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Master's Degree Program in
Data Science with specialization in Business Analytics

The Perception of Blockchain Benefits in Tourism and Hospitality

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Master Thesis
presented as partial requirement for obtaining a Master's Degree in Data Science and Advanced Analytics

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
Universidade Nova de Lisboa

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By

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Statement of integrity

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism, any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledged the Rules of Conduct and Code of Honor from the NOVA Information Management School.

[Cascais, 27/11/2024]

Abstract

Blockchain technology is gaining attention in tourism and hospitality for its potential to transform operations. This study explores the relationships between Automation Identification, Cost Saving, Security, Perception of Blockchain Benefits, and their impact on Behavioral Intention when choosing a hotel.

These elements have not been extensively studied and the aim of this study is to fill this gap by analyzing how these factors influence the behavioral intention of blockchain adoption.

Using a questionnaire, data was collected and analyzed with Smart PLS 4. The main findings reveal that Automation Identification positively influences both Perception of Blockchain Benefits and Behavioral Intention, suggesting that automation is instrumental in shaping the respondents' perceptions. Cost savings also have a moderate positive effect on these factors, emphasizing its importance in adoption. However, the relationships between Security, Perception of Blockchain Benefits and Behavioral Intention were statistically insignificant, security concerns may not influence respondents' perceptions and intentions on adoption. Blockchain perception strongly correlates with behavioral intention, indicating that favorable perceptions drive adoption. These findings highlight the importance of communicating blockchain's cost-saving and automation identification benefits to boost perceptions and adoption.

The originality of this research focus on automated identification, as other studies focused on trust, cost and transparency.

Keywords: Blockchain; Technology Adoption; Tourism; Hospitality

Sustainable Development Goals (SDG):

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1. Introduction

The tourism industry is evolving to provide technology-enhanced smart experiences, replacing traditional practices. With technological improvements, tourism managers now have access to various consumer data allowing them to construct more sophisticated client profiles personalizing experiences to individual interests, resulting in enhanced customer satisfaction (Pai et al., 2020).

As hospitality and tourism industries embrace technological advancements to meet evolving customer expectations, blockchain technology emerges as a key innovation. Blockchain technology is a distributed, replicated, and irreversible digital ledger that enables various parties to conduct business more trustworthy and transparently (Lansiti & Lakhani, 2017).

Blockchain technology can facilitate hospitality and tourism enterprises and destinations in acquiring valuable insights, including a deeper understanding of tourists' behavior, the identification of their preferences and requirements, monitoring tourists' geographic locations, tailoring services to individual needs, introducing novel products and services, enhancing revenue management practices, and refining pricing strategies (Stylos et al., 2021). Tourism companies can use big data technologies to carefully plan hotel, restaurant, and event recommendations based on tourist preferences, geographic location, and online behavior (Davenport & Dyché, 2013). Blockchain can also secure travel payments, decrease fraud, and assist tourists in keeping track of their expenses (Thees, Erschbamer, & Pechlaner, 2020). Furthermore, blockchain can be used to develop decentralized booking systems that do not rely on a central authority (Crosby et al., 2018). This facilitates travelers' finding and booking travel arrangements and potentially lowering expenses. Finally, blockchain technology helps produce personalized marketing and loyalty programs, tracking luggage, as well as providing booking solutions (Tripathi et al., 2023).

Several hospitality and tourism sector platforms are leveraging this disruptive and revolutionary technology. For instance, Travala.com is a cryptocurrency-accepting travel booking platform that allows people to book travel plans without using a typical bank or credit card (Travala, 2023). The Expedia Group, one of the world's biggest Online Travel Agencies (OTA), created a new reward program (Expedia Traveler Network) that leverages a private permissioned blockchain. Expedia and its partners can track and reward traveler behavior using ETN, and customers can earn and redeem rewards for their travel purchases through this program.

It is expected that by 2030, the use of blockchain technologies might add US$1.76 trillion to the global economy through improving tracking, tracing, and trust (PwC, 2020).

This investigation starts with the exploration of the research question: How can the perception of blockchain benefits influence consumer behavioral intention when choosing a hotel?

To answer this question, the approach begins with a comprehensive literature review to understand the existing research on blockchain technology and its perceived benefits namely security, smart contracts, automated identification, cost reduction, and payments in the hospitality industry. Next, a survey was developed to collect data from consumers regarding their perceptions and behavioral intentions. This data was then analyzed using the PLS-SEM (Partial Least Squares Structural Equation Modeling) methodology to identify the relationships between perceived blockchain benefits and consumer intentions. Finally, conclusions were drawn to demonstrate how these perceptions can impact consumer decision-making and guide marketing and operational strategies for hotels.

In addition, this study integrates the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB) to explore how consumers adopt blockchain technology in the hotel industry. TAM provides insight into how technological aspects, like security and cost reduction, influence consumers' perceptions of blockchain's usefulness. In contrast, the TPB enriches the analysis by incorporating broader behavioral factors, such as attitudes and perceived control, offering a more comprehensive understanding of the factors that shape consumers' behavioral intentions.

The remainder of this dissertation is structured as follows: The next chapter presents an overview of blockchain technology and reviews the existing literature. A conceptual model for blockchain adoption in tourism is proposed, and the research methodology is explained. Finally, this study discusses implications and presents a conclusion.

2. Literature Review

In this section, a literature review is presented, which aims to highlight the impact of blockchain technology and its transformative potential within the tourism and hospitality sector. Emphasis is given to the advantages of smart contracts in enhancing automation, the streamline of automated identification processes, and loyalty programs benefits, as well as the use of blockchain in transactions, contracts, and payments, demonstrating its role in fostering efficiency, security, and transparency in this industry.

2.1 Tourism and Hospitality sector

The tourism industry has grown significantly since the creation of the commercial airline industry and the advent of the jet plane in the 1950's. By 1992 it had become the largest industry and the largest employer in the world (Theobald, 2005).

It's crucial in tourism and other sectors to stand out and make a difference to gain competitive advantages. Porter's model (1990) provides a foundational framework for analyzing competitive strategies and can be applied to the context of blockchain technology within the tourism and hospitality sector.

Porter's 1990 framework delves deeper by identifying five critical factors shaping competitive dynamics. The first factor looks at competition in the market, especially among service providers in touristic areas, with concerns such as having too many hotels and the fact that tourism services can't be stored or used later (Porter, 1990).

The other four factors focus on a destination's overall competitive position, including supply and demand, the bargaining power of customers and suppliers, threats from new competitors, and how easily one destination can be replaced by another.

Applying Porter's models not only highlights the relevance of cost leadership and differentiation strategies in the tourism and hospitality sector but also illustrates how blockchain technology can fundamentally reshape competitive dynamics and drive innovation within the industry.

According to Attila (2016), in the tourism industry, destinations with similar characteristics can be easily substituted by travelers, making competition fierce. Likewise, investors seeking to develop tourism-related projects—such as hotels, resorts, theme parks, or restaurants—can also choose between competing locations based on factors like profitability, infrastructure, and market conditions. As a result, destinations must continuously innovate and differentiate to remain attractive to tourists.

2.2 Overview of Blockchain Technology

Blockchain is a technology that enables numerous parties involved in communication to perform different transactions without the involvement of a third party (Shrimali and Patel,2022). In other words, it facilitates peer-to-peer (P2P) transactions, with a wide range of applications for blockchain beyond finance, such as the health, governance, and tourism sectors (Tyan et al., 2020), best exemplified by business-to-consumer interactions, for various online bookings and reservations, including hotel bookings, airline ticket purchases, and tour package reservations.

Blockchain most famous implementation is the cryptocurrency Bitcoin, which was created by Satoshi Nakamoto (2008), who first conceptualized peer-to-peer networks. It empowers tourists to utilize cryptocurrencies like Bitcoin for payments, eliminating the need for reliance on financial institutions or intermediaries (Valeri and Baggio, 2021). This speaks to one of the primary challenges in the tourism industry: the lack of transparency, particularly regarding information on hotel capacity, price discrepancies at different source markets, data inconsistencies caused by reservations transiting through numerous systems, human mistakes, duplicate booking, manual and paper-based communication (Irannezhad & Mahadevan, 2021).

2.2.1 Smart Contracts

A Smart Contract can automatically execute and enforce a predefined set of rules or conditions (Davidson, De Filippi, & Potts, 2018). Numerous practical applications based on implementing smart contracts on Blockchain technology have been developed in recent years (Taherdoost & Hamed,2023). Smart Contracts can autonomously carry out any actions the provisions require instantly or at scheduled times, encompassing a range of contractual clauses, and depending on the scenario, they may or may not necessitate human intervention, thus enabling partial or complete self-execution (Gupta, 2017).

These contracts allow the blockchain to automate transaction processing based on predefined rules (Hristov & Dimitrov, 2018). For example, some tourism and hospitality activities include booking and payment procedures and loyalty programs.

2.3 Blockchain Adoption in the Tourism and Hospitality Sector

Blockchain technology offers numerous applications in the tourism and hospitality industry. This discussion focuses on four key areas: transactions, contracts, and payments; cost reduction; automated identification; and security. Existing research highlights blockchain's potential to streamline operations, reduce expenses, enhance identity verification processes, and protect sensitive data. These aspects are widely discussed in literature as key benefits of blockchain technology. However, further investigation is required to understand whether these perceived benefits directly

influence behavioral intentions, such as the willingness to adopt blockchain-enabled technologies in the tourism and hospitality sector.

2.3.1 Security

Information security refers to the safeguarding of confidentiality, integrity, and availability of information. It may also encompass other aspects such as authenticity, accountability, non-repudiation, and reliability (Stallings W., 2006). On the other hand, network security focuses on protecting networks and their services from unauthorized alterations, destruction, or disclosure. It ensures that the network functions as intended, without causing any harmful side effects, and provides confidence in its ability to perform critical tasks accurately (Stallings W., 2006).

According to Antonopoulos (2014), blockchain security prevents malicious activity, illegal access, and tampering with data and transactions kept on the network. Consensus procedures and cryptographic techniques are used to guarantee data availability, confidentiality, and data integrity.

While existing research, such as Avdiomiotis and Moshotoglou (2022), highlights the crucial role of security in blockchain systems, it is important to note that in this study, security is part of a formative construct rather than a direct predictor of behavioral intention. The perception of blockchain benefits—encompassing factors like security and cost reduction—shapes individuals' behavioral intentions to adopt blockchain systems. In this context, security is one of several factors that collectively influence the overall perception of blockchain technology's benefits, rather than being a direct, standalone influence on behavior.

According to Alshamsi and Andras (2019) user perceptions of blockchain's security benefits can significantly influence their view of its overall advantages. As highlighted in that study's results, a lack of awareness or understanding of advanced security features (such as 2-step verification, wallet auto-generation, and local currency balance display) negatively affects how users perceive the technology's security and utility. Furthermore, usability challenges, such as complex authentication processes, exacerbate misconceptions, reinforcing the importance of consumer education in shaping positive perceptions. This aligns with the hypotheses that for blockchain to be perceived as beneficial, users must recognize and understand its unique security features. Without sufficient knowledge, consumers may undervalue blockchain's security benefits, hindering adoption despite its inherent advantages (Alshamsi & Andras 2019).

Furthermore Lu et al. (2021) posit that information security positively influences the relative advantage of blockchain, this relative advantage consists on the cumulative benefits from blockchain when it surpasses the traditional technology. The study refers that blockchain adoption can bring more non-tangible benefits to the Elderly care industry. The immutability and traceability of blockchain data storage support the

industry in providing personalized services, monitoring and activity log and responsibility. Smart contract deployment simplifies business processes in data governance and improves efficiency (Lu et al., 2021). Generally, organizations are more likely to adopt blockchain if its advantages surpass those of existing systems. This study concluded that information security positively affects the advantages of blockchain technology and indirectly affect blockchain adoption intention (Lu et al., 2021).

All the conclusions from the studies above lead to the following hypotheses:

H1: The security features offered by blockchain positively affect the perception of its benefits in the tourism sector.

2.3.2 Automated identification

Nowadays, individuals when travel must provide their identification card at different junctures of their journey, encompassing booking, boarding, lodging, and hotel check-in. With blockchain technology incorporating transactional data across all nodes, travelers can navigate these stages without needing physical documentation. Moreover, the absence of identity-based checks for tourists guarantees a streamlined and stress-free experience for travelers (Bodkhe et al., 2019).

As noted by Jackson (2009), the hospitality industry is well-positioned to adopt and integrate new technologies to enhance existing business processes. One of the more notable advancements in recent years is the rise of biometric technologies. Many hospitality businesses, particularly in the lodging sector, have begun to recognize the significant advantages these technologies can provide and have started to incorporate them into their daily operations.

A biometric identification system typically has three key components: a scanner to capture a person's trait (like a fingerprint or face scan), software that converts the captured data into biometric information, and a database to store it for future use (Jones et al., 2007). The first step is registering a trait, such as a face or fingerprint scan, or even a signature. This process, called enrollment, creates a template that is saved in the system's database. This approach is commonly used in European citizen cards, which combine both facial recognition and fingerprint scanning for secure identification. These biometric features help improve security and make the verification process faster and more reliable. When new biometric data is collected, the system compares it to the stored template. If the new data closely matches the saved template, the system confirms the person’s identity (Jones et al., 2007). This opens the possibility of implementing a blockchain-based registration procedure for storing data biometrics (Kwok & Koh, 2019). This approach aims to create and maintain a backend database of individual records, ensuring that personal information remains safe from theft or misuse. In the conventional hotel system, data is centralized and overseen by the hotel itself or a third-party provider. This centralized structure grants the hotel complete

control over the data, with any modifications or revisions necessitating authorization from this central entity. Because data is concentrated in a single database, there exists a vulnerability to tampering or unauthorized changes.

Automated identification systems devices could be used for several purposes, such as improving security at hotels, controlling the flow of people in common areas, and streamlining check-in procedures at hotels or airports (Rasanayagam et al., 2018). These systems can also expedite the check-in process by verifying guests' identities and luggage handling procedures (Rasanayagam et al., 2018). Automated identification systems streamline processes by eliminating manual tasks, reducing errors, and accelerating operations. At the hotels, the blockchain system would manage the storage of biometric data for guest identification purposes. Upon arrival, guests would go to the reception desk to obtain an access card, granting them entry to their rooms and communal areas. Positioning blockchain technology as an innovative solution that amplifies the benefits of automation can enhance its perceived value.

Blockchain simplifies customer authentication by removing the need for paper documents typically required in traditional systems, a benefit that, while significant, is not unique to blockchain technology. It reduces the risk of terrorism and criminal attacks by detecting individuals traveling with falsified documents (Line et al., 2020).

Automated identification is perceived as user-friendly (Wang, 2021), whereas blockchain is often considered as complex and difficult to perceived usefulness (Akter, Kummer, & Yigitbasioglu, 2024). Blockchain benefits become easier to understand when linked to familiar technologies, such as automated identification and Face ID, which are widely understood by people. This reflects a concept related to perceived ease of use and perceived usefulness, which are central elements of the Technology Acceptance Model (TAM) (Venkatesh & Bala, 2008). According to TAM, users are more likely to adopt and accept new technologies such as automated identification when they find them easy to understand and relevant to their existing knowledge or experiences (Venkatesh & Bala, 2008).

Moreover, Rele, Patil, & Boujoudar (2023) discuss the integration of artificial intelligence (AI) and blockchain offers secure and accurate identity verification. By combining AI's advanced facial recognition capabilities with blockchain's decentralized data storage, biometric information such as facial features, fingerprints, and iris scans can be securely stored, ensuring an immutable record of identity. Some examples, this technology can streamline identification processes at critical points, such as ports of entry, significantly reducing identity fraud and unauthorized access. However, successful implementation requires addressing public perception and encouraging broad adoption. Trust in these technologies depends on ensuring transparency, accountability, and the protection of individual privacy and rights (Rele, Patil, & Boujoudar, 2023). Open communication, well-defined policies, and robust safeguards are essential to alleviate concerns and build

public confidence in the use of AI and blockchain within homeland security operations. By prioritizing these measures, stakeholders can enhance public trust and unlock the full potential of these innovative solutions (Rele, Patil, & Boujoudar, 2023).

According to Jang and Han (2022), the enhancements in products or services significantly influence user acceptance and motivation, driving greater engagement and sustained use. However, the researchers also discuss that while blockchain technology continues to advance rapidly, it is widely agreed that research on user experience in blockchain technology has not progressed at the same rate as its implementation. (Jang & Han, 2022). Limited research has examined the challenges to widespread acceptance of blockchain technology from the user's perspective (Jang et al., 2020).

This integration in the tourism and hospitality sector, the automated identification systems with blockchain technology, significantly enhances the speed and security of hotel check-ins, which in turn improves the overall guest experience and creates a more secure hotel environment. This leads to the following hypotheses:

H2: Automated identification positively affects the perception of blockchain benefits.

2.3.3 Transactions, contracts, and payment

In the financial services industry, blockchain enables the simultaneous assurance of transparency and security. The absence of transparency within the system increases the probability of security issues, as individuals remain uninformed until an incident occurs, or data is compromised. Transparency in the system is beneficial and necessary for financial service providers and their clients. Due to the inherent difficulty in altering a distributed ledger, monitoring ownership becomes notably simpler. Trust can be increased by using the ledger to verify information on claims and ownership transfers. Automation made possible by blockchain technology lowers the cost, complexity, and time needed for transactions (Javaid et al., 2022).

Blockchain also offers the ability to decrease fraud and expedite procedures. By anonymously preserving all transactions and information, it is possible to give consumers value by enabling faster cost-efficient and traceable transactions.

Nevertheless, the computational complexity of the processes involved in these transactions raises concerns about the number of potential transactions and the substantial energy consumption required (Thees, Erschbamer, & Pechlaner, 2020).

The concept of smart tourism has evolved in recent years - according to Gretzel et al. (2015) - tourism destinations are growing reliance on unique and changing forms of information technology. This reliance allows tourism regions to collect and store data and information with the potential for utilization. This emerging trend is in its early stages, and the rapid progress of new technologies such as big data, ID recognition, and

location-based technology requires their integration into tourism locations for efficient and effective exploitation.

As per Künstner (2020), using blockchain technology within enterprises functions mainly as a powerful marketing tool. The goal is to expand blockchain community knowledge and target a youthful, knowledgeable audience. With a focus on logos, advertisements, and bitcoin acceptance, the objective is to raise awareness of blockchain technology.

Despite potential discrepancies in distribution throughout the system, blockchain technology has the potential to lower the total cost of financial transactions. This is primarily due to blockchain-based networks typically imposing lower transaction fees for end users than traditional banks (Dadkhah, Rahimnia, & Filimonau, 2022).

Blockchain technology in transactions, contracts, and payments offers streamlined processes that can contribute to cost reduction.

2.3.4 Cost Reduction

Cost reduction can be defined as reducing transaction fees by streamlining processes, shortening waiting times, and eliminating unnecessary intermediaries (Di Francesco Maesa et al., 2019). This leads to more efficient operations and lower overall expenses. Smart contracts are utilized by travel companies, airline operators, and agents to facilitate real-time transactions. Benefits to consumers, manufacturers, and agents include features like mileage points, instantaneous billing, and transparency. In the tourism industry, these technologies could lead to cost savings and increased profitability (Turkay et al., 2019; Kwok & Koh, 2019).

According to Garg et al. (2021), research demonstrated that one of the visible business benefits of implementing blockchain in a banking system is the reduction of overhead costs. This finding is particularly significant because it highlights how cost efficiencies can enhance the perceived advantages of blockchain technology. Given the similarities in operational challenges and cost structures, the positive influence of cost reduction on the perception of blockchain advantages observed in the banking industry can be extended to the hotel industry. Hotels, like banks, deal with significant overhead costs related to transaction processing, record-keeping, and intermediary services.

According to Wilson, Johnson, and Brown (2024), while cost reduction significantly enhances the perception of blockchain's value, its adoption also depends on other factors such as industry relevance, regulatory environment, and technological infrastructure. Therefore, blockchain's ability to drive cost savings and improve operational efficiency makes it a powerful tool with broad applicability across various industries. This leads to the following hypotheses:

H3: Cost reduction positively impacts the perception of blockchain benefits.

2.3.5 Behavioral Intention

Behavioral intention represents the strength of a person's commitment to performing a specific behavior and is primarily shaped by two factors: their attitude toward the behavior and the subjective norms surrounding it (Maffei et al., 2012). In other words, if an individual has a positive attitude toward their behavior and perceives social support or approval for it, they are more likely to follow through with the action. Consequently, a person's intention to act is guided both by their personal view of the behavior and by the influence of social expectations (Maffei et al., 2012).

Researchers Raddatz et al. (2021) provide insight into how individuals' perceptions of the advantages offered by blockchain-based databases are influenced by their perceptions of the benefits these technologies bring. A blockchain-based database offers privacy protection as a key feature of its functionality. If an individual views the privacy protection mechanisms of blockchain as beneficial, they are more likely to consider switching from centralized banking to blockchain-based banking when given the option (Raddatz et al., 2021). Their findings highlight how crucial it is to comprehend how customers view the advantages of blockchain technology. Beyond the usage of databases, this understanding may influence customer behavior in the hospitality sector. Hotels that use blockchain technology are more likely to attract customers who value efficiency, security, and transparency. To improve the overall guest experience, blockchain-enabled solutions, for example, can guarantee safe transactions and clear booking procedures (Albshaier, Almarri & Rahman, 2024).

H4: Perception of blockchain benefits positively influences behavioral intention choosing a hotel.

Table 1 summarizes the construct definitions.

Table 1 – Construct definitions

Construct	Definition	Author
Security	The definition of security involves providing private services to safeguard information, people, and assets, ensuring individual safety and community well-being.	(Craighead, 2003)
Automated Identification	The process of verifying the identity of an unknown individual by performing a one-to-many comparison. In this process, the user provides biometric data, which is then compared to all	(Sharma & Dwivedi, 2024)

	stored templates in the database to find a match.	
Cost Reduction	Cost reduction refers to savings achieved in production, administration, sales, and distribution by removing unnecessary elements, product design and redefining associated techniques and practices.	(Akeem, 2017)
Behavioral intention	Behavioral intention reflects the strength of an individual's commitment to carrying out a particular action, influenced primarily by two key factors: their attitude toward the behavior and the social norms that influence their decision	(Maffei et al., 2012).

2.3.6 Conceptual Model

This study integrates the Technology Acceptance Model (TAM) (Davis,1989). and the Theory of Planned Behavior (TPB) (Ajzen, 1985, Ajzen, 1991) to examine how consumers embrace blockchain technology in the hotel industry. TAM offers understanding of technological factors, in this case security, biometric automation and cost reduction, shape consumers' perceptions of the usefulness of blockchain. On the other hand, TPB enriches the analysis by incorporating broader behavioral factors, such as attitudes and perceived control, offering a more comprehensive understanding of the factors that influence consumers' behavioral intentions.

The first three hypotheses (H1, H2, and H3) are derived from the Technology Acceptance Model (TAM), focusing on how specific blockchain advantages (security, cost reduction, automated identification) influence consumers' perceptions of usefulness. The last Hypotheses 4 explores the relationship between these perceptions and behavioral intention, incorporating elements of the Theory of Planned Behavior (TPB) to account for broader attitudes toward blockchain adoption.

These hypotheses were stated to define the direction of the research clearly. They attempt to explain the occurrences and contribute to advancing knowledge in this field. Consequently, the theoretical framework of this study is illustrated in Figure 1, demonstrating the potential direct associations among these factors. Blockchain technology provides the ability to improve transparency, security, and efficiency in travel and hospitality systems (Notomoro,2024).

Figure 1 presents a conceptual model detailing significant components and functions.

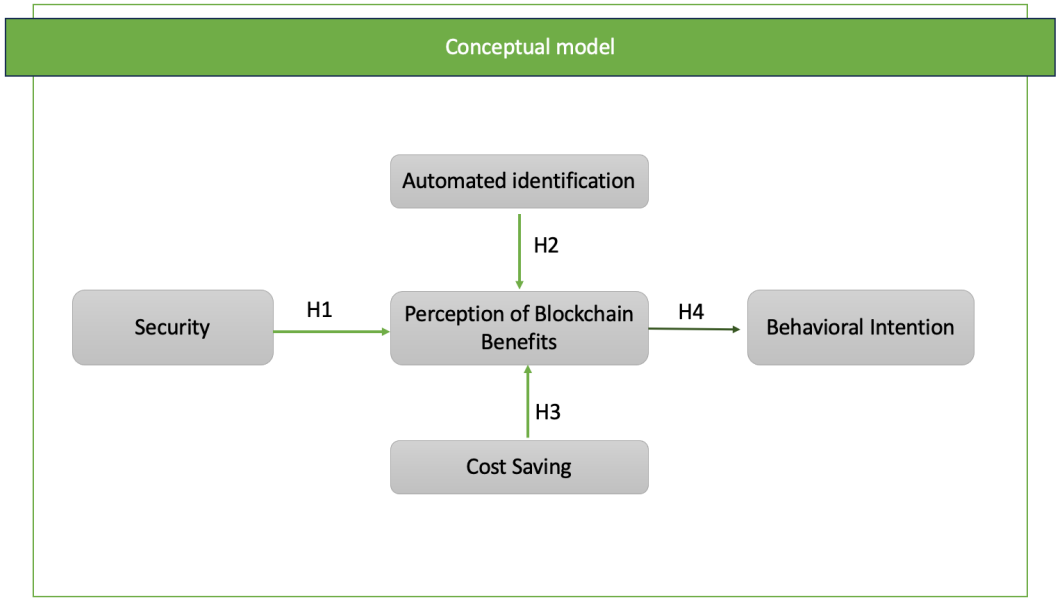

Figure 1- Conceptual model

3. Methodology

This section explains the process required to implement the study's objectives. The key topics discussed include the population and sampling method selected, the experiment's measurement, and the data collection and analysis procedures. The measurement items are drawn from existing literature and adjusted to maintain content validity.

The research applies a survey-based approach to investigating hotel clients' perceptions of the benefits of blockchain technology and their behavioral intentions toward adopting blockchain solutions. By collecting primary data in a structured questionnaire (Appendix A and B), this study tends to measure the clients' attitudes, beliefs, and intentions toward adopting blockchain solutions in their respective industries. This study tries to understand how perceptions of security enhancement, automated identification systems, and potential cost savings in blockchain influence the willingness of clients to adopt and use blockchain-based services or products. Through a statistical analysis and interpretation of the survey results, this research offers valuable insights for understanding the driving factors behind clients' acceptance and adoption of blockchain technology.

An online survey was created using Qualtrics to efficiently collect data from a large sample within a short timeframe. Before the survey was officially launched, a pilot test was conducted with three individuals to identify any potential errors or issues in the questionnaire design. This test confirmed that the survey was clear and with any errors, allowing it to be released without further modifications. The pilot test also confirmed that the survey questions were clear and free of errors, the sequence was logical and easy to follow, and the overall length of the questionnaire was appropriate for respondents.

To gather participants, it was used as a convenience sampling method by distributing the survey through personal network and social media platforms, including Facebook and Instagram. This approach was chosen to maximize reach quickly and effectively by leveraging existing connections.

A Likert scale comprising seven points was used in the questionnaire. The seven-point Likert scale was chosen because it effectively reduces response bias and maximizes variance (Eutsler & Lang, 2015). Labeling all points on the scale helps respondents accurately interpret each option, reducing the tendency to lean toward central or extreme responses without a clear reason. Additionally, SMART PLS 4 was used for analysis.

This study utilized the Partial Least Squares (PLS) structural equation modeling (SEM) method to examine how the perception of blockchain benefits may affect consumer

behavioral intention. Partial least squares (PLS) are an alternative to linear structural relations (LISREL), which aims to depict theoretical covariance structures through structural equations in multivariate analysis. Unlike LISREL, PLS is advantageous in capturing the explanatory power of intricate causal models, even with a relatively small sample size (Chang et al., 2022).

The survey includes demographic details of the respondents, including gender, age, level of education, occupation, and whether they are employed in the tourism sector.

Additionally, the survey comprises five distinct categories of questions which can be found in Appendix C: three questions pertaining to security taken from Avdimiotis & Moschotoglou (2022), an additional three addressing automated identification adapted from Gan & Lau (2023), a further three centered on cost saving taken from Garg et al. (2021), two about perception of blockchain benefits adapted from Esfahbodi et al. (2022), and finally, two specifically exploring behavioral intention adapted from Chang et al (2022).

The selection process of questions from multiples sources followed a rigorous set of criteria, such as relevance to the research objective and clarity of the questions. It was ensured that the questions were relevant and adaptable to the hospitality and tourism sector. In addition, it was taken into consideration that this study aimed to gather insights from clients rather than blockchain-adoption decision-makers and direct users such as hotel managers and stakeholders. Therefore, some questions were excluded. The questions from Esfahbodi et al. (2022), such as "Using blockchain enhances my effectiveness in EC transactions," and from Chang et al. (2022), such as "I am willing to participate in learning programs on blockchain technology" and "I am willing to introduce blockchain technology in addition to the existing information technology," were removed from the survey as they seemed less relevant to the clients being surveyed. These questions focused on more technical aspects and personal willingness to engage with blockchain beyond immediate use cases, which did not align with the primary interests and concerns of the respondents. Additionally, the question "I want to use a blockchain phone when released" was also excluded as it was speculative and not directly related to the clients' current needs or experiences with blockchain technology in the context of the tourism and hospitality industry. This modification was done before data collection, based on the assessment that the question did not align well with the study's context and objectives. The removal ensured clarity and relevance for respondents, while maintaining the integrity of the construct as informed by prior studies. As blockchain is a complex and technical subject, this is even more challenging for individuals outside of the technology sector to clearly understand it. As many hotel clients may not have direct exposure or knowledge of blockchain, it increases the difficulty formulating questions that are both relevant and simple to this audience. Therefore, the questions streamlined from other studies aimed to provide a

comprehensive understanding and ensure no important aspect was missing, preserving the integrity of the information captured.

4. Results and discussion

4.1 Demographic evaluation

In this section, the results of the demographic evaluation are presented. The analysis examines key demographic factors that may influence perceptions and adoption of blockchain technology, such as age, gender and education level. These factors provide valuable insights into how different demographic groups interact with and perceive the potential advantages of blockchain, including cost reduction, security, and automated identification.

Of the 276 respondents, only 220 were valid responses. As a result, this analysis considered only the individuals that answered all the questions. The sample is composed of 37% (82) male, 62% (137) female and 1% (1) other. The respondent's age is predominantly in the range 18-24 years old (51%); the different ranges are the following: between 25-34 years old (27%), 35-44 years old (10%), 45-54 years old (7%), 55-64 years old (3%) and >65 years old (2%). Regarding educational level, the largest portion of respondents, comprising 58% of the sample, hold a bachelor's degree. Following this, 23% possess a master's degree, 15% have a high school diploma or equivalent, 2% hold a professional degree, 1% have attained a doctoral degree, and 1% report having less than a high school education. There were 32 respondents (15% of the total sample) who work in the tourism sector, while 188 respondents (85% of the total sample) do not work in the tourism sector.

4.2 Assessment of the measurement model

During this phase, the quality of the constructs is assessed by examining the factor loadings within the measurement model, followed by confirming the reliability and validity of the constructs.

Table 2- Construct reliability and validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Automation Identification	0.827	0.827	0.897	0.743
Behavioral Intention	0.878	0.884	0.942	0.891
Cost Saving	0.804	0.806	0.884	0.717

Perception of Blockchain Benefits	0.876	0.877	0.942	0.890
Security	0.928	0.931	0.954	0.874

Table 2 shows that all research variables have a Cronbach alpha and a composite reliability value of more than 0.7, so it can be concluded that all variables have met the reliability and internal consistency criteria. Composite reliability values range from 0 to 1, where higher values signify greater reliability. Values below 0.60 indicate a lack of internal consistency reliability (Haji-Othman & Yusuff, 2022). This ensures that questions adequately represented the constructs without compromising the reliability and validity.

The reliability analysis reveals that the lowest Cronbach's α coefficient obtained was 0.717, which exceeds the commonly accepted baseline of 0.7, indicating satisfactory reliability across the variables tested.

Average Variance Extracted

The average variance extracted values for automation identification, behavioral intention, cost saving, perception of blockchain benefits and security are 0.743, 0.891, 0.717, 0.890 and 0.874, respectively. All these values exceed 0.500, demonstrating enough convergent validity (Hair et al., 2011). This suggests that the variables in the study consistently converge to measure the same underlying construct, reinforcing the reliability of the findings.

Variance Inflation Factor (VIF)

A variance inflation factor is a measure used to assess the extent of multicollinearity among variables.

As stated by Daoud (2017), a VIF value exceeding 5 is indicative of a high correlation among variables. In this analysis, however, all observed VIF values are below this threshold, suggesting that there is no significant multicollinearity present in the data.

Table 3 – Variance Inflation Factor

	VIF
Automated Identification -> Perception of Blockchain Benefits	2.374
Cost Saving -> Perception of Blockchain Benefits	1.946
Perception of Blockchain Benefits -> Behavioral Intention	1.000
Security -> Perception of Blockchain Benefits	1.753

Heterotrait-monotrait ratio (HTMT)

According to Teo et al. (2008), the recommended threshold for HTMT is 0.90 or lower. Analysis of the HTMT ratios in the table below shows that most ratios are lower than the specified threshold, indicating acceptable discriminant validity between the measured constructs.

Table 4-Heterotrait-monotrait ratio (HTMT)

	Automation Identification	**Behavioral Intention**	**Cost Saving**	**Perception of Blockchain Benefits**	**Security**
Automation Identification					
Behavioral Intention	0.790				
Cost Saving	0.842	0.755			
Perception of Blockchain Benefits	0.819	0.805	0.827		
Security	0.733	0.668	0.616	0.601	

As per the criterion established by Fornell and Larcker (1981), discriminant validity is established when the square of the average variance extracted (AVE) for a construct exceeds its correlation with all other constructs (Hair et al., 2011). Table 5 illustrates that the square root of the AVE for each construct is greater than its correlation with other constructs. This robustly affirms the presence of discriminant validity in the study.

Table 5-Fornell-Larcker criterion

	Automation Identification	**Behavioral Intention**	**Cost Saving**	**Perception of Blockchain Benefits**	**Security**
Automation Identification	0.862				
Behavioral Intention	0.673	0.944			
Cost Saving	0.687	0.633	0.847		

Perception of Blockchain Benefits	0.698	0.708	0.697	0.943	
Security	0.643	0.605	0.534	0.544	0.935

Outer Weights

Outer weights are used to measure the relationship between the latent variables and their respective indicators. It is important to analyze the Mean, STDEV, T statistics, and P values; if the p-value is less than 0,05, the statement is retained. All the variables below have a p-value inferior to 0,05, so the statement is maintained. All the t-statistics above 1,96 are significant for 95% confidence levels, indicating that the relationships being tested in the model are statistically significant (Winship & Zhuo, 2020) (Appendix C). It is crucial to examine the confidence intervals bias corrected for any discrepancies. If no values are zero in the 2.5% and 97.5% columns, the variables and the statements are maintained (Appendix D). This analysis confirms that the selected indicators effectively measure their intended constructs, providing a robust basis for further research and analysis in the context of this study.

Outer Loadings

The outer loadings and associated T-statistics and p-values indicate that all the indicators are highly reliable and statistically significant in measuring their respective constructs. This suggests a well-validated measurement model, providing a solid foundation for further analysis in the study. The consistently high loadings (above 0.835) and significant T-statistics (all p-values = 0.000) across all constructs underscore the robustness and reliability of the measurement instruments used in this research (Appendix E).

The outer loading analysis shows that all items have loadings above 0.5, with their respective confidence intervals not crossing this threshold; it is evident that all items are valid indicators of their constructs. Therefore, retaining these items is crucial for maintaining the integrity and reliability of the measurement model. (Appendix F)

4.3 Structural Model Evaluation

This study used a second-order methodology to assess latent variables, incorporating dimensions and indicators. The goal was to analyze the Inner Model and conduct hypotheses testing. The bootstrapping technique, facilitated by SmartPLS 4.0 software, was employed, generating 5000 samples to enhance the robustness and reliability of the results.

In this phase, to examine the relationship between the exogenous latent variable and the endogenous latent variable, it is important to analyze the path coefficient value, T-

statistic value, and p-value using the bootstrapping procedure. Hair et al. (2011) use the bootstrap method to assess the significance of path coefficients in the structural model. Alternatively, it can rely on the traditional p-value criterion (<0.05).

Path coefficients serve as indicators of the strength and direction of relationships between variables in structural models. The algorithm generates standardized coefficients, typically ranging between -1 and +1, for each relationship in both the structural and measurement models. Path coefficients near +1 indicate a strong positive relationship, while those near -1 represent a strong negative relationship (Hair et al., 2017). When the estimated coefficients are closer to 0, the relationships are weaker, and values near 0 are generally not statistically significant (Hair et al., 2017).

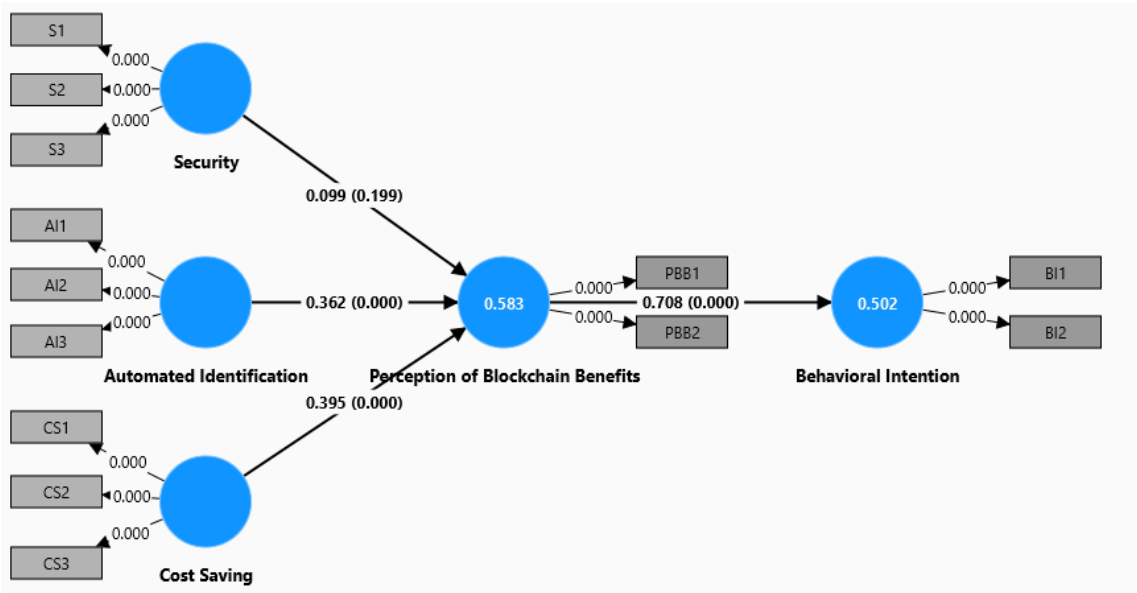

Figure 2-Model Path Coefficients

Figure 2 displays the latent variable values for P-values, Path coefficients and for R square. The values in parentheses represent p-values, which indicate the statistical significance of the relationships. Security and Perception of Blockchain Benefits has a p-value of 0.199 and path coefficient of 0.099, suggesting this relationship may not be statistically significant.

The R square values can be categorized as strong (R^2 = 0.750), moderate (R^2 = 0.500), or weak (R^2 = 0.250), all of which are considered valid ranges for the R^2 statistic (Hair et al., 2011). In this context, the Perception of Blockchain Benefits demonstrates a moderate strength, with an R^2 value of 0.583 and behavioral intention also has a moderate value of 0.502. The perception of blockchain benefits variable can be explained by 58.3% by the exogenous variable (security, automation identification, and cost-saving). Meanwhile, 50.2% of the exogenous variable explains the behavioral intention variable (Perception of Blockchain Benefits). Composite reliability reflects the combined

reliability of both indicators and latent variables. A variable is deemed reliable when its Cronbach's alpha value reaches or exceeds 0.7 (Taber, 2018).

In table 6, security influences behavioral intention, and security affects the perception of blockchain benefits, the t-statistic value for the items is below 1.96. In conclusion, the hypotheses are rejected (Winship & Zhuo, 2020).

Table 6- Total Effect: Confidence Intervals

	Original sample (O)	**Sample mean (M)**	**Standard deviation (STDEV)**	**T-Statistics**	**P-Values**	**Decision**
Automation Identification-> Behavioral Intention	0.257	0.259	0.055	4.646	0.000	Supported
Automation Identification-> Perception of Blockchain Benefits	0.362	0.366	0.073	4.969	0.000	Supported
Cost Saving -> Behavioral Intention	0.280	0.279	0.047	5.960	0.000	Supported
Cost Saving-> Perception of Blockchain Benefits	0.395	0.397	0.069	5.719	0.000	Supported
Perception of Blockchain Benefits-> Behavioral Intention	0.708	0.706	0.056	12.717	0.000	Supported
Security -> Behavioral Intention	0.070	0.071	0.058	1.210	**0.226**	**Not Supported**
Security -> Perception of Blockchain Benefits	0.099	0.097	0.077	1.284	**0.199**	**Not Supported**

Outlined below are the direct effects of the constructs, highlighting the influence one construct exerts on another without considering the impact of the mediating variable.

Security and Perception of Blockchain Benefits: Likewise, the correlation between Security and Perception of Blockchain Benefits demonstrates a slight positive tendency (coefficient: 0.099) yet lacks statistical significance according to the p-value. This suggests that security apprehensions may not strongly and substantially impact

perceptions of blockchain benefits. According to Esfahbodi et al. (2022), the path from data privacy security also does not show a significant effect, which makes blockchain's data protection capabilities appear less credible. There are several reasons for this perception. Users are concerned about malicious cybercriminals stealing information for financial gain. Additionally, they might be skeptical about blockchain's overall data protection capabilities, associating the technology with hacking attacks and cryptocurrency fraud.

Automation Identification and Perception of Blockchain Benefits: The relationship here is notably strong (coefficient: 0.362), indicating that as Automation Identification increases, so does the perception of blockchain benefits. This implies that automation positively influences perceptions of blockchain technology.

Cost Saving and Perception of Blockchain Benefits: The significant correlation (coefficient: 0.395) between Cost Saving and Perception of Blockchain Benefits highlights a strong relationship. It suggests that clients who perceive substantial cost-saving advantages associated with blockchain technology also tend to harbor a more positive overall perception of blockchain. The perception of cost-saving benefits appears to be intricately intertwined with the broader perception of blockchain technology's efficacy and utility.

Perception of Blockchain Benefits and Behavioral Intention: A strong positive relationship (coefficient: 0.708) exists between Perception of Blockchain Benefits and Behavioral Intention. This suggests that a positive perception of blockchain benefits significantly influences behavioral intention, a strong motivational factor for blockchain adoption.

Below are the total effects of the constructs, encompassing both direct influences and the indirect effects mediated through the perception of blockchain benefits.

Security and Behavioral Intention: Despite observing a slight positive correlation (coefficient: 0.070) between Security and Behavioral Intention, it's crucial to note that this relationship lacks statistical significance based on the p-value. This implies that while there is a tendency for security considerations to influence Behavioral Intention positively, this influence may not be substantial or reliably detected within the study context. In other words, the data suggests that participants' concerns regarding security may not significantly influence their intentions toward adopting blockchain technology in the tourism and hospitality sector. This finding challenges the assumption that security concerns are a primary driver of behavioral decisions in this domain. However, it also highlights the need for further investigation into the specific factors influencing behavioral intention regarding blockchain adoption within this industry. Such research could provide valuable insights for businesses and policymakers aiming to promote the uptake of blockchain technology.

Cost Saving and Behavioral Intention: As observed through client responses, the relationship between Cost Saving and Behavioral Intention suggests a notable correlation (coefficient: 0.280). This indicates a moderate positive association between the perceived cost-saving benefits of blockchain adoption and respondents' intention to engage with such technology. Essentially, clients' inclination to utilize this technology increases as they perceive more significant potential cost savings linked with blockchain implementation in the tourism and hospitality sector.

Automation Identification and Behavioral Intention: The analysis shows a moderately positive relationship (coefficient: 0.257), indicating that as automated identification increases, Behavioral Intention also tends to increase. However, it's important to note that this effect is mediated through the perception of blockchain benefits, rather than being a direct relationship. This suggests that the influence of Automation Identification on Behavioral Intention is shaped by how individuals perceive the advantages of blockchain technology, such as cost savings and security.

4.4 Discussion

In this section, the goal is to compare this study's findings with the results from previous research, examining how they align with or differ from existing literature.

The Hypotheses 1 suggests that security positively affects the perception of blockchain advantages, notwithstanding it was not supported by this study results and is consistent with the findings of another research (Esfahbodi et al., 2022). This is potentially a consequence of respondents being more likely to recognize the usefulness of reduced costs and automated identification, but they may be less aware of the advantages related to security. These results suggest there may be a lack of awareness regarding the specific ways blockchain enhances security in tourism. Additionally, security might be seen as a fundamental requirement rather than a unique benefit. If stakeholders assume that any effective technology must inherently be secure, they may not recognize the added value of blockchain's security features.

Automated identification technologies significantly improve staff efficiency by streamlining the process of verifying and processing guest information. This reduction in manual tasks leads to notable cost savings, primarily through lower administrative and operational expenses. The findings are aligned with Neo et al. (2014) study that suggests that effective and secure automated identification systems can enhance user trust and satisfaction, which in turn improves the perceived benefits of blockchain technology (Hypotheses 2).

In this research, the advantage of cost reduction brought by blockchain strongly influences users' perception of blockchain benefits (Hypotheses 3). This result aligns with other research findings, which suggest that the lower the costs blockchain provides to users, the more likely they are to perceive it as useful and beneficial (Catalini and

Gans,2020; Ullah et al., 2020). Customers who believe blockchain offers cost reductions may view it as a valuable tool, suggesting that perceived cost benefits can influence their perception of blockchain's advantages. Cost is a critical factor that hotel guests pay close attention to, as it directly reflects the effort and resources they will need to invest in their stay. The price of a hotel room not only affects the guests' budget but influences their perception of value, amenities, and overall experience. Guests consider the cost in relation to the quality of service, location, comfort, and additional offerings such as complimentary breakfast or free Wi-Fi. Therefore, hotels must carefully balance pricing to attract and retain guests while delivering a satisfactory experience that justifies the expense.

The study's findings underscore a significant relationship between the perception of blockchain benefits and customer behavioral intention, as demonstrated by the acceptance of Hypotheses 4 at a statistically significant level of $p < 0.05$. This suggests that users' recognition of the advantages offered by blockchain technology correlates with an increased propensity to utilize it, as highlighted by the research of Liu and Ye (2021). Expanding upon the preceding analysis, the overall results emphasize the pivotal influence of cost savings and automated identification in shaping respondents' perceptions of the practical value of blockchain technology. Consequently, this enhanced perception of value heightens their intention to integrate blockchain solutions within the tourism and hospitality domain, illustrating the profound impact of perceived benefits on adoption behaviors.

For hotel owners and managers, these results highlight the importance of understanding and communicating the benefits of blockchain technologies to both hotel staff and stakeholders, focusing on cost savings and operational improvements that result from automated identification. For consumers, the adoption of these technologies promises enhanced service experience, increased trust, and potential cost benefits. Although security does not significantly drive the adoption of these technologies, consumers can still benefit from the enhanced security features of blockchain, such as secure payments and safe data handling. Both parties stand to gain significantly from the strategic implementation of these technological advancements as they do not only improve hotel operations but also elevate guest experience.

There is a lack of substantial real-world data and case studies showcasing the effectiveness of blockchain in the tourism sector, which restricts the depth of analysis and empirical evidence available. Blockchain technology is complex and technical, involving cryptographic principles, distributed networks, and consensus mechanisms. Explaining these concepts comprehensively in the thesis and in the questionnaire was challenging because the target audience consisted of people with different academic and professional backgrounds. Hence, overcoming the disparity between theoretical comprehension and real-world implementation poses a substantial obstacle in

thoroughly assessing the viability and uptake of blockchain technology within the tourism sector.

5. Conclusion

5.1 Research Contributions

Blockchain technology is an innovative advancement that will significantly transform the business models of various industries, including tourism. The study contributes to blockchain technology's theory and practice angles in the tourism and hospitality sector.

The results confirm that cost-saving and automated identification significantly influence the perception of blockchain benefits. Our empirical evidence shows no security impact on the perception of blockchain benefits. It's essential to note that security concerns may not significantly influence behavioral intention or the perception of blockchain benefits in this context. This suggests that while security remains an important consideration, it may not be a primary driver of blockchain adoption in the tourism and hospitality sector, at least based on the factors considered in this study.

This thesis adopts a client-centric approach in studying the adoption of blockchain technology within the tourism and hospitality sectors. Unlike existing studies that primarily focus on stakeholders and managers, this approach prioritizes understanding the behaviors, and perceptions of clients towards blockchain technology. This unique perspective not only enriches the research landscape but also offers valuable insights that can drive innovation and differentiation in the industry.

5.2 Managerial Implication

The managerial applications of blockchain technology in the tourism industry offer numerous opportunities for improving hotel operations. By adopting blockchain, hotel managers can streamline operations, reduce security concerns, decrease operational costs, enhance the speed and accuracy of services, and overall customer experience. Additionally, blockchain's application in automating identity verification can lead to a more seamless and efficient experience for travelers, improving customer satisfaction and loyalty. By recognizing the perceived benefits of blockchain, hotel managers and industry stakeholders can leverage this technology to improve operational efficiency and implement a more effective dynamic pricing strategy. Managers can optimize pricing models to respond quickly to market changes, maximizing revenue while maintaining competitive position. By implementing blockchain solutions, hotel managers can optimize internal operations while also positioning their hotels as innovators and leaders in delivering customer-focused services within the competitive tourism industry.

5.3 Limitations of the study and Future Research

The sample size was appropriate for the objectives of this study; however, future research must validate these findings using data from a broader range of samples. Given that the data was predominantly gathered from Portuguese users, this may impact the

generalizability of the results beyond this specific context. From a future research perspective, it would be interesting to extend the proposed approach by integrating other variables in the model. For instance, incorporating traveler behavior patterns and preferences for technology adoption of blockchain acceptance could provide deeper insights. Additionally, potential integrations could involve utilizing machine learning to provide personalized services, incorporating augmented reality to enhance customer engagement, and employing big data analytics to uncover insights and streamline operations. These solutions could offer a more comprehensive and innovative approach to addressing challenges in the tourism and hospitality industry.

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Appendix

Appendix A - Demographic Questionnaire

Demographic Question:	**Item**
Gender	Male Female Other
Age	18-24 years old 25-34 years old 35-44 years old 45-54 years old 55-64 years old >65 years old
Are you Portuguese?	Yes No
In which country do you live?	List of all countries.
What best describes your employment status over the last three months?	Working full-time Working part-time Unemployed and looking for work A homemaker or stay-at-home parent Student Retired Other
Education Level	Less than high school High school diploma or equivalent (e.g., GED) Bachelor's degree (e.g., BA, BS) Master's degree (e.g., MA, MS, MBA) Doctoral degree (e.g., PhD, EdD) Professional degree (e.g., MD, JD, DDS)
Do you work in the tourism sector?	Yes No

Appendix B- Questionnaire

Construct	Label	Measures	Adapted from
Security	S1	In a blockchain network, I feel that my private data remains secure and protected.	(Avdimiotis & Moschotoglou,2022)
	S2	The blockchain network ensures the security of transactions.	
	S3	I believe that the information provided by blockchain is genuine and truthful.	
Automated Identification	AI1	Using automated identification technologies would speed up the process of a blockchain-based hotel.	(Gan & Lau ,2023)
	AI2	Using automated identification would increase staff productivity in a blockchain-based hotel.	
	AI3	I would find automated identification useful in a blockchain-based hotel.	
Cost Saving	CS1	Blockchain technology in tourism can bypass intermediaries.	(Garg et al. 2021)
	CS2	Blockchain technology will reduce operational costs.	
	CS3	Through blockchain implementation in tourism, clients can expect reduced administrative costs.	
Perception Of Blockchain Benefits	PBB1	I find blockchain technology to be valuable for the tourism sector.	(Esfahbodi et al. 2022)
	PBB2	Utilizing blockchain enhances the performance of tourism sector operations.	
Behavioral Intention	BI1	I am willing to use automated identification systems in a blockchain-enabled hotel in the future.	(Chang et al. ,2022)
	BI2	I am willing to accept blockchain technology in the tourism sector.	

APPENDIX C- OUTER WEIGHTS

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics	P values
AI1 <- Automation Identification	0.380	0.379	0.018	20.838	0.000
AI2 <- Automation Identification	0.396	0.396	0.019	20.498	0.000
AI3 <- Automation Identification	0.385	0.386	0.023	16.671	0.000
BI1 <- Behavioral Intention	0.503	0.503	0.012	42.049	0.000
BI2 <- Behavioral Intention	0.556	0.557	0.016	33.931	0.000
CS1 <- Cost Saving	0.427	0.427	0.036	11.801	0.000
CS2 <- Cost Saving	0.379	0.379	0.021	18.363	0.000
CS3 <- Cost Saving	0.375	0.374	0.023	16.441	0.000
PBB1 <- Perception of Blockchain Benefits	0.521	0.521	0.010	54.375	0.000
PBB2 <- Perception of Blockchain Benefits	0.539	0.540	0.010	52.166	0.000
S1 <- Security	0.343	0.343	0.017	20.566	0.000
S2 <- Security	0.346	0.346	0.014	25.535	0.000
S3 <- Security	0.381	0.382	0.018	21.024	0.000

APPENDIX D -CONFIDENCE INTERVALS BIAS CORRECTED

	Original sample (O)	Sample mean (M)	Bias	2.5%	97.5%
AI1 <- Automation Identification	0.380	0.379	-0.000	0.345	0.417
AI2 <- Automation Identification	0.396	0.396	0.001	0.360	0.437
AI3 <- Automation Identification	0.385	0.386	0.001	0.348	0.437
BI1 <- Behavioral Intention	0.503	0.503	0.000	0.478	0.525
BI2 <- Behavioral Intention	0.556	0.557	0.000	0.530	0.595
CS1 <- Cost Saving	0.427	0.427	0.001	0.377	0.523
CS2 <- Cost Saving	0.379	0.379	-0.000	0.336	0.418
CS3 <- Cost Saving	0.375	0.374	-0.001	0.333	0.422

PBB1 <- Perception of Blockchain Benefits	0.521	0.521	0.001	0.502	0.540
PBB2 <- Perception of Blockchain Benefits	0.539	0.540	0.000	0.522	0.564
S1 <- Security	0.343	0.343	-0.000	0.309	0.374
S2 <- Security	0.346	0.346	-0.001	0.318	0.372
S3 <- Security	0.381	0.382	0.001	0.352	0.423

APPENDIX E- OUTER LOADINGS: ORIGINAL SAMPLE, SAMPLE MEAN, STANDART DEVIATION, T-STATISTICS, P-VALUE

	Original sample (O)	**Sample mean (M)**	**Standard deviation (STDEV)**	**T statistics**	**P values**
AI1 <- Automation Identification	0.857	0.855	0.026	33.102	0.000
AI2 <- Automation Identification	0.863	0.863	0.024	36.027	0.000
AI3 <- Automation Identification	0.866	0.865	0.020	43.167	0.000
BI1 <- Behavioral Intention	0.938	0.937	0.012	76.208	0.000
BI2 <- Behavioral Intention	0.950	0.950	0.008	125.296	0.000
CS1 <- Cost Saving	0.844	0.845	0.021	39.795	0.000
CS2 <- Cost Saving	0.861	0.860	0.026	33.458	0.000
CS3 <- Cost Saving	0.835	0.834	0.026	32.724	0.000
PBB1 <- Perception of Blockchain Benefits	0.941	0.941	0.011	88.359	0.000
PBB2 <- Perception of Blockchain Benefits	0.945	0.945	0.010	98.340	0.000
S1 <- Security	0.925	0.924	0.014	67.020	0.000
S2 <- Security	0.945	0.945	0.008	117.780	0.000
S3 <- Security	0.935	0.935	0.010	97.146	0.000

APPENDIX F -OUTER LOADING: CONFIDENCE INTERVALS BIAS CORRECTED

	Original sample (O)	Sample mean (M)	Bias	2.5%	97.5%
AI1 <- Automation Identification	0.857	0.855	-0.002	0.798	0.898
AI2 <- Automation Identification	0.863	0.863	-0.000	0.809	0.904
AI3 <- Automation Identification	0.866	0.865	-0.001	0.820	0.899
BI1 <- Behavioral Intention	0.938	0.937	-0.001	0.910	0.957
BI2 <- Behavioral Intention	0.950	0.950	-0.000	0.933	0.963
CS1 <- Cost Saving	0.844	0.845	0.001	0.795	0.881
CS2 <- Cost Saving	0.861	0.860	-0.001	0.801	0.902
CS3 <- Cost Saving	0.835	0.834	-0.001	0.773	0.876
PBB1 <- Perception of Blockchain Benefits	0.941	0.941	-0.001	0.916	0.959
PBB2 <- Perception of Blockchain Benefits	0.945	0.945	-0.001	0.923	0.962
S1 <- Security	0.925	0.924	-0.000	0.893	0.947
S2 <- Security	0.945	0.945	-0.001	0.927	0.958
S3 <- Security	0.935	0.935	0.000	0.912	0.951

APPENDIX G- ETHICS COMMITTEE REPORT

This is to certify that

Project No.: **DSCI2024-4-296261**

Project Title: **The Perception of Blockchain benefits in Tourism and Hospitality**

Principal Researcher: **Marta Antunes**

according to the regulations of the Ethics Committee of NOVA IMS and MagIC Research Center this project was considered to meet the requirements of the NOVA IMS Internal Review Board, being considered **APPROVED** on 5/1/2024.

It is the Principal Researcher's responsibility to ensure that all researchers and stakeholders associated with this project are aware of the conditions of approval and which documents have been approved.

The Principal Researcher is required to notify the Ethics Committee, via amendment or progress report, of

- Any significant change to the project and the reason for that change;
- Any unforeseen events or unexpected developments that merit notification;
- The inability of the Principal Researcher to continue in that role or any other change in research personnel involved in the project.

Lisbon, 5/1/2024

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