stakeholders will adapt to this ecosystem and learn new ways of existing (Yadav et al. 2021). The metaverse tourism based on BCT will also greatly impact the stakeholders (Lin et

al. 2023). According to Fragnière et al. (2022), blockchain will have to adapt to THI and not the other way round. Governments must take this matter very seriously and devise policies for the development of blockchain in tourism.

A study by Önder and Gunter (2022) emphasises the need for further research on BCT in THI, as existing studies have been limited to finance. They highlight platforms based on blockchain that accept cryptocurrencies as a new application within this sector, along with loyalty programmes using blockchain-based tokens as rewards to guests through loyalty points. Additionally, Treiblmaier (2022) states that academic research must specify the conditions for using blockchain and explore its potential impact on THI. The researcher recommends conducting rigorous case studies, building theory, and testing to better explore blockchain's implications in this sector. Furthermore, Önder and Treiblmaier (2018) present some research propositions to be refined and elaborated by the tourism research community. One of the propositions is related to the market implications of increased disintermediation in THI due to the impact of BCT.

3.6.2 Tourist perspective

Önder and Treiblmaier (2018) present some research propositions for the tourism research community to refine and elaborate on. The propositions focus on consumer perspectives and new review technologies, leading to a trustworthy rating system. They also propose the adoption of cryptocurrencies based on BCT for easier money interchange without trusted third parties, enabling new customer-to-customer transactions in primary and secondary tourism markets.

Willie (2019) states that BCT will simplify international payments, and customers will have multiple payment methods in restaurants. In fact, blockchain adoption can increase customer satisfaction in the food industry (Hao et al. 2024b). Hao et al. (2024a) suggest that customer innovativeness and cryptocurrency ownership significantly impact BCT transparency perceptions, highlighting the role of these factors in shaping customer attitudes towards innovative technologies in the food industry. Also, Cozzio et al. (2023) found that applying BCT in the food supply chain builds consumer trust.

According to Bolici et al. (2020), tourist attitude is crucial to BCT diffusion on social media sites. Tyan et al. (2021) argue that medical tourists may benefit from BCT for easier and more secure payments, data security, privacy, and trusted review systems. Using blockchain mobile payment services in hotels ensures customer satisfaction, leading to a loyal guest (Karim et al. 2023). Ukhina et al. (2022) also benefit from BCT's ability to change people's perceptions of loyalty programmes in THI.

BCT enables diverse cryptocurrencies for secure payments and reduces privacy concerns through blockchain-based digital identity (Tyan et al. 2020). Moreover, blockchain-based identity management will help to build trust, reduce data breach risks, improve efficiency, and provide better customer experiences (Başer et al. 2023). Furthermore, BCT can enhance the trustworthiness of consumers' online reviews for decision-making (Rajaguru 2023). Bulchand-Gidumal and Melián-González (2023) propose an online review system based on BCT to ensure trust in reviews posted by real tourists who enjoyed the service and reduce the risk of fake feedback.

On the other hand, the lack of awareness about data security poses new obstacles, such as potential hacks, identity theft, loss of private keys, misplacement of tokens, and safeguarding the privacy of personal records (Tyan et al. 2020). Also, the volatility of cryptocurrency value also risks price stability for potential tourists (Kizildag et al. 2019; Kwok and Koh 2019).

As mentioned by Kwok and Koh (2019), BCT can be applied in loyalty programmes. Future studies could focus on the advantages of loyalty programmes based on BCT and how they could be better than traditional loyalty programmes for tourists. Also, future studies could further focus on the advantages of BCT in different tourism sectors, such as the airline industry, from the tourism perspective, except for reducing transaction costs and baggage tracking.

3.7 Disintermediation and intermediaries

The Decentralised applications (DApps) are currently seen as the latest application of blockchain available to consumers (Nam et al. 2021). DApps could be used by companies to better interact with their customers. Ozdemir et al. (2020) attempted to investigate blockchain basics criteria to evaluate the DApps in the tourism and travel industry, which resulted from the analysis of the following DApps: Nocturus, SmartTrip, Further, and GOeuroka. The researchers found that all DApps utilised smart contracts and had their own tokens based on the Ethereum or Stellar platform for Further's token. Nam et al. (2021) revealed four key propositions for comprehending blockchain development adoption and future vision. Firstly, online travel intermediaries should realign their business models to match emerging trends as BCT matures. Secondly, higher incentives result in swifter BCT adoption. Thirdly, the platform users will heavily influence dominant players on BCT. Lastly, only a few dominant players will survive.

Raluca-Florentina (2022) states that curiosity, loyalty, adaptability, and utility perceived by the consumer are the factors that can convince specialists that BCT should be integrated as soon as possible in the field of tourism and the ability to use technology could affect the degree of satisfaction and the traveller's intention to continue using e-commerce applications. Rashideh (2020) advocates that BCT will influence businesses by eliminating the middleman in THI, a process that can impact business models and create new services and structures, affecting multiple dimensions of the industry.

Integrating BCT in a smart tourism platform can enhance data security and transparency and provide a revolutionary improvement for the big data mining model (Long and Chen 2024). Moreover, the more important effect of BCT platforms is eliminating intermediaries and using smart contracts to increase information transparency and security for tourists and hosts (Aghaei et al. 2021). For example, disintermediation has the potential to affect medical tourism, by helping to increase trust, transparency, and information availability, while decreasing information asymmetry (Parekh et al. 2021). InterestinglyStrebinger and Treiblmaier (2022b) found that collectivistic travellers are more willing than individualistic travellers to use BCT platforms for hotel bookings.

Strebinger and Treiblmaier (2024) indicate that consumers prefer blockchain applications that offer supplementary services such as call centres and cancellation options. The role of online travel agencies (OTAs) may change due to the development of blockchain start-ups. OTAs could create blockchain start-ups to prevent direct competition and ensure survival. Despite these changes, the identity of tourism intermediaries as professional travel advisors will still be their greatest strength (Melkić and Čavlek 2020). OTAs should consider adopting BCT to improve revenue cycle validity and efficiency and eliminate administrative effort on account balances and transaction settlements. Smart contracts can also help resolve disputes more efficiently for OTAs (Ampountolas and Chiffer 2022). OTAs could increase travellers' loyalty and gain a good part of the market by adopting BCT (Pérez-Sánchez et al. 2021). Furthermore, OTAs can build a common review and rating system based on BCT to enhance the trustworthiness of their information disclosure and gain consumers' trust. However, profitability in information disclosure through online tourism platforms may require consideration of lower costs or a more significant proportion of information-sensitive consumers (Zhou et al. 2022).

On the other hand, some researchers developed a new design of decentralised platform based on BCT for THI. Su et al. (2022) used brainwave and eye movement analysis, emotion assessment, sound-reflection method, and questionnaires to enhance an OTA prototype design based on BCT. They found that providing a familiar operating environment reduces the fear of unfamiliar technology. Even users without prior experience with BCT can build trust from related experiences and accept the technology. Dubey et al. (2022) develop a blockchain platform on a hybrid blockchain design for travellers that eschews third-party involvement and brings transparency to the travellers, as well as connecting all the stakeholders in the tourism sector, including air ticket booking, hotel reservation, transport, rewards to travellers, and other services. Syed et al. (2022) offer a framework enabling real-time communication and data sharing between guides and tourists using BCT technology, ensuring security, and integrating this with AR. Tourists could hire guides for information during tours and view virtual objects on their mobile screens.

Luo and Zhou (2021) propose a smart tourism platform to link tourists and attractions in a trustworthy way and to improve the efficiency of the tourism industry using an overall system architecture of blockchain. Zhang et al. (2021) suggest a multichain blockchain platform with public and private chains for different data types to enhance transaction processing capability, providing various tourism-related services and bridging the gap between providers and tourists without third-party commissions. Moreover, Arif et al. (2020) advocate a blockchain-based decentralised network for tourism destination recommendation, connecting users, servers, and sensor nodes to exchange data and enhance data-sharing capabilities and security.

Future studies could investigate what hotels need as resources to adopt BCT and its effectiveness in stopping the dominance of the middleman or at least decreasing their authority.

3.8 The tokens

Treiblmaier (2021) states that researchers must clarify the functionality, role, and purpose of specific tokens within THI. This clarification can help to build a robust framework for studying blockchain in tourism and hospitality, moving beyond the assumption of technology as a uniform entity with predetermined characteristics.

The main obstacle to adopting tokens is the lack of knowledge about the technology and its advantages (Pilkington, 2020). Çapar (2021) states that using cryptocurrencies positively influences medical tourists' intention. Cryptocurrencies could increase trust and relational capabilities, democratise economic participation, and redistribute power among actors by influencing data collection, storage, exchange, ownership and trade for value creation. Thus, cryptocurrencies could support sustainable development goals in tourism (Tham and Sigala 2020).

The usefulness and ease of using cryptocurrency as a new digital payment are the principal factors influencing hospitality businesses' intention to adopt this technology (Nuryyev et al. 2021). In addition, factors affecting the success of initial coin offerings (ICOs) in the tourism industry include human capital and the acceptance of Bitcoin. In fact, strong cryptocurrency adoption, such as Bitcoin, facilitates ICOs participation and increases fund-raise likelihood (Bulut 2022).

Aiazbekov (2023) deems the adoption of cryptocurrencies as a method of payment in THI that has several benefits, such as lower transaction costs, higher efficiency and improved security. BCT payment will positively affect the loyalty of hotel visitors (Dhiraj et al. 2023).

Trust, novelty, ease of use, safety and hedonic aspects of cryptocurrencies are positive factors that impact users' level of satisfaction (Treiblmaier et al. 2020). Moreover, BCT network structures still cannot manage the high volumes of transactions related to concurrent payments in airline reservations and hotel bookings. This aspect can lead to high transaction costs, although the use of cryptocurrencies simplifies the process of money interchange without referring to reliable third parties (Rashideh et al. 2022).

On the other hand, Kanoujiya et al. (2023) highlight that cryptocurrency value is volatile, and for this reason, it needs to be evaluated under a legal framework, especially for the tourism sector. Due to its high volatility, adopting cryptocurrencies in THI can be difficult and risky (Daglis 2023). Gao et al. (2024) advocate the adoption of cryptocurrency payment generally leads to a significant decrease in revenue because of the negative associations concerning cryptocurrency. Also, Manahov and Li (2024) examine the implications of hacker cyber-attacks on the travel and tourism sectors and propose regulatory tools such as Bitcointracker and Ethereumtracker to scan crypto wallets and identify suspicious activities, which can decrease risk.

NFTs could be used as a BCT token, as Gričar et al. (2023) mention that NFTs can generate significant revenue and are easy to earn for tourists with limited digital skills. Mofokeng and Matima (2018a) contend that BCT could be utilised as a catalyst through the development of NFTs, and the use of advanced technology will positively impact the sustainable management of tourism. The combination of VR and BCT could take tourism to the next level if it reaches a significant level of mainstream adoption. The use of tokens could be employed as an alternate source of fund-

raising (Mofokeng and Matima 2018b). According to Aysan et al. (2023), NFTs may increase the efficiency of hotel bookings and could be more evolutionary than cryptocurrencies. They could help solve more problems and transfer ownership rights. However, O'Connor (2024) emphasises that NFTs may not reduce dependency on travel intermediaries for hotels, as secondary markets could lead to a loss of control over inventory and price distortion, causing customer dissatisfaction.

Therefore, future studies could empirically test NFT's utility for booking hotel rooms or flights and the impact of reselling the NFT in the secondary markets on THI.

3.9 The adoption and the intention of accepting BCT

The cost, traceability, disintermediation, lack of government regulation and policy, privacy and the resistance to change are the factors that can influence the adoption of BCT in hospitality and tourism (Sharma et al. 2021). Security and trust are highlighted as linchpins that can enhance the intention to adopt BCT (Sarnacchiaro et al. 2024; Suanpang et al. 2024). In addition, Nuryyev et al. (2020) stress that adopting cryptocurrency as a payment method for small and medium-sized enterprises in THI can provide a competitive advantage. Social influence, strategic orientation, and the manager's characteristics significantly impact the intention to adopt cryptocurrency for digital payments. In addition, the high transaction costs of fiat currencies were identified as the most significant factor motivating tourists to adopt BCT and start using cryptocurrencies on their trips (Mujačević 2024).

Through their study on the adoption and acceptance of technology in THI, Strebinger and Treiblmaier (2022a) highlight the profile of early adopters of blockchain-based hotel booking applications. These early adopters are likely to be young, highly educated, and risk-tolerant, with strong IT innovativeness, familiarity with BCT, and a sense of power. Additionally, male travellers are more prone to being early adopters due to their familiarity with BCT. Characteristics that attract these users include booking applications offering discounts over OTAs, providing additional services beyond booking, and having well-known brand names. Also, loyalty programmes, reliability and traceability of website customer reviews could be determining factors for adopting this new technology (Corne et al. 2023).

Huy et al. (2024) state that factors influencing the intention of small and medium hospitality and tourism enterprises to adopt BCT could be compatibility, top management support, organisational readiness, employee knowledge, competitive pressure, customer pressure, and government support. Chang et al. (2022) show that the determinants affecting the acceptance of BCT in Jeju Island, Korea, include trust and transparency. The study suggests that local government and tourism business entities should consider these factors before launching blockchain or related technologies. According to Muharam et al. (2024), the key predictors of acceptance of a blockchain-based peer-to-peer accommodation system are the economic incentives, technological advantages and user preferences regarding the blockchain type.

The increase in users could lead to the proliferation of technology development (Chang et al. 2022). Through a study conducted on air travellers by Ltifi and Mesfar (2022), it was found that the perceived corporate social responsibility of the air transport service positively influences the consumer's resilience and attitude towards

using BCT, which in turn affects their behavioural intention to use BCT. In addition, the consumer's actual behaviour in using this technology is influenced positively by the behavioural intention to use BCT (Ltifi and Mesfar 2022). Additionally, Jang et al. (2023) unveiled that adopting BCT in food service may face employee resistance due to traditional barriers and technology factors. However, collaboration between internal and external stakeholders could reduce this resistance and increase adoption intentions.

Accordingly, future studies could explore the intention of adopting NFTs for booking purposes and as a loyalty programme from a tourist perspective, as well as the profile of early adopters.

3.10 Smart contracts

Researchers present new concepts based on smart contracts to apply them to different THI services. Zhou et al. (2023) proposed the Psychometric Index Trust Blockchain model related to a secure dynamic recommendation system for the hotel industry. Karode et al. (2020) propose a global travel review framework using Ethereum smart contracts to enhance online reviews' transparency, security, and reliability. Additionally, it can easily integrate into existing platforms, providing a credible alternative for users seeking trustworthy information.

Demirel et al. (2022) suggest a booking system with a unique smart contract between customers and hotels integrated into the reservation system. This includes all types of services, utilising decentralised proof mechanisms to eliminate commission fees and reception costs through smart services, IoT devices, decentralised proof methods, and blockchain-based contracts. Shrestha et al. (2020) propose a blockchain-based travel booking platform that allows users to own their data, share it with other service providers while receiving rewards, and enforce privacy preferences through smart contracts requiring double deposit collateral for agreement compliance. Arif et al. (2023) utilise blockchain with the aid of smart contracts to support decentralised rating data sharing for a recommender system that selects tourist destinations based on tourists' preferences.

Moreover, a blockchain platform was presented as beneficial for guaranteeing the origin and provenance of food items in a smart tourism destination context. The platform promises transparency, efficiency and trustworthiness through smart contracts to enable consumers to access detailed information about their purchased product and verify its origin (Baralla et al. 2021). Additionally, Saveetha and Maragatham (2021) suggest an application in the restaurant industry that utilises smart contracts in BCT to ensure the authenticity of customer reviews and prevent manipulation by restaurants.

BCT could also be used in cultural heritage organisations, specifically in museums, to manage loans of cultural objects between organisations using smart contracts. However, there are obstacles to using the Ethereum public blockchain, such as the need to pay in Ether currency and issues with correcting or cancelling smart contracts. Therefore, experts and developers are trying to provide solutions to correct a smart contract by using another smart contract (Mucchi et al. 2022). Siddiqui et al. (2022) propose a secure blockchain-based intermediary service for tourists and

Table 2 The use of BCT in THI: contexts and methodologies

Context/methodology	Quantitative	Conceptual	Qualitative	Applied research	Mixed methods	Total	%
Tourism in general	9	11	7	1	1	29	30
Intermediaries	6	2	3	3	2	16	16.5
Hospitality	5	2	2	1	-	10	10.5
Medical tourism	3	1	2		-	6	6
Virtual tourism	1	1	1	2	1	6	6
Tourist perspective	4	-	-	1	1	6	6
Food and beverage	2	-	-	1	2	5	5
Destination	-	3	-		1	4	4
Review system	-	1	-	3	-	4	4
Recommendation system	-	-	-	3	1	4	4
Business perspective	2	1	-		-	3	3
Booking system	-	2	-		-	2	2
Museum	-	-	1		-	1	1
Airline	1	-	-		-	1	1
Identity management	-	1	-		-	1	1
Total	33	25	16	15	9	98	100.0

tourism sites that allows them to offer virtual tours while enabling them to register, subscribe, access, and be billed based on usage. The system uses smart contracts for automatic usage and permission control.

Consequently, more studies are needed to explore the use of smart contracts for automation in the tourism business and how smart contracts could play an important role in automating travel insurance in case of a flight delay or cancellation to improve the efficiency of the process, for example.

3.11 Contexts of analysis and methodological approaches

Regarding the nature of the study in each of the selected articles, Table 2 shows that quantitative research is dominant. For example, 33 articles use structural equation modelling. Conceptual studies are also common in this topic (25). The remaining articles are qualitative (16), applied research (15), or use mixed-methods (9). More use of mixed methods could help understand the use of blockchain in THI more deeply from different perspectives, both businesses and consumers, and how to surpass identified constraints (Cozzio et al. 2023).

Concerning the application contexts (Table 2), most studies focused on tourism in general (30%). However, 16.5% of the studies focused on intermediaries within THI, and 10.5% on hospitality in general. Specific contexts addressed were, for example, medical tourism and airlines but this type of research is much less common. Studies are needed to discover the use of BCT in different contexts, such as implementing BCT in customer relationship management or tourism companies or how BCT could impact customer loyalty, for example. Appendix 2 shows more details about the nature and the application contexts of the 98 selected articles.

3.12 Theoretical implications

This study contributes theoretically to the advance of research on BCT in THI by mapping previous research. In so doing, this systematic review offers a theoretical framework that depicts both business and consumer perspectives considering different BCT applications (e.g., NFTs, cryptocurrencies, smart contracts, DApps) instead of a too general or fragmented view. By understanding further perceived benefits by tourists (e.g. accelerated international payments; Willie 2019) and businesses (e.g. enhanced efficiency; Cheng 2023), obstacles perceived by tourists (e.g. market volatility; Tyan et al. 2020) and businesses (e.g., lack of expertise; Erol et al. 2022), as well as the adoption and intention of accepting BCT (Nuryyev et al. 2020), the dynamics of disintermediation (Nam et al. 2021), how the use of smart contracts gained increasing interest (Demirel et al. 2022), and how BCT has been explored in different contexts (e.g. medical tourism, food and beverage), this research contributes to a more holistic overview of this research topic using management lens.

Also, the current review depicts theories that can advance knowledge around the research topic since it shows how selected studies used theories from different disciplines to explore the implementation/use of BCT in THI and covers multiple angles of view to help a more holistic research approach. For example, the diffusion of innovation (DOI) theory (Bolici et al. 2020; Dadkhah et al. 2022; Erol et al. 2022; Huy et al. 2024; Maythu et al. 2024) has been considered important for analysing the timing of innovation diffusion in a population and the dynamic of the same innovation over different adopters' populations (Scaglione 2020). Technology acceptance model (TAM) (Nuryyev et al. 2020; Pérez-Sánchez et al. 2021; Ltifi and Mesfar 2022; Karim et al. 2023; Corne et al. 2023), developed by Davis et al. (1989), states that users accept a technology (e.g. BCT) if it is useful, has essential functionality and is easy to use. Stakeholder theory (Jang et al. 2023; Ltifi and Mesfar 2022; Chaudhuri et al. 2023) addresses relevant stakeholders and their interconnections and how management interacts with them (Yadlapalli et al. 2022). Topical analysis conducted in our review showed the relevance of considering different perspectives (e.g., supply and consumer) to understand better the challenges of using BCT in THI and how to implement adequate strategies. Addressing these concerns is relevant since institutional theory (Yadav et al. 2021; Lin et al. 2023) argues that organisations in the same institutional environment tend to adopt similar strategies, organisational structures, and practices since these organisations experience the same institutional forces (Dimaggio and Powell 1983). The theory of planned behaviour (Ajzen 1991) has also been deemed useful (Pérez-Sánchez et al. 2021; Karim et al. 2023) as attitude, subjective norms, and perceived control can impact individual loyalty, collectively determining behaviour. The unified theory of acceptance and use of technology (UTAUT) (Chang et al. 2022; Sarnacchiaro et al. 2024), as presented by Venkatesh et al. (2003), reveals four constructs that can be interpreted as reflecting technology attributes, namely performance expectancy and effort expectancy, as well as contextual factors, such as facilitating conditions, and social influence.

Other theories have been less used but could be further explored in future research on BCT in THI. This is the case of affordance theory, developed by Gibson (1977) and applied to technologies by Norman (1988). This psychology-related theory, used

in the context of BCT by Cozzio et al. (2023), states that technology provides individuals with both real and perceived opportunities for action, which can vary depending on the context in which it is used. Signalling theory (Connelly et al. 2011) is relevant because it explains how individuals use signals to influence others' perceptions (Hao et al. 2024b). In the dynamic capability view (DCV) (Chaudhuri et al. 2023), it is argued that to respond to changes in the market, the organisation must enhance their dynamic capabilities (Teece et al. 1997). Connectivism theory (Chang et al. 2022) demonstrates changes in the learning environment with technology developments (Conole et al. 2011). Pérez-Sánchez et al. (2021) used social exchange theory to explain the loyalty of an online travel agency (OTA) consumer. Strebinger and Treiblmaier (2022b) used the agentic theory of human behaviour to investigate whether this factor interacts with a traveller's individualistic versus collectivistic predisposition in consumer acceptance of BCT for hotel booking. Contingency theory (Treiblmaier et al. 2020) was combined with the technology adoption model to study travellers' intention to use cryptocurrencies. Game theory (Zhou et al. 2022) was established to study supply chain members' optimal strategies in two decentralised and centralised scenarios when the online platform does not adopt or adopt BCT. Grounded theory (Muharam et al. 2023) allows flexibility in rationalising behaviour. The theory of disruptive innovation (Rashideh 2020) can be used to explain the process of adopting a technology (Bower and Christensen 1995). Theory of reasoned action (TRA) has been used to study online users' behaviour by introducing cognitive assessments associated with the benefits and risks of buying (Raluca-Florentina 2022). Social cognitive theory can be applied to investigate behavioural and environmental factors that influence everyone's dispositions (Bolici et al. 2020). Also, information processing theory (Hao et al. 2024a) and resource-based view (Sarfraz et al. 2023) were used in one study to explore BCT's applications in THI.

4 Conclusion

The current paper presented a systematic review of 98 journal articles related to the application of BCT in THI. The aim was to identify what has been done and what is yet unknown in order to guide future researchers in seeking meaningful further insights into this domain.

A thematic analysis showed that the main topics addressed in studies focusing on BCT in THI are "benefits and obstacles", "disintermediation and intermediaries", "tokens", "adoption and the intention of accepting BCT", and "smart contracts". Also, the visualisation of the co-occurrence of authors' keywords resulted in three main clusters focused on: (a) innovation and impact of BCT, (b) adoption of tokens and cryptocurrencies, and (c) intermediaries and their business model. This study also aided in advancing the study of BCT in THI by providing a framework regarding the tools currently used and a synthesis of advantages and obstacles from the perspective of tourists (consumers) and businesses. This approach made visible opportunities for future research, as shown in the next section.

Additionally, the findings can be useful for stakeholders and policymakers by aiding them in better-incorporating blockchain into their strategies and decisions. Adopt-

ing BCT offers a structured way for tourism companies to do their daily operations (Rashideh 2020). For instance, BCT can be exploited to provide security and transparency to execute tasks and successfully decrease the requirement for third-party intermediaries (Maythu et al. 2024). Additionally, BCT can eliminate the intermediaries' issue and thus eliminate third-party costs (Aghaei et al. 2021). Furthermore, stakeholders also have to invest and adapt to this technology (Yadav et al. 2021). Also, policymakers should develop clear regulations, particularly for cryptocurrency use, which will lead to the increased use of BCT by tourism companies such as restaurants, aeroplanes, hotels, and OTAs (Sharma et al. 2021).

4.1 Future research directions

The approach used in this systematic review allows us to highlight future directions based on depicted relevant topics and unexplored perspectives. For example, future research could explore the advantages of loyalty programmes based on BCT and investigate how they can be enhanced compared to traditional loyalty programmes from tourists' perspective. Also, to focus on the potential use of BCT in different contexts, such as the airline industry, from tourist and business perspectives. Furthermore, future research could examine the hotels' need as resources to adopt BCT and its effectiveness in stopping the dominance of the middleman or at least decreasing their authority.

Moreover, more empirical studies are needed to test the utility of NFTs for booking hotel rooms or flights and the impact of reselling NFTs in the secondary markets on THI. The intention to adopt NFTs for booking purposes and as a loyalty programme from a tourist perspective, as well as profiling the early adopters' profiles, still needs to be explored.

The use of smart contracts for automation in the tourism business and how smart contracts could play an important role in automating travel insurance in case of a flight delay or cancellation to improve the efficiency of the process are also relevant research avenues.

Finally, THI needs creative ideas, applied research, more use of mixed methods, and further exploring theories in technology and consumer behaviour to understand how to adopt BCT correctly and address constraints. This technology is a tool that will not solve THI challenges if it is not properly applied and considers different stakeholders. Future studies can also explore how companies could combine other emerging technologies, such as artificial intelligence, robotics or the Internet of things, with BCT in THI, since the combination of different technologies offers many opportunities to improve experience management in THI (Agapito and Sigala 2024).

4.2 Limitations

While this systematic review did not include books, literature reviews, theses, business reports and conference proceedings, and focused on English peer-reviewed articles, it is considered that the dataset of documents for analysis retrieved from Web of Science and Scopus is sufficient in quantity and quality to perform a rigorous SLR and map the topic under analysis (Agapito et al. 2022).

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Declarations

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