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Identifying Capabilities and Constraints in Utilizing Blockchain Technology in Hospitality and Tourism

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Abstract

Purpose: This study synthesizes the body of research revolving around blockchain technology (BCT) whilst drawing on the Technology-Organization-Environment framework, the Resource-Based Theory and Theory of Constraints, to conceptualize capabilities (enablers) and constraints (barriers) of BCT in the hospitality and tourism industry.

Design/methodology/approach: A systematic literature review of BCT in the hotel and tourism industry has been achieved through two databases: Scopus and Web of Science. From 544 articles selected between the years 2008 and 2023 (first quarter), a sample of 49 articles was used to structure existing research on this subject.

Findings: The findings of this systematic literature review of BCT in the hospitality and tourism literature establish a solid groundwork for assessing the development and evolution of this research area over time. Findings are classified into two groups: capabilities (enablers) and constraints (barriers) of BCT based on publication year, different research methods, theoretical underpinnings, and applicable contexts.

Originality/Value: By adopting three theories, to the best of the authors' knowledge, this systematic literature review analysis is the first attempt to synthesize the studies related to BCT in

hospitality and tourism research. It serves as a foundation to evaluate the development of BCT studies in this field.

Keywords: Blockchain Technology, Technology-Organization-Environment Framework, Resource-Based Theory, Theory of Constraints, Hospitality & Tourism.

1. Introduction

Described as the "next iteration of the internet", blockchain technology (BCT) functions as a secure digital data storage system based on distributed ledgers that are collectively maintained by network nodes. Recognized as a disruptive force similar to previous Internet disruptions, it has garnered significant interest from the financial sector, with approximately 90% of U.S. and European banks and financial institutions exploring its capabilities (Mitic, 2023). In addition, a significant percentage of companies are planning significant investments, with a projected business value of more than $3.1 trillion by 2030 (Laborde, 2023). This increased attention has spurred academic interest in fields as diverse as supply chain management, healthcare, information systems, energy, new product development, patent management, finance, pharmaceuticals, and logistics (Benzidia *et al.*, 2021; Denter *et al.*, 2023; Devine *et al.*, 2021; Ganguly, 2022; Guggenberger *et al.*, 2020; Paul *et al.*, 2021; Tandon *et al.*, 2020). Despite offering secure transactions, streamlined supply chain management, automated smart contracts, and personalized customer experiences, blockchain faces challenges such as knowledge gaps, trust issues, security concerns, and historical market attacks (Khatwani, 2018; Nam *et al.*, 2021). While stakeholders recognize its potential, recent studies highlight its challenges (Toufaily *et al.*, 2021). Given the limited research in the hospitality and tourism context, a systematic literature review is critical to synthesize existing knowledge, identify research gaps, and provide valuable insights. Applying the

Technology-Organization-Environment (TOE) framework (Tornatzky and Fleischer, 1990), Resource-Based Theory (Barney, 1991), and the Theory of Constraints (Goldratt, 1988), this study reviews 49 articles from peer-reviewed journals (2008-Q1 2023) to shed light on the capabilities and constraints of BCT.

The study makes three key contributions to BCT in the hospitality and tourism literature. Firstly, it provides a comprehensive analysis and categorization of the enablers and barriers of BCT in the hospitality and tourism industry. To the best of our knowledge, none of the current empirical studies or literature reviews have attempted to categorize enablers (capabilities) and barriers (constraints) based on the lens of the TOE Framework, Resource-Based Theory and Theory of Constraints. These are developed into an integrative framework that clarifies the current state of the literature and serves as a reference for future research. The study also identifies research gaps and proposes different directions for future research that address important aspects of BCT in the hospitality and tourism literature. This study will help to advance the theories mentioned above and the practice of hospitality and tourism scholars and practitioners. Lastly, Pahlevan-Sharif et al. (2019) emphasized the need for more research in the hospitality and tourism industry through a systematic literature review based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol, which is known for providing high reliability in this field. In response to this call, we conduct a systematic literature review on BCT in the hospitality and tourism industry to provide a framework that encompasses both the enablers (capabilities) and barriers (constraints) of BCT for stakeholders.

2. Theoretical Framework

The TOE framework (Tornatzky and Fleischer, 1990) serves as a foundation for identifying the technological, organizational, and environmental factors that influence technology adoption within organizations (Clohessy *et al.,* 2020; Clohessy and Acton, 2019). It considers the interplay between technological factors, organizational capabilities, and the external environment. In the tourism and hospitality industry, which is heavily influenced by technological advancements and evolving consumer preferences, understanding how these elements interact is crucial. Moreover, Treiblmaier (2021) has emphasized the need for research on the importance of the TOE framework in assessing the transformative impact of tokens, a key component of BCT, across various tiers. He stated that this aids in comprehending the underlying reasons behind the choice to adopt or refrain from using a specific technology. Thus, this study is built on the TOE framework to understand the antecedents of blockchain usage. However, while this framework provides a comprehensive model based on specific categories, it does not distinguish between enablers and barriers. Therefore, we extend the TOE framework by incorporating the Resource-Based Theory (Barney, 1991) and Theory of Constraints (Goldratt, 1988) to conceptualize enablers (capabilities) and barriers (constraints). This study utilizes the Resource-Based Theory to explore the necessary resources for implementing BCT, considering technological, organizational, and environmental capabilities. Additionally, drawing on the Theory of Constraints, which is grounded in systems thinking, we address barriers within an organization.

Similar to emerging technologies like Artificial Intelligence (AI), organizations must develop specific resources to effectively capitalize on their investments and create business value, as stated by Mikalef and Gupta (2021). Resource-Based Theory emphasizes how a company's distinctive resources and capabilities can result in long-lasting competitive advantage. Extant literature on information technology capabilities and organizations, such as AI capabilities (Mikalef and Gupta,

2021), social media capabilities (Benitez *et al.,* 2018), and social commerce capabilities (Braojos *et al.,* 2019), also draws on the Resource-Based Theory to identify enablers. In line with these studies, we employ the Resource-Based Theory to identify enablers of BCT, which can come up with technological, organizational, and environmental capabilities. In a tourism and hospitality context, where customer experience and service quality are extremely important, having distinctive resources (like specialized staff, unique properties, or innovative technologies) can set a business apart from competitors.

Goldratt (1988) defines the Theory of Constraints (TOC) as a comprehensive framework for managing and operating organizations while considering limitations imposed by activity constraints. The purpose of TOC is to identify constraints that impede system performance and offer strategies to improve overall efficiency. Previous studies have also utilized TOC to identify organizational constraints in the work environment (Coo *et al.,* 2021; Pindek *et al.,* 2019). Therefore, this study draws on the TOC framework to identify barriers as representative of constraints faced by stakeholders when adopting and using BCT. We emphasize that, since the tourism and hospitality industries require operational efficiency, it is important to enhance customer satisfaction, reduce costs, and improve profitability by identifying and overcoming constraints such as staff allocation, facility utilization, and service delivery.

3. Methodology

A framework-based review, which is a systematic type of reviewing, enables researchers to utilize frameworks in their review process. When conducting framework-based reviews, researchers have the option of creating their own framework or utilizing an established framework such as Antecedents, Decisions, and Outcomes (ADO) (e.g., Paul and Criado, 2020) and Stimulus-Organism-Response to classify the antecedents and outcomes (e.g., Busalim *et al.,* 2022). Based

on this, this study employs a framework-based approach to analyze the literature from the TOE framework to classify the enablers and barriers of using BCT in hospitality and tourism.

We utilized a systematic literature review (SLR) methodology, following the approach of Tranfield et al. (2003), to comprehensively explore existing research in our study. The SLR process involves three key steps: initial planning, conducting, and final reporting of the review (Tranfield *et al.*, 2003). In the planning stage, we defined our research questions and objectives and developed a review protocol. This protocol guided our search terms, strategy, and criteria for including or excluding studies. In the conducting stage, we carefully selected relevant studies, assessed their quality, and extracted and synthesized the collected data. Finally, in the reporting stage, we presented our findings in a clear and concise manner, while also critically evaluates the review process, including any limitations encountered.

3.1. Review Protocol

A critical step in conducting a systematic review is developing a protocol outlining the methodology used (Busalim, 2016). The protocol's purpose is to minimize any potential research bias, as Kitchenham (2004) noted. While preparing the research protocol, we also utilized the PRISMA model, which serves as an essential checklist for reporting findings in systematic reviews and meta-analyses. With the usage of PRISMA protocol, the findings become more reliable and involve four stages which are identification, screening, eligibility, and inclusion (Moher *et al.*, 2010). Considering both criteria gives us the opportunity to guarantee a very solid review process. The research questions and review protocol performed for this study are depicted in Figure 1.

Figure I Here

3.2. Inclusion and Exclusion Criteria -Identification

Inclusion and exclusion criteria are established to ensure that the selected studies are pertinent and relevant to this research. As this review aims to investigate BCT, only full-text studies published in high-impact, English-language journals will be evaluated. In addition, the selected studies are limited to those conducted between 2008 and 2023 (first quarter). The rationale for this timeframe is twofold: firstly, this review builds on previous research (e.g., Sharma *et al.,* 2021; Önder and Treiblmaier, 2018) to provide a more comprehensive understanding of BCT. Second, BCT gained popularity with the emergence of the concept of "bitcoin" (invented by Nakamoto) in 2008. Therefore, we chose 2008 as the starting point. The most recent articles written on BCT in hospitality and tourism research cover the literature up to the first quarter of 2023. We made a specific effort to find systematic reviews of all papers related to hospitality and tourism that have been published in journals listed on the Australian Business Deans Council (ABDC) journal quality list until March 2023. When compared to other ranking indexes like the SSCI, ABS, and Scopus, the ABDC list stands out for its comprehensive coverage of a wide range of journals (Mura and Pahlevan Sharif, 2015; Pahlevan-Sharif *et al.,* 2019).

Table I Here

3.3. Search Strategy -Identification

Figure 1 outlines a two-stage search strategy employed to identify primary studies on BCT. The first stage, called the automatic stage, involves using several online databases. After examining other reviews, we determined that the primary databases to use were Scopus and Web of Science, as noted by Stornelli et al. (2021) and Thune and Mina (2016). To perform the automatic search, the researchers used specific keywords such as “blockchain,” OR “cryptocurrency,” OR “bitcoin,” OR “smart contracts,” OR “digital currency,” OR “utility tokens,” OR “NFT” OR “non-fungible tokens” OR “decentralized” AND “tourism” OR “hospitality.” The study followed Tranfield et

al.'s (2003) suggestion to guarantee that the systematic review did not miss or exclude any essential articles.

3.4. Study Selection Process -Screening

After the initial search using defined keywords, a total of 544 studies were identified, of which 102 were selected after duplicate studies were removed using Mendeley. The inclusion/exclusion criteria were then applied to the abstract and conclusion of each study, resulting in 64 articles. Of the 64 studies, a thorough evaluation was conducted based on specific eligibility criteria for the full papers. As a result of this evaluation, 9 additional studies were excluded, leaving 45 studies that met all criteria. In addition to the initial systematic search, we used backward and forward snowballing searches to identify additional relevant articles. In line with the study by Alghababsheh and Gallear (2019), we selected the three most cited articles as the starting point for the snowballing search, as these articles were among the first to examine the topic of BCT in the hospitality and tourism literature and had received a high number of citations. We examined the reference lists of these three key articles and other relevant articles to identify additional articles, and continued the process until we found no more relevant articles. We performed the forward snowballing analysis using Google Scholar to trace the citations of the key articles. The snowballing process yielded 4 papers. Finally, 49 papers were included in this review.

4. Descriptive Findings of Blockchain Technology in the Hospitality and Tourism Industry

4.1. Publication Trend

As shown in Section 3.2, the timeframe chosen for this study is from 2008 to the end of March 2023. The distribution of articles over these years is shown in Figure 2. Although we started our research in 2008, we did not find any studies that met our criteria until 2018. The graph shows that

the number of publications on BCT steadily increases from 2019 to 2022, with the highest number of publications (22 studies) occurring in 2022. In the first quarter of 2023, only seven studies were published. This pattern suggests that the number of blockchain studies may gradually increase in the future.

Figure II Here

4.2. Distribution of Publication Sources Among Journals

In this process, only articles were selected, excluding lecture notes, book chapters, conference, workshop, and symposium notes. The review identified 49 full articles on BCT published in various peer-reviewed journals. Most of the important and most cited articles are published in Current Issues in Tourism, Annals of Tourism Research, Tourism Management, and International Journal of Hospitality Management, relatively speaking. Other journals included in the list are Tourism Economics, Tourism Management Perspectives, International Journal of Contemporary Hospitality Management, Journal of Hospitality & Marketing Management, and Technological Forecasting and Social Change, as shown in Table 2. In addition, the list includes several journals listed in ABDC, such as Journal of Theoretical and Applied Electronic Commerce Research, Asia Pacific Journal of Tourism Research, and Worldwide Hospitality and Tourism Themes.

Table II Here

4.3. Methodological Approaches

The existing research on BCT in the hospitality and tourism industry has employed various methodological approaches to explore different aspects of the technology. Conceptual

development papers have been commonly used to discuss barriers, opportunities, and applications of blockchain (e.g., Filimonau and Naumova, 2020; Kizildag *et al.,* 2020; Line *et al.,* 2020). Research notes have also been utilized to contribute to the literature (e.g., Ampountolas and Chiffer, 2022; Treiblmaier, 2021; 2022). Case studies have been combined with research notes in studies by Chen and Tham (2023), Mucchi et al. (2022) and Viano et al. (2022). Qualitative studies have included systematic reviews, content analysis, semi-structured interviews, and exploratory research (e.g., Adeyinka-Ojo *et al.,* 2020; Aghaei *et al.,* 2021; Kashem *et al.,* 2022; Rashideh, 2020; Tham and Sigala, 2020). The Delphi method was used in studies by Dadkhah et al. (2022) and Su et al. (2023). Quantitative studies employed structural equation modelling, experimental design, and logistic regression (e.g., Bae, 2022; Bulut, 2022; Chang *et al.,* 2022; Kim *et al.,* 2022; Lew *et al.,* 2020; Quan *et al.,* 2023; Radic *et al.,* 2022; Strebinger and Treiblmaier, 2022; Treiblmaier *et al.,* 2021; Wu and Chang, 2021). Some studies adopted a mixed-methodology approach, incorporating techniques such as analytic hierarchy process, interpretive structural modeling, and expert opinions (e.g., Sharma *et al.,* 2021; Erol *et al.,* 2022). In summary, out of the total papers, 25 are based on qualitative studies employing conceptual and interview approaches. Additionally, there are 5 research notes and 4 case-based studies. Among the papers, there are 12 empirical studies that include logistic, experimental, and structural equation modelling methodologies. Furthermore, 3 studies have utilized a mixed-method approach for their research. These methodological approaches have contributed to a comprehensive understanding of BCT in the hospitality and tourism industry.

4.4. Key Main Research Contexts (Applicable Contexts)

When BCT entered the hospitality and tourism industry, it brought various applications and promising advantages. One of its key exploration areas is digital payments (e.g., Önder and

Treiblmaier, 2018) where cryptocurrencies like Bitcoin enable customers to make direct transactions, facilitate cross-border money transfers, and even serve as alternative financing methods for tourism ventures (Bulut, 2022; Kim, 2023; Radic *et al.*, 2022; Tham and Sigala, 2022). Another exciting field is smart tourism, where BCT offers decentralized applications, cryptocurrencies, and smart contracts to enhance the overall travel experience (e.g., Nam *et al.*, 2021; Yadav *et al.*, 2021). In addition, blockchain has been proposed to tackle issues with recommendations and review systems, combating fake reviews and biased results. Moreover, it has great potential to improve booking and reservation systems by increasing transparency and reducing the risk of fraud (Bae, 2022; Dubey *et al.*, 2022; Treiblmaier, 2022). The literature highlights these areas as fertile ground for BCT in the hospitality and tourism industry, paving the way for its potential benefits and implications.

4.5. Theoretical Underpinnings

In the existing literature, researchers have explored the adoption of BCT in the hospitality and tourism industry through various theories. One theory that has been widely applied is the diffusion of innovation theory (e.g., Erol *et al.*, 2022; Kizildag *et al.*, 2019), which suggests that BCT is experiencing exponential growth and is on its way to a full adoption. Additionally, agency theory and transaction cost analysis are used in BCT. Agency theory highlights how blockchain's transparent and decentralized nature can establish fair governance mechanisms and reliable business relationships, and transaction cost analysis represents the cost of a transaction using digital assets (Treiblmaier, 2022). Another important theory is the theory of disruptive innovation, emphasizing that BCT can give smaller players a competitive edge in the market (Filimonau and Naumova, 2020; Nam *et al.*, 2021; Rashideh, 2020). While there is limited empirical research, some studies have developed conceptual models that combine technology adoption research with

contingency theory to examine factors related to BCT in the tourism sector. Some studies have used the technology acceptance model (TAM) to understand consumer preferences for payment options and the factors influencing the adoption of BCT (e.g., Bae, 2022; Radic *et al.*, 2022). Stakeholder and innovation resistance theories have been integrated to understand better how external pressures and internal awareness affect employees' responses to adopting BCT (Jang *et al.*, 2023). However, despite these valuable insights, further research is needed to fully comprehend and explore the adoption of BCT in the hospitality and tourism industry.

5. Synthesis of Findings for Capabilities (Drivers) and Constraints (Barriers) of Blockchain Technology

After conducting the descriptive analysis of the articles, the identification of the potential capabilities (drivers) and constraints (barriers) for BCT in the hospitality and tourism industry followed via thematic analysis. To achieve this, we employed the TOE framework, considering the research call made by Treiblmaier (2021). While he specifically mentioned using the framework for tokens, we have utilized the TOE framework to broaden the understanding of the whole BCT usage for different types of stakeholders. Additionally, inspired by several studies (e.g., Dadkhah *et al.*, 2022; Dubey *et al.*, 2022; Sharma *et al.*, 2021), we separated TOE-based factors into capabilities (drivers) and constraints (barriers).

5.1. T-O-E Capabilities

Technological enablers, such as traceability, immutability, and connectivity, facilitate the adoption and utilization of BCT. Organizational enablers, including auditability, the number of advisors, and agility, represent a company's abilities, expertise, and culture supporting successful implementation. Environmental enablers, such as the reduction of information asymmetry and

climate change awareness, signify external factors conducive to an organization's operations and success.

5.1.1. Technological Capabilities

Traceability in blockchain refers to the secure and transparent recording of transactions in a tamper-proof manner. Each transaction forms a block that is linked chronologically in the blockchain, creating an immutable ledger. This feature is crucial for industries such as hospitality and tourism, helping with online bookings, food safety, baggage tracking, and tourism authentication (Filimonau and Naumova, 2020; Erol *et al.,* 2022).

The concept of **immutability** in blockchain guarantees that any data added will remain unchanged (Flecha-Barrio *et al.,* 2020). These characteristic increases both security and trust. When applied to hotel bookings, it creates an unalterable record, preventing fraud and increasing trust (Bodkhe, 2019). Similarly, customer reviews and ratings recorded on a blockchain remain tamper-proof, mitigating fraud and improving trust in the review process (Irannezhad *et al.,* 2021).

Connectivity refers to enabling secure transactions and direct communication between customers and service providers, regardless of geographic distance. This decentralized approach fosters connections between industry segments such as hotels, airlines, tour operators, and customers, promoting an integrated and efficient ecosystem (Line *et al.,* 2020).

5.1.2. Organizational Capabilities

The **auditability** feature of BCT allows for a comprehensive audit of all network transactions (Parekh *et al.,* 2021). Through a transparent and immutable ledger, every activity and change is recorded, giving auditors access to a transaction's complete history. This is critical in industries such as hospitality and tourism, where transaction accuracy is paramount for customer satisfaction

and to avoid disputes and legal issues. Businesses in this sector can use blockchain to ensure accurate recording of transactions and speed up dispute resolution (Mucchi *et al.,* 2022). In summary, auditability stands out as a key enabler for organizations adopting BCT.

The presence of blockchain advisors is crucial for the successful adoption of the technology, especially in larger organizations where their guidance and expertise are important (Bulut, 2022). Hence, in this context, **the number of advisors** becomes critical in driving implementation. These advisors, who are well-versed in BCT, provide guidance on platform selection, smart contract development, and integration with existing systems. For example, TUI Group and Marriott International have established advisory boards of blockchain experts to contribute to initiatives that improve customer experience and increase supply chain transparency (Marr, 2018; Park, 2018). Despite the importance of advisors, Aghaei et al. (2021) note that there is a shortage of blockchain experts in the tourism and hospitality industry, which is a barrier to adoption. Therefore, having a sufficient number of blockchain-savvy advisors is crucial to guide and support organizations in their blockchain initiatives.

Agility, in the context of organizations, refers to the ability to quickly respond and adapt to market uncertainties and technological advancements, such as the adoption of blockchain (Sheel and Nath, 2019). In the tourism and hospitality industry, an agile organization can efficiently integrate blockchain technologies to improve service visibility and efficiency. Agility enables rapid adaptation to new blockchain applications, addressing changes in areas such as the hotel food supply chain, travel payment processing, and guest experience (Ozdemir *et al.*, 2023). This ability to quickly adapt to digitization meets the dynamic needs of service-oriented industries such as hospitality and tourism, making agility a critical enabler for technology adoption.

5.1.3. Environmental Capabilities

Reducing information asymmetry as an environmental enabler of BCT refers to its ability to increase transparency and trust in the tourism and hospitality industry by addressing information asymmetry between consumers and businesses or between business partners (Gordon, 2023). This is particularly important in loyalty programs, where traditional systems can lead to trust issues and fraud risks due to information asymmetries (Charlebois, 2017). Blockchain's potential to eliminate intermediaries, as highlighted by Parekh et al. (2021), can establish trust between parties and ensure the verifiability of data, fostering more informed decision-making and mitigating information asymmetry concerns (Schmidt and Wagner, 2019).

Climate change awareness can be viewed as an environmental capability of an organization, especially when it comes to embracing sustainability and demonstrating environmental responsibility. The organization or individual demonstrates their capability by actively promoting and raising awareness about climate change among their members and stakeholders. BCT has nowadays captured considerable attention because of its immense potential to make a significant impact in reducing climate change (Yousefi and Tosarkani, 2022). Jang et al. (2023) found that employees with greater climate change awareness are more open to exploring BCT to drive sustainable practices within the organization. Moreover, Dey (2023) stated that BCT has the potential to make a substantial impact in mitigating climate change by facilitating transparent and verifiable platforms for trading carbon credits.

5.2. T-O-E Constraints

We examined the technological, organizational, and environmental constraints that hinder blockchain usage. Technological constraints encompass various technical challenges or barriers that impede the adoption and implementation of BCT. These barriers may include technological immaturity, lack of interoperability, complexity, and network latency. Organizational constraints

within a company pose obstacles to successfully adopting and utilizing blockchain. These barriers may include team size, lack of top management commitment and support, and lack of access to technology. Environmental constraints denote external barriers or conditions that create challenges or limitations for organizations seeking to adopt blockchain. Such barriers include market uncertainty and energy consumption. They will likely hinder the adoption and usage of BCT in the tourism and hospitality industry and require solutions and strategies to overcome them.

5.2.1. Technological Constraints

Technological immaturity is based on a lack of technical maturity (Erol *et al.*, 2022). It refers to the early stages of development and limited technology functionality. In the tourism and hospitality industry, the technological immaturity of blockchain may refer to the limited number of blockchain solutions developed specifically for this industry and the lack of standardized practices for implementing and using BCT in this field. This can present a barrier to adoption as companies may be hesitant to invest in technology still in its early stages and lacks proven success in the industry.

Additionally, **the technical complexity** of blockchain can also present a barrier for companies with limited technical expertise or resources. Technical complexity in BCT refers to the challenges that arise while designing, developing, and implementing blockchain-based systems. It encompasses the intricacies of creating a secure and decentralized network, designing smart contracts, ensuring interoperability, addressing scalability issues, and establishing consensus mechanisms. The complexity arises from carefully considering data privacy, network security, cryptographic protocols, and integrating existing systems with BCT. These challenges require expertise in cryptography, distributed systems, and software development. Implementing blockchain is technically demanding because these challenges arise due to the complex nature of the technology (Melkić and Čavlek, 2020), which involves distributed ledgers, cryptographic

algorithms, consensus mechanisms, and smart contracts. The technical complexity of BCT can create barriers to adoption in the tourism and hospitality industry, as it requires specialized technical knowledge and expertise to develop and deploy blockchain-based systems (Dadkhah *et al.*, 2022; Jang *et al.*, 2023). An example of technical complexity in BCT could be the requirement for users to have a certain level of technical knowledge to use it effectively (Filimonau and Naumova, 2020). This includes understanding private and public keys, mining, and wallets, and navigating and using blockchain interfaces and platforms. This technical complexity can be a barrier to adoption for individuals and organizations without the expertise or resources to implement and manage BCT.

The **technical complexity** of blockchain, which includes design, development, and implementation challenges, is a barrier for companies with limited technical expertise or resources. It includes complexities related to creating a secure and decentralized network, designing smart contracts, ensuring interoperability, addressing scalability issues, and establishing consensus mechanisms. These complexities arise from considerations such as privacy, network security, cryptographic protocols, and integration with existing systems. Given the demanding nature of BCT, its technical complexity may hinder its adoption in the tourism and hospitality industry, as it requires specific expertise for successful development and deployment (Melkić and Čavlek, 2020). Users, including individuals and organizations, may encounter adoption barriers in the tourism and hospitality industry due to the requisite technical knowledge, encompassing understanding private and public keys, mining, wallets, and navigating blockchain interfaces and platforms (Filimonau and Naumova, 2020). This is exacerbated by the technical complexity of blockchain, necessitating specialized knowledge and expertise for the development and deployment of blockchain-based systems (Dadkhah *et al.*, 2022; Jang *et al.*, 2023).

The **lack of interoperability** in BCT, which refers to the challenges of integrating different systems and platforms without standardized technology, is a significant technological barrier (Wegner, 1996). Interoperability involves the seamless exchange of data between different systems, but achieving this in blockchain is challenging due to the lack of standardization. Different blockchain platforms often use different protocols, consensus mechanisms, and data structures, hindering their ability to work together and share data (Belchior *et al.,* 2021*;* Lohachab *et al.,* 2021). The lack of interoperability may cause information to be segregated, hindering the exchange of data among diverse blockchain systems. This can lead to inefficiencies and obstruct the seamless integration of BCT in the tourism and hospitality industry (Dutta *et al.,* 2020; Erol *et al*., 2022).

Network latency, as identified by Kizildag et al. (2019), represents a delay in data transmission between network nodes (Gillis, 2020). This delay, caused by factors like limited bandwidth, congestion, and security protocols, can impede blockchain network performance, affecting transaction speed and efficiency (Lunin, 2022). In the tourism and hospitality industry, network latency can result in processing delays for transactions, such as customer payments, impacting the overall customer experience. For instance, the implementation of a blockchain-based payment system in hotels may lead to payment processing delays, causing customer frustration and dissatisfaction. Additionally, slow reservation processing times due to blockchain's technical complexities can disrupt the expected ideal booking experience, affecting customer satisfaction (Sharma *et al.,* 2021). The significance of network size and bandwidth as a technological barrier, particularly in addressing scalability issues, underscores the importance of addressing network latency in BCT (Sharma *et al.,* 2021).

5.2.2. Organizational Constraints

Team size plays a critical role in the successful adoption and implementation of BCT, as highlighted by Guzmán et al. (2020) and Bulut (2022). While larger teams benefit from a wider range of resources and expertise, making it easier to deal with the complexities of blockchain, they may face coordination and communication challenges. Smaller teams, on the other hand, may face resource limitations and difficulty navigating the complexities of BCT, potentially leading to slower adoption or project failures. Balancing team size is essential, as both small and large teams have their benefits and challenges. Achieving the optimal team size, which combines the necessary expertise with effective collaboration, is critical to successful blockchain implementation. This approach minimizes risk, promotes efficient problem solving, and improves decision making, ultimately increasing the likelihood of successful technology adoption.

A lack of top management commitment and support for BCT can hinder its adoption within an organization (Farooque *et al.*, 2020; Sharma *et al.*, 2017, 2021; Tveita and Borander, 2018). When there is a lack of interest, it can cause a shortage of resources, lack of guidance, and employee unwillingness, preventing potential benefits such as improved efficiency, transparency, and security. If top management of a hotel chain lacks interest in blockchain, it could result in outdated processes, privacy issues, and missed opportunities to improve customer satisfaction and loyalty.

Lack of access to technology infrastructure is a significant organizational barrier to blockchain adoption in the tourism and hospitality industry (Filimonau and Naumova, 2020; Sharma *et al.*, 2021). This barrier refers to a lack of the necessary infrastructure, technical skills, and expertise required to implement BCT. For example, if a hotel lacks the technical resources or expertise to set up a blockchain-based booking and payment system, it hinders the adoption of the technology. Therefore, BCT faces challenges in the industry due to its associated costs and learning curve (Mougayar, 2016; Toufaily *et al.*, 2021).

5.2.3. Environmental Constraints

Market uncertainty, resulting from unpredictable and unstable market conditions, is a significant barrier to blockchain adoption in the tourism and hospitality industry (Sharma *et al.,* 2021). It is characterized by challenges in understanding events and circumstances, leading to uncertainty about potential impacts or changes (Lubowiecki-Vikuk *et al.,* 2023). In the context of blockchain, market uncertainty can result from unclear regulatory frameworks, lack of standardization, and uncertain market demand. This uncertainty complicates decision making for companies considering investments in BCT. The volatile nature of markets and uncertain factors such as demand patterns and regulatory gray areas create complexity for companies in assessing the potential benefits and risks of integrating blockchain into their processes. As a result, companies may be reluctant to allocate resources to implementing blockchain solutions due to a lack of clarity and information. The uncertain legal and regulatory framework surrounding cryptocurrencies and blockchain further exemplifies this environmental barrier and influences companies' adoption decisions (Filimonau and Naumova, 2020; Kizildag *et al.,* 2019).

Another important barrier is the **energy consumption** that BCT has caused. Treiblmaier (2022) has stated that the high energy consumption associated with blockchain operations is a commonly discussed topic. It is acknowledged that energy consumption is another factor frequently viewed as a drawback to adopting blockchain-driven business solutions (Mucchi *et al.,* 2022). Furthermore, Özgit and Adalier (2022) have expressed concerns about the sustainability of BCT due to its high energy consumption in the long run. This is because BCT operates through a computer network that consumes considerable energy to maintain the network. It is widely recognized that Bitcoin's energy consumption is very high, as noted by De Vries (2020). The consensus protocols that validate transactions and generate new blocks are the main culprits of

high energy consumption (Bada *et al.*, 2021). These protocols require multiple computers to process the transactions, which demands a significant amount of electricity. Due to this high energy consumption, many companies find it challenging to justify the expenses of implementing BCT. In short, energy consumption is an obstacle to blockchain and cryptocurrency adoption and development (Tham and Sigala, 2020).

Figure III Here

6. Discussion and Conclusion

With the increasing interest in BCT, researchers and managers have focused more on investigating the potential drivers and barriers of blockchain usage in the hospitality and tourism industry. BCT holds significant potential for the tourism and hospitality sector by providing enhanced security, transparency, and traceability; however, identifying challenges to its use is also critical. While studies exploring the application of blockchain in various industries have emerged, research in the context of tourism and hospitality remains relatively scarce (Erol *et al.*, 2022; Valeri and Baggio, 2021). To address this research gap, our study endeavors to provide a holistic understanding of the enablers and barriers of BCT in the tourism and hospitality industry. It consists of two phases. One is a descriptive section based on existing work, derived from a systematic literature review (SLR). This aspect is carried out following the approach of Tranfield et al. (2003). This part provides information related to the number of publications, publication sources, methodologies, theories, and contexts. The second stage is constructed based on three major theories: the Technology-Organization-Environment framework, Resource-Based Theory, and the Theory of Constraints. The integration of the TOE framework, Resource-Based Theory, and Theory of Constraints into a comprehensive model is one of the important theoretical contributions of this study. With the help

of these theories, we focused on identifying “less emphasized” capabilities (drivers) and constraints (barriers) in blockchain adoption and use, which we believe will be beneficial for future studies. To accomplish this, we avoided using repeated and well-known factors (e.g., transparency or trust) and only paid attention to those that were rarely mentioned. This research effort has a notable impact on both theory and practice within the tourism and hospitality fields, providing valuable perspectives for academics and industry professionals.

6.1. Theoretical Implications

This study provides valuable theoretical contributions to the existing literature. First, this study conducted a descriptive analysis of existing research on BCT in the hospitality and tourism industry. Compared to previous studies (for example, Jain *et al.,* 2023), this study obtained a more comprehensive data set based on the ABDC journal list. Compared to previous studies, such as Jain et al., (2023), this study obtained a more comprehensive data set based on the ABDC journal list. Therefore, this study clarifies the direction of the literature on BCT in the hospitality and tourism industry. Additionally, a substantial amount of research focuses on exploring the possibilities and challenges of implementing BCT in different sectors. Despite this, the factors that drive or hinder the implementation of blockchain in the hospitality and tourism industry have not received thorough investigation, including the TOE framework, Resource-Based Theory, and the Theory of Constraints. Therefore, we have contributed to the literature on BCT, especially in the tourism and hospitality industry, by applying these theories. We also identified the list of drivers and barriers through a systematic review. In doing so, our aim was to answer Treiblmaier's (2021) request for research by providing a theoretical perspective. Moreover, unlike existing studies (e.g., Dadkhah *et al.,* 2022; Dubey *et al.,* 2022; Erol *et al.,* 2022; Sharma *et al.,* 2021), we provided different capabilities (drivers) and constraints (barriers) of blockchain usage. Finally, we have

focused our attention on specific factors such as network latency and climate change awareness. While these factors have been addressed in other literature, they are seldom mentioned in the 49 articles we reviewed. Therefore, we aimed to emphasize the significance of these factors in the hospitality and tourism industry and offer valuable insights for future studies.

6.2. Practical Implications

In addition to theoretical implications, this study offers valuable practical implications. It attempts to answer Rashideh's (2020) question about why companies choose to adopt BCT. By identifying potential drivers and barriers, we provide insights into this central question. First, traceability reduces the potential for fraudulent activities and counterfeiting by providing details about the source, processing, and final destination (Sharma *et al.,* 2021). In the tourism sector, this could include tracking a traveler's entire journey, from booking flights and accommodations to experiencing various activities at the destination. Smart contracts on the blockchain can automatically record these interactions, providing a complete and tamper-proof history (Demirel *et al.*, 2022). In addition, the immutability feature of BCT helps the hospitality sector. For example, a guest's information, including check-in details, preferences, and feedback, is protected on the blockchain, ensuring its security and preventing any alterations.

The adoption of BCT, with its decentralized nature, will make operations more efficient by reducing reliance on intermediaries and enabling faster and more efficient processes in booking and payments (Irannezhad and Mahadevan, 2021; Özgit and Adalıer, 2022; Rashideh, 2020). This powerful combination, coupled with access to information and real-time updates, will give businesses the agility to respond effectively to market changes. Tourism and hospitality stakeholders can use blockchain's transparent ledger and smart contracts to protect customer information (Aghaei *et al.*, 2022; Filimonau and Naumova, 2020). This is likely to build trust and

reduce potential disputes, ultimately differentiating them by being more transparent and satisfying customers. In addition, companies can use BCT to verify and promote their sustainable efforts, demonstrating a firm commitment to environmental awareness. Companies can gain a competitive advantage and attract environmentally conscious travellers by engaging them in their sustainability efforts.

In terms of constraints, for example, network latency is a critical challenge for certain stakeholders, particularly those in regions with limited or unreliable Internet connectivity. This delay in data transmission can significantly impede real-time interactions, affecting activities ranging from online communication to financial transactions. To address this issue, stakeholders must prioritize the improvement and expansion of network infrastructure. This can include investing in high-speed internet, developing localized data centers, and implementing technologies such as 5G to reduce latency. Another important factor is the lack of access to technology (Kwok and Koh, 2019; Sharma *et al.*, 2021). This is a significant challenge for certain stakeholders, especially in regions or communities with limited technology infrastructure. For example, individuals in remote areas may struggle with inadequate internet connectivity, which hinders their ability to participate in digital platforms or utilize online resources. To address this issue, it is essential to implement initiatives that focus on expanding technological infrastructure and improving connectivity in underserved regions. This could include government intervention, private sector investment, and partnerships with technology companies to ensure broader access. In addition, energy consumption is a critical concern for certain stakeholders. Sectors such as cryptocurrency mining, data centers, and large-scale computing operations face significant energy demands (Hinsdale, 2022). To address this challenge, stakeholders need to prioritize energy efficiency measures and invest in

renewable energy sources. In addition, transitioning to renewable energy sources such as solar or wind power can help reduce environmental impact and offers long-term cost savings.

7. Future Research Directions and Limitations

As evident from the detailed analysis of the literature review and the conceptual framework provided, which includes capabilities and constraints, there is a noticeable shortage of scholarly research on the use of BCT in the tourism and hospitality industry. As research on BCT is still in its early stages in the tourism and hospitality literature, more scholars need to make efforts to advance our current understanding. In theory, more research on BCT is necessary to explain and examine the adoption process using established theories. Besides the theories already mentioned, such as diffusion of innovation and agency theory, the examination of organizational information processing theory can reveal the specific features of BCT that influence the tourism and hospitality field. For example, organizational information processing theory can be used to understand how organizations process and use information, including that generated and managed by BCT. Stakeholder theory, another significant concept, can help us understand and enhance collaboration among individuals who either intend to use or are already using BCT in their business environments. Understanding the impact of BCT on performance in an environment depends on how well it fits with the tasks that individuals and companies are expected to perform. As such, utilizing task-technology fit theory can shed light on the connection between technology and stakeholder performance.

The tourism and hospitality industry has seen a variety of methodological approaches in previous research exploring BCT including conceptual development, survey, case study, and mixed methods. Among these approaches, conceptual development papers were the most common, followed by research notes. Therefore, more research is needed that incorporates both qualitative

and quantitative approaches. Future research should conduct multi-group analysis to understand if there are differences between countries in the adoption of BCT in tourism and hospitality activities. Another important methodological approach is to conduct interviews, such as semi-structured interviews, to gain comprehensive insights from industry experts. This helps to uncover new factors, such as sustainability, that influence the use of BCT. Future research can also use surveys to explore the impact of capabilities and limitations on specific outcomes, such as stakeholder engagement.

BCT has tremendous power to transform the entire tourism and hospitality industry. Although the existing studies illustrate how blockchain technologies can be used in tourism and hospitality, there are still numerous contexts where BCT can be used. One of them is the sharing economy (e.g. Airbnb). BCT can enable the creation of a strong identity verification system through decentralization, helping to prevent fraud for both local and international guests. On these platforms, stakeholders can implement loyalty programs using BCT, such as tokenization or smart contracts, to enhance engagement. Another important aspect is entertainment and event management, which is a key component of tourism and hospitality. BCT can improve the ticketing process by creating digital tickets that cannot be duplicated. To achieve this, managers can benefit from non-fungible tokens, which are unique and not interchangeable. Despite the adoption of NFTs by certain airlines, such as Flybondi, to expand consumer options and improve revenue generation, the industry has yet to widely adopt this technology, possibly due to a lack of knowledge or awareness. The utilization of BCT has shown promising results in the field of medical tourism. BCT might have the capability to foster a dependable setting for intermediaries in the medical tourism industry, or potentially remove their necessity. BCT can remove intermediaries from the market, allowing medical tourists to interact directly with medical service providers. In addition,

BCT can transform pricing strategies overall by reducing reliance on intermediaries and enabling dynamic, real-time pricing models. It also has the potential to change loyalty programs by creating decentralized, token-based reward systems that enhance customer engagement and retention. In addition, BCT may well automate transactions and reduce processing fees, leading to more efficient revenue management practices. This is likely to optimize profitability for companies in the industry.

Most importantly, future research BCT in the tourism and hospitality industry has the potential to uncover the factors that either help or hinder its adoption and implementation. The TOE framework alone is not enough to fully understand BCT engagement; therefore, we should also consider social, economic, and psychological factors. The study has identified enablers (facilitators) and barriers (obstacles) which require further elaboration. When considering what drives progress, it is important to explore technological aspects such as privacy and security, technological literacy, decentralization, and the automation of smart contracts. These advances can significantly improve transparency and overall efficiency within the industry. The transparency, traceability, and immutability of BCT increase consumer confidence in the accuracy and authenticity of information provided by companies. This can reduce fraudulent practices and align with consumer protection principles. The BCT's capability to decrease information asymmetry gives consumers direct access to reliable information, reducing fraud or misleading claims. Smart contracts and immutable records could also provide automated and transparent dispute resolution, ensuring that consumer rights are fairly protected. In addition, the robust security measures and decentralized nature of BCT protect consumer data, aligning with data protection laws and preserving consumer privacy. Blockchain verification could enhance environmental standards, possibly leading to consumer protection laws including or encouraging these practices. As blockchain enables quicker

and more secure transactions, consumer protection laws may need to develop to accommodate more efficient payment processes. This would reduce the risk of payment problems or fraudulent activity. BCT in these areas leads to more secure, transparent, and trustworthy interactions between businesses and consumers. As a result, consumer protection laws may need to be adapted to effectively protect consumer interests in this evolving technological landscape. In addition, organizational factors such as top management support or technology-related policies within the organization deserve attention to understand how organizations can best leverage the transformative power of blockchain. Examples of environmental enablers include regulatory support, market dynamics, information sharing, information intensity, and government support. In contrast to the enablers, it is equally important to address the barriers associated BCT. Research should aim to identify and find solutions to technological challenges such as scalability, integration complexity, and regulatory compliance. In addition, identifying organizational barriers such as resistance to change, lack of trust, and cultural barriers will aid in creating strategies that support the successful adoption and implementation of blockchain in the tourism and hospitality sector. In short, future research can pave the way for the widespread use of BCT to revolutionize operations and enhance experiences in this dynamic industry by exploring both its capabilities and limitations. Therefore, some research questions may be useful for future research (see Table 3).

It is important to acknowledge several limitations associated with this SLR. To gather articles for this review, we used the Scopus and Web of Science databases, which are widely recognized and considered reliable sources of scholarly literature. However, research on BCT may have been published in outlets not covered by these databases. Therefore, it's possible that we may have missed some important studies in our analysis. Second, BCT is evolving, and there is a rapid increase in studies within the tourism and hospitality sector. It is worth noting that our review may

not incorporate studies that are currently undergoing peer review or in the process of being published. In other words, there might be additional research on the topic that we are not aware of or have not included in our analysis. As a result, some of the descriptive analysis pieces we identified in the literature on BCT may already be addressed or explored in ongoing research. This study also emphasizes that certain environmental factors linked to BCT are still open to debate. While some consider blockchain to be beneficial for the environment, others hold the opposite view. This is a potential limitation of our study and highlights the need for further research to delve deeper into this aspect. Furthermore, our emphasis on factors that have received comparatively less attention in the field is based on our interpretation and understanding. We expect these factors to become more prominent in future research. In parallel, forthcoming studies can establish a conceptual design by emphasizing the factors that are most commonly referenced in the current scholarly works.

Table III Here

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Table I. Inclusion and Exclusion Criteria

Inclusion Criteria	**Exclusion Criteria**
Full text	Uncompleted studies
Published within selected period (2008-March 2023)	Papers published outside the selected time range
Published in the Scopus and Web of Science	Papers published outside the selected databases
Study manuscript written in English	Non- English papers
Focus on blockchain technology	Artificial intelligence, metaverse, digital transformation, digitalization

Table II. Publication Source

Journal	**Number of Publications**
Annals of Tourism Research	2
Tourism Management	3
International Journal of Hospitality Management	3
Technological Forecasting and Social Change	1

International Journal of Contemporary Hospitality Management	2
Journal of Hospitality& Marketing Management	1
Tourism Management Perspective	2
Current Issues in Tourism	6
Tourism Economics	3
Worldwide Hospitality Research	4
Journal of Hospitality and Tourism Technology	6
Information Technology & Tourism	4
Technology in Society	1
Quality and Quantity	1
Operations Management Research	1
Journal of Travel & Tourism Marketing	1
Journal of Hospitality Financial Management	1
Policy and Society	1
OPSEARCH	1
Journal of High Technology Management Research	1
International Journal of Hospitality and Tourism Administration	1
Asia Pacific Journal of Tourism Research	1
Tourism and Hospitality Research	1
Journal of Theoretical and Applied Electronic Commerce Research	1
Total	**49**

Table III. Some Suggestions and Research Questions for Future Studies

Theories to consider: Technology Acceptance Model (e.g., Erol et al., 2022), Unified Theory of Acceptance and Use of Technology (e.g., Erol et al., 2022), Disruption Innovation Theory (e.g., Nam et al., 2021; Rashideh, 2020), Diffusion Innovation Theory (Kizildag et al., 2020), and Agency Theory (Kizildag et al., 2020)
Techniques to consider: Expert opinions such as Delphi studies (e.g., Filimonau and Naumova, 2020), Longitudinal study and Experimental design (e.g., Wu and Chang, 2021), and Case studies (e.g., Onder and Gunter, 2020)
Contexts to consider: Smart& Green Hotels (e.g., Filimonau and Naumova, 2020), Meetings incentives conferences and exhibitions (MICE) (e.g., Onder and Gunter, 2020), Leisure trips (e.g., Onder and Gunter, 2020), Booking systems applications (e.g., Ampountolas and Chiffer, 2022), Baggage tracking, reservation, and ticketing (e.g., Treiblmaier, 2022)
Some example research questions for future research
RQ1: How can blockchain technology be effectively integrated into the tourism and hospitality industry, and what are the unexplored enablers and barriers affecting its adoption and implementation?
RQ2: What potential applications does blockchain technology have in the tourism and hospitality sector, specifically in sharing economy platforms like Airbnb, entertainment and event management, and medical tourism?

RQ3: How do different theoretical frameworks, such as diffusion innovation theory, agency theory, organizational information processing theory, stakeholder theory, and task-technology fit theory, contribute to understanding the adoption process and impact of blockchain technology in the tourism and hospitality industry?
RQ4: What are the most suitable methodological approaches, such as conceptual development, surveys, case studies, and mixed methodologies, to investigate the implementation and effects of blockchain technology in the tourism and hospitality sector?
RQ5: How do qualitative and quantitative approaches, including multi-group analysis and interviews, contribute to enhancing our understanding of blockchain technology adoption and usage in different countries and contexts?

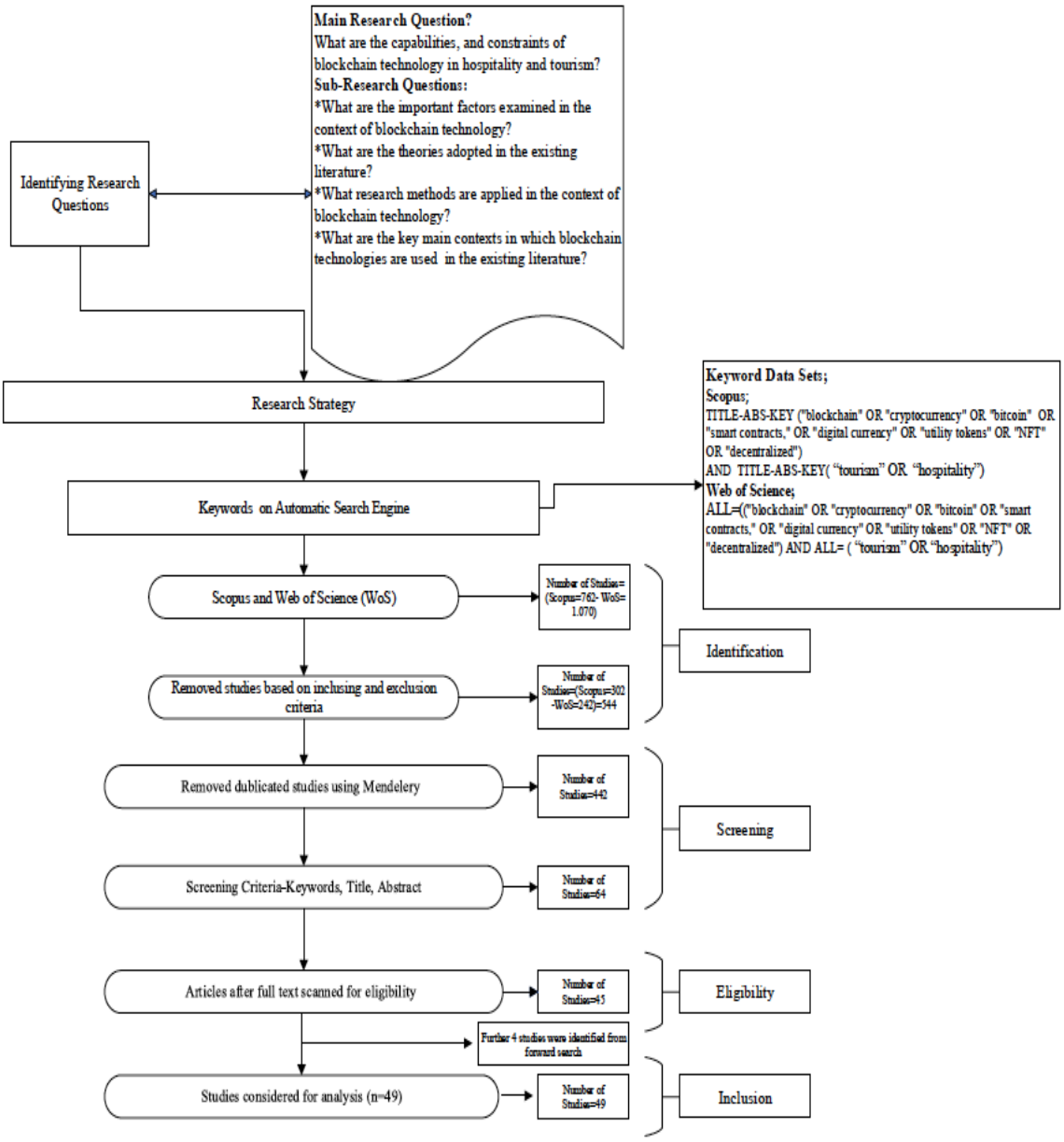

Figure I. PRISMA Protocol

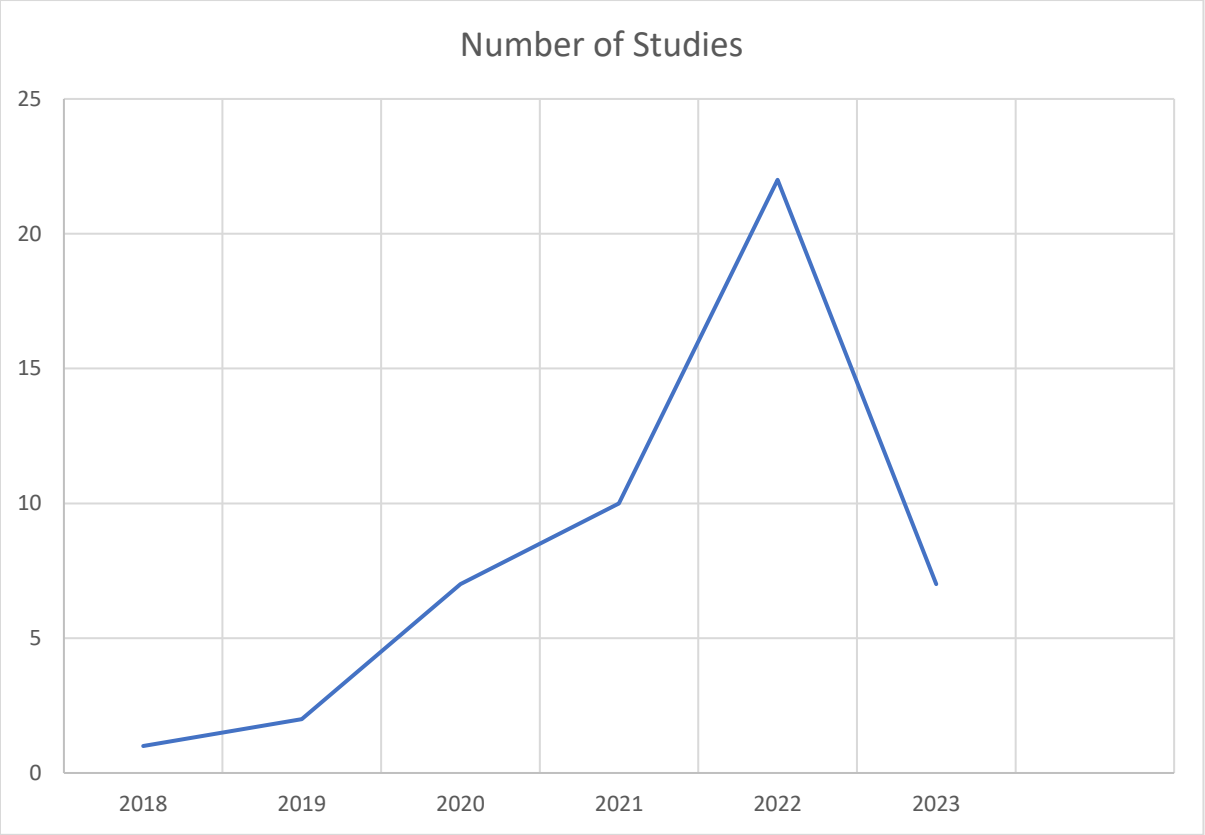

Figure II. Year of Each Publication in the Dataset

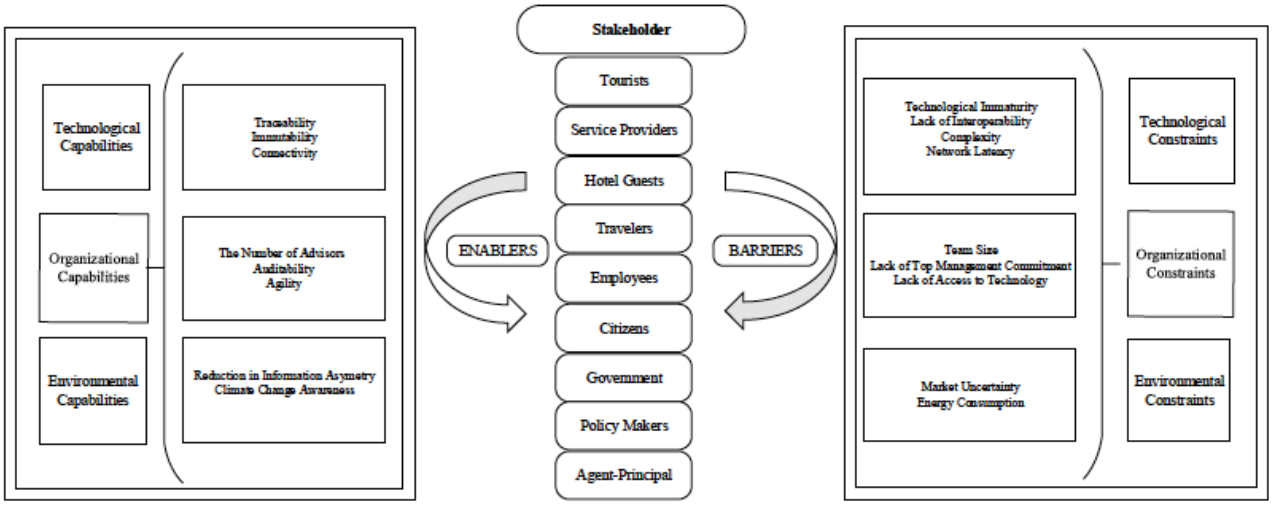

Figure III. Synthesis of Findings and Literature Mapping