BACHELOR'S THESIS

Blockchain in the hospitality industry: Identifying main applications

Antonio Salamanca Fernández

Degree in Tourism

Faculty of Tourism

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Abstract

From an unknown point of view, it may seem that the hospitality industry and blockchain technology have nothing to do with each other, but nothing could be further from the truth. With each passing day, these two are more intertwined because the possibilities that this technology can offer in the hospitality sector are enormous. From completing processes faster and easier, to doing it in a more secure and private way. For this reason, more companies are betting on its introduction in their operations, not only in this industry, but in the vast majority of industries, especially in larger companies. However, not all of its aspects are perfect and they still have a lot of room for improvement because, in reality, it is a fairly new technology where much remains to be explored.

Resumen (Castellano)

Desde un punto de vista desconocido, puede parecer que la industria de la hospitalidad y la tecnología blockchain nada tienen que ver, pero nada más lejos de la realidad. Cada día que pasa, más se entrelazan estos dos pues las posibilidades que dicha tecnología puede ofrecer en el sector de la hospitalidad son enormes. Desde completar procesos de forma más rápida y fácil, a hacerlo de una forma más segura y privada. Por ello cada vez son más el número de empresas que apuestan por su introducción en sus operaciones, no solo en esta industria, sino en la gran mayoría de industrias, especialmente en aquellas empresas de más tamaño. Sin embargo, no todos sus aspectos son perfectos y aún tienen mucho margen de mejora pues, en realidad, es una tecnología bastante nueva donde queda mucho por explorar.

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1. Introduction

1.1.   Motivations and objectives

First, I have chosen this topic due to the fact that I have been using blockchain technology in some way for some time. More specifically, by the hand of NFT games, which obviously use Smart Contracts for their operation, as well as cryptocurrencies and others. Therefore, from the first moment I found it an interesting topic with potential.

In addition, even though it is true that I have been using the blockchain for a long time, I had not stopped to investigate deeply at any time, nor had I thought about other applications that could be given to it. I was curious and, what better opportunity to learn more than doing a Bachelor's Thesis where the subject is discussed firsthand.

If we add to this the fact that we live on an island where the hospitality industry is the main source of wealth, the reasons for choosing this topic become even more powerful.

It can be particularly useful to know the subject because we are in a region where its application is almost guaranteed and, thinking about my future, maybe it will give me some advantage when it comes to finding a job or any other business opportunity.

That said, the main objective of this work is to delve into the main applications of blockchain technology for the hospitality industry. First there will be a presentation, separately, to know what the hospitality industry is and what is the blockchain. Next, the two concepts will be intertwined by analyzing the applications themselves.

Both pros and cons will be seen and, also, it will be especially related to the tourism sector, essential on our own island, since it is the main economic engine that many of us can sustain from or that we are already doing. In addition, some real cases of its application will be observed, where it is possible to see more closely the applications that will have previously been explained.

With all of this, it is expected that a clear idea is explained of what blockchain technology is and how it can be used or is already being used in the hospitality sector.

1.2.   Literature review and methodology

To conduct this work, a wide variety of material has been consulted. Academic or comparable articles have been investigated, especially for the sections referring to the applications of blockchain technology. All of them will be correctly referenced in their respective section at the end of the work. Some of these have been: Blockchain technology for hospitality industry, by Khanna, Sah, Choudhury and Maheshwari; The blossoming of the blockchain, by Peck and Moore; The Impact of Blockchain Technology Adoption on Tourism Industry: A Systematic Literature Review, by Leonardo Rama, Adamashvili and Tricase; among others.

Reports such as the 2019 Global Blockchain Survey carried out by Deloitte have also been consulted, which primarily exposes specific data on the subject.

Other materials from which information has been extracted are news articles, especially for the section on some real cases, where examples of companies that have already applied blockchain technology have been reviewed. Furthermore, and for this same section, a review of a video on the YouTube platform has also been included, uploaded by TUI Group, which teaches us some of the blockchain applications in the tourism sector, especially related to its own corporation.

Next, an interview with an important person of Globalia Corporación Empresarial was made. He was asked questions relating the introduction of the blockchain within their corporation and this was later analyzed in more detail. Finally, in Exhibit I, you will be able to see further data in the form of graphs extracted from Deloitte's 2019 Blockchain Survey. Although the data is from said work, al the graphs are self-made.

2. What is the hospitality industry and the blockchain?
2.1. The hospitality industry

The hospitality industry is an essential sector in the global economy, encompassing a wide range of businesses that provide accommodation, food, and entertainment services to consumers. This industry ranges from small local establishments to large international chains of hotels, restaurants, bars, casinos, convention centers, theme parks and cruise ships.

Tourism is one of the main drivers of the hospitality industry, as many people travel to explore new cultures, enjoy vacations, attend events, and conduct business. Therefore, accommodation and food services are necessary to meet the needs of tourists around the world.

The hospitality industry is an important and growing sector in the global economy. It provides essential services for tourists and travelers, and offers employment opportunities in a variety of areas, from cooking and cleaning to management and marketing. This is key to economic growth, promoting tourism and creating memorable experiences for consumers.

It is especially relevant when it comes to economic growth. This industry generates a substantial number of jobs around the world, from customer service jobs to senior management jobs. According to the World Tourism Organization, tourism, and the hospitality industry account for 10.4% of global GDP, in addition to generating approximately 319 million jobs worldwide. Thus, it is easy and obvious to see how the hospitality industry is an important source of income for many countries. Tourists and travelers spend money on hotels, restaurants, bars, attractions, and other tourism activities, which in turn stimulates the local and national economy.

Finally, the hospitality industry encourages investment and infrastructure development. Hotels, restaurants, tourist attractions, and other businesses in the hospitality industry require strong infrastructure and basic services to operate effectively, such as transportation, water, and power systems, which also benefit local communities.

2.2. **The Blockchain**

On the other hand, we have the concept of blockchain technology. This is a technology that allows you to store and transfer information in a secure and decentralized manner. Essentially, it is a distributed and public database that records transactions between users in an immutable and transparent way.

This technology is based on a network of interconnected nodes that validate and verify each transaction before adding it to the blockchain. Each block contains information from multiple transactions and is linked to the previous block by a cryptographic hash, creating a chain of blocks that is difficult to tamper with.

The main advantage of blockchain technology is the security it provides. As each transaction is verified and validated by multiple nodes, it is extremely difficult to fake or manipulate. In addition, the decentralization and transparency of the technology make it resistant to hacker attacks and fraud, which makes it an attractive option for the transfer of valuable transactions and the management of sensitive data.

Today it is already used in a wide variety of applications such as cryptocurrency, smart contracts, electronic voting, property registration, identity management, and supply chain tracking.

Overall, blockchain technology has the potential to transform numerous industries and processes around the world, by providing a secure and decentralized way to store and transfer information.

We will focus on analyzing its applications and potential in the hospitality sector, including its pros and cons. Specifically, we will investigate three main applications:

- Reservation and payment management: Reservation and payment management is one of the primary areas in which this technology can be applied in the hospitality industry. Currently, intermediaries such as online travel agencies (OTAs) and booking platforms charge high commissions and can hold payments for several days. Blockchain allows the creation of a decentralized platform for the management of reservations and payments, eliminating intermediaries and reducing costs. Customers can make direct payments to service providers, increasing transparency and security in transactions.
- Data Security and Privacy: Data security and privacy are a major issue in the hospitality industry, as copious amounts of personal information are handled. Blockchain technology offers a solution to this problem by providing a secure and decentralized database. Customers can be assured that their personal data is protected and will not be shared with third parties without their consent.
- Supply Chain Management: Supply chain management is another area where this technology can be applied in the hospitality industry. Restaurants and hotels can use blockchain to trace the origin of the products, which guarantees the quality and safety of these. They can also use technology to track the transportation of products, which improves supply chain efficiency.

3. Management of reservations and payments

Reservation and payment management is a critical part of the hospitality industry. Businesses in the industry rely heavily on intermediaries such as online travel agencies (OTAs) and banks to process payments and manage reservations. However, these intermediaries charge high fees, hold payments for multiple days, and don't always provide a frictionless experience for customers. Blockchain technology can be a solution to these problems, allowing the creation of a decentralized platform for the management of reservations and payments.

In a blockchain system, data is stored in a decentralized database, which means there is no single point of failure and information is not found in just one place. Instead, the information is distributed to nodes throughout the network. When a transaction is made, a record is created on the blockchain that contains information about the transaction, including the amount of the transaction, the parties involved, and any other relevant information. This information is visible to all parties on the network, increasing transparency and reducing the possibility of fraud.

3.1. Elimination of intermediaries

The elimination of intermediaries is one of the main advantages of blockchain technology in the management of reservations and payments in the hotel industry. This is because it allows transactions to be made directly between the hotel and the client, without the need for intermediaries such as online travel agencies (OTAs) and banks.

OTAs are intermediaries that allow customers to search for and book hotel rooms online. However, these companies charge a commission for each reservation that is made through their platform. These commissions can vary between 10% and 30% of the room price, which can be expensive for hotels, especially for small and medium-sized businesses.

Additionally, OTAs can limit the ability of hotels to set their own prices and cancellation policies, which can be disadvantageous for hotels. With blockchain technology, hotels can set their own pricing and cancellation policies, giving them greater control over pricing and inventory management.

Eliminating the middleman can also improve the customer experience by providing a more direct booking and payment experience. When customers book directly with the hotel, they can communicate directly with the hotel to obtain additional information about their stay, request special services and receive personalized attention.

Additionally, by cutting out the middlemen, hotels can reduce the risk of booking and payment errors and delays. Blockchain technology can automate much of the booking and payment process, meaning that customers can book and pay for their stay online without the need to interact with an agent or intermediary. This reduces the workload for hotel employees and increases the efficiency of the reservation and payment processes in general.

3.2. Reduction of costs and transaction times

As briefly mentioned already, a major advantage of blockchain technology in managing reservations and payments in the hotel industry is its ability to reduce costs and transaction time. Traditional reservation and payment systems often involve multiple intermediaries, increasing the cost and time to process transactions.

For example, in a traditional payment system, when a customer makes a reservation online, multiple verifications and payment authorizations must be completed before the transaction can be completed. This may include verification of customer information, credit card verification, and payment authorization by the credit card issuing bank.

With blockchain technology, these verifications and authorizations can be automated and simplified, significantly reducing transaction processing time and costs. In addition, as said before, since it's decentralized, transactions can be made directly between the hotel and the client, which eliminates the need for intermediaries and further reduces transaction costs.

This technology can also reduce the costs of fraud and errors in the management of reservations and payments. With traditional reservation and payment systems, transactions can be vulnerable to human error and fraud, which can result in economic loss for the hotel. Blockchain technology uses cryptographic algorithms to ensure the security and integrity of transactions, which significantly reduces the risk of said fraud and errors.

On the other hand, its implementation can reduce currency exchange costs by allowing customers to pay in their own local currency. With traditional payment systems, customers may be forced to pay in a foreign currency and subject to foreign exchange fees and exchange rate fluctuations. With the blockchain, hotels can accept payments in different currencies and use it to automatically convert currencies to the currency of their choice, meaning lesser fees.

In conclusion, the elimination of intermediaries is one of the main advantages of blockchain technology in the management of reservations and payments in the hotel industry. By reducing costs, improving efficiency, and providing a more personalized booking and payment experience, blockchain technology can help hotels become more competitive and profitable in an increasingly competitive marketplace.

3.3. Blockchain challenges in reservation and payment management systems

Not everything is as simple as it seems and, obviously, there are some obstacles that must be overcome to implement the blockchain efficiently.

The integration of this technology into existing reservation and payment management systems in the hotel industry is one of the biggest challenges. Most reservation and payment management systems have been designed to work with traditional technologies, such as databases and centralized servers.

Integrating blockchain technology into these existing systems can be complicated and require significant restructuring of existing systems. In addition,

it can be difficult to convince reservation and payment management system providers to adopt it, as it can require a significant investment in time and resources.

Another related challenge is that many hotels use a variety of reservation and payment management systems from different providers, which can make it difficult to integrate it technology into all systems.

On the other hand, scalability is another major challenge facing the application of blockchain technology in reservation and payment management in the hotel industry. Currently, these networks have limitations in terms of the number of transactions that they can process in a certain period of time.

If a hotel receives a large number of reservations and payments in a brief period of time, the blockchain network may not be able to process all transactions efficiently. This may result in delays in confirming reservations and payments, which may negatively affect the customer experience.

Developers are working on solutions to improve it, such as implementing layer 2 solutions that process transactions outside of the main blockchain. However, there is still work to be done to improve the scalability and efficiency of this networks.

Another major challenge is regulation and regulatory compliance. Blockchain technology is still at an early stage of adoption in the hospitality industry, which means there is no clear regulation around its use.

Hotels must comply with applicable regulations and laws regarding the management of their customers' personal and financial data. Additionally, this technology, by its very nature, allows for a prominent level of privacy and anonymity, which can pose issues in terms of regulatory compliance.

They must ensure that the implementation of the blockchain complies with applicable regulations and laws and guarantees the privacy and security of their customers' personal and financial data. This may require the implementation of additional security measures, such as data encryption and user authentication.

Additionally, the adoption of blockchain technology in the management of reservations and payments depends to a considerable extent on the education and adoption of the user. Many customers may not be familiar with it, resulting in many concerns they may have about the privacy and security of their personal and financial data.

Hotels need to educate their customers about the benefits it can bring to everyone and how it can improve the security and efficiency of booking and payment management. This may include implementing marketing campaigns and training employees so they can respond to customer questions and concerns.

Furthermore, the adoption of this technology may depend on the availability of digital wallets and the ease of use of blockchain-based payment systems. Hotels need to ensure that customers have access to secure and easy-to-use digital wallets and that the payment experience is as easy and seamless as possible.

Thus, system developers and providers must work together to overcome these challenges and make blockchain technology an integral part of reservation and payment management in the hotel industry.

4. Security and data privacy

The blockchain can help the hospitality industry protect guest and staff information, reduce the risk of fraud, and improve the quality of services offered. Using it, hotels can create secure and immutable digital records that provide an efficient way to manage information and ensure data privacy and security.

4.1. Guest registration

Guest registration is a critical task in the hospitality industry, as it involves the collection and storage of sensitive personal and financial information from guests. Blockchain technology can improve the security and efficiency of guest registration in several ways:

This allows for a more secure and reliable identification of guests. Instead of relying on a manual process, the blockchain can enable automated guest authentication using private and public keys.

Such technology uses cryptographic algorithms to store data securely and immutably, which means that guest information is stored in blocks of data that are connected by a chain, making the data unalterable and impossible to tamper with without detection.

In addition, it makes guest records available in real time to all service providers. Records can be updated in real time to ensure information is accurate and up to date. This facilitates more efficient management of guest registration and check-in.

On the other hand, it allows guests to have greater control over their privacy since they can choose what information they want to share with service providers, which makes them maintain control over their personal and financial information.

Finally, since the blockchain can also help prevent fraud and spoofing, it makes it a lot more difficult for potential criminals to tamper with or falsify the data.

4.2. Protection of credit card information

The hospitality industry is one of the main targets for cybercriminals regarding credit card information, as guests' personal and financial data is stored on their systems. Blockchain technology can help protect guests' credit card information in a number of ways.

First, guests' credit card information can be encrypted. This encrypted data is, again, stored in multiple blocks of data, so the potential attackers will have a bigger difficulty accessing the credit card information without proper authorization, simply because not everything is in one place.

Second, it can also help prevent fraud in credit card transactions. Payments made with credit cards can be authenticated using private and public keys,

which makes it harder to falsify transactions. Additionally, blockchain technology allows credit card data to be stored securely and accessible to authorized service providers. This service providers then have access to the most recent and accurate information, which further reduces said risk of errors or fraud in transactions.

Similarly, guests can control who has access to their financial data and can revoke access at any time. This guest credit card information can be updated in on the blockchain at any time, so at any suspicion they may have of something not adding up, they can check it in order to solve it.

4.3. Supplier records

The hospitality industry often works with a wide variety of service providers such as caterers, housekeeping services, supply vendors, and many others. It is essential to have accurate records from these providers to ensure that the services are provided effectively and securely.

Blockchain technology can provide a secure and transparent platform to verify the identity and history of providers. For example, suppliers can be registered on a public or private blockchain, allowing buyers to see who they are and what they have done in the past, akin to a history. Thus, it can also be used to track the supply chain of suppliers allowing companies to verify that the products and services they are purchasing are produced and delivered in an ethical and sustainable manner.

On the other hand, it allows the management of smart contracts, which can improve the efficiency and security of the business transaction. These smart contracts, being digital agreements that are executed automatically when certain conditions are met, can reduce the risk of fraud and errors.

Finally, the blockchain can provide an immutable and secure record of transactions between suppliers and buyers. As in the previous point, this can help reduce the risk of errors and fraud, as well as provide an accurate and complete history of all transactions.

4.4. Identity management

And of course, similar to the situation of credit card information, identity management is a critical aspect in the hospitality industry, where the personal data of guests and employees must be managed in confidential manner. Blockchain technology can provide a secure and decentralized solution for managing it, both for customers and employees. In addition, it allows identity verification without the need for trusted intermediaries, such as banks or governments, meaning that users can provide proof of identity through the blockchain, and others can verify the information without the need for a central authority.

They can have control over their own identity information, and identity verification can be done without divulging personal information. They can also verify the identity information of other users and confirm their authenticity, which can help prevent the creation of false identities.

Finally, this technology can help companies comply with personal data protection regulations because, as we have already said, users have control over their own identity information, which allows greater compliance with privacy regulations. However, this would also need to be deeply explored by the governments, so that they can make laws and regulations for the matter.

4.5. Blockchain challenges in data security and privacy

One of the biggest issues with the blockchain in terms of security and privacy is the vulnerability of decentralized systems to "double spend" attacks. Double spending is a type of attack in which a user tries to spend the same digital assets twice. Although it is designed to prevent these types of attacks, there are situations where attackers can find loopholes and vulnerabilities to achieve their goals.

From a personal experience, I have seen this happen in some underdeveloped NFT games in which I have participated. Obviously, their budget is not the same as the one big companies could have, so errors like that may be more common, but it goes to show how it can happen.

Another security issue on the blockchain is the possibility of the network being attacked by a malicious majority, also known as a 51% attack. This type of attack occurs when a group of users controls the majority of the processing power in the blockchain network and can take control of the it. If this happens, attackers can manipulate the information stored on the blockchain and carry out fraudulent transactions.

The privacy of it can also be compromised due to the lack of anonymity in some implementations of the technology. Some blockchains allow anyone to view all transactions that have been made on the it, which can be a problem for those who want to keep their transactions private. Although there are solutions to address this problem, such as implementing masking techniques, these solutions can be expensive and difficult to implement on an existing blockchain.

In addition, smart contracts can also present security and privacy concerns if contracts are not written correctly or implemented incorrectly. They can be vulnerable to hacker attacks or human errors that could compromise the security of the blockchain network.

Lastly, its adoption in the hospitality industry can also present legal and regulatory issues. The implementation of blockchain technologies may be subject to various regulations and laws that may vary by jurisdiction. Providers of it may also face legal liability for misuse of the technology or for errors in the implementation of smart contracts. Therefore, it is important that companies in the hospitality industry are aware of the legal and regulatory issues associated with the adoption of blockchain technologies and take steps to comply with applicable laws and regulations and that governments, as said before, participate in helping with these new regulations in the new changing environment.

5. Supply chain management

Blockchain technology has emerged as an innovative and revolutionary solution to address some of the biggest issues facing the hospitality industry in managing its supply chain. In this sense, blockchain can improve operational efficiency, reduce costs, and improve the quality of service.

As mentioned in the previous section, the supply chain in the hospitality industry can be extraordinarily complex, since it involves a large number of suppliers, from food and beverage producers to logistics and transport companies. That means that supply chain management can be exceedingly difficult to track and control, resulting in errors, delays, and unnecessary costs. If you have ever worked, for instance, in a hotel, you know common it is.

Thus, through smart contracts, blockchain can provide an efficient means through management. Let us remember that smart contracts are essentially computer programs that are executed automatically when certain predefined conditions are met. This means that contracts can be used to automate processes and transactions, which can reduce administrative costs and improve the speed and accuracy of transactions.

In the hospitality industry, these smart contracts may be used to streamline the invoice approval process, verify compliance with service agreements and payments, as well as real-time asset and resource allocation and management, among many other things.

The blockchain can also help improve service quality in the hospitality industry by providing a platform for product quality and traceability management. For example, it can be used to track the origin and quality of food and beverages used in hotels and restaurants, helping to ensure that products are of high quality and meet the necessary health and safety standards. Basically, if something is not correct, such as expired food, we will know how and where it came from.

In summary, blockchain technology can significantly improve the supply chain management of the hospitality industry by creating a secure and transparent platform for data management, process and transaction automation, product and service traceability and improving operational efficiency.

5.1. Challenges and difficulties of the blockchain in supply chain management

Blockchain technology offers an innovative solution to improve hospitality industry supply chain management, but it also presents a number of challenges and issues that need to be addressed before its widespread adoption. These problems are remarkably similar to those we have already seen in previous sections but with some twists.

One of the main challenges in implementing blockchain in the supply chain is, again, the lack of standardization. The absence of common standards for its implementation can lead to difficulties for integration and interoperability between different supply chain systems. That can also make it difficult to assess the quality and authenticity of data stored on a blockchain, resulting in a delay in

the adoption of it in the supply chain of the hospitality industry. So, it's important to define some general standards to follow.

Another challenge that it faces in its implementation in the supply chain is the cost of implementation. The technology can be expensive due to the need to develop custom solutions for each case, even having to create a different one by type of provider with different conditions. In addition, it can also be expensive in terms of infrastructure resources and personnel for the implementation and maintenance of the nodes of the blockchain network. These costs can be a significant factor for businesses in the hospitality industry, especially those that are small to medium-sized because you would also need to train people in order to perform, as it is a fairly new technology.

Scalability, as we saw in the management of payments and reservations, is another problem that arises in the implementation of blockchain in the supply chain. As the number of transactions increases, network speeds may decrease and transaction costs may increase and, with the enormous number of providers that businesses in the industry have with large amounts of data being processed in real time, the issue becomes apparent. This could be a major obstacle that needs to be addressed before the total adoption of blockchain technology in the supply chain.

Lastly, the introduction of this technology in the hospitality industry supply chain can be a problem due to a lack of knowledge and understanding about how it works and its benefits. Lack of knowledge can make companies reluctant to adopt it because people are sometime afraid of changes, even if it can significantly improve supply chain management. So, it is important that companies in the hospitality industry are well informed about the blockchain and its supply chain applications so that they can make an informed decision about its adoption. It's also why big corporations with consultancies such as KPMG or Deloitte, have an own department dedicated to the it, as I saw it firsthand when doing work for KPMG.

6. The blockchain today

In 2019, Deloitte, one of the most renowned Big 4 consulting firms, published a report on the adoption of distributed ledger technology at the enterprise level. The survey was applied to companies in Brazil, Canada, China, Germany, Hong Kong, Israel, Luxembourg, Singapore, Switzerland, the United Arab Emirates, the United Kingdom, and the United States. In total, 1,386 representatives of companies with annual earnings between 500 million USD and 100 million USD were asked.

The 2019 report shows a 10% increase in the use of blockchain technology compared to the results obtained in the previous year's survey. Furthermore, the statistics reveal that 83% of respondents see compelling use cases for this technology in their organizations.

On the other hand, it revealed that, in addition to the financial sector, businesspeople linked to technology, life sciences, the media, telecommunications and government showed greater interest in said technology.

However, even though the momentum had been seen, the report does not indicate that it is translating into concrete action, as only 40% of companies were willing to invest $5 million or more in blockchain projects in the next 12 months.

Finally, the study also found that the vast majority of respondents (92%) belong to a blockchain consortium or plan to join one in the next 12 months, demonstrating a strong interest in the technology.

Also, the global blockchain market has been the subject of a 2021 study by Allied Market Research, which has projected its growth to the year 2027. According to this study, the market size was valued at $2.89 billion in 2019 and is expected to reach $137.29 billion by 2027, representing a 62.7% CAGR or compound annual growth rate per year from 2020 to 2027.

Although the pandemic had significantly affected the demand for blockchain distribution in various industries such as BFSI, manufacturing, retail, e-commerce, and healthcare, it has been noted that, with the recovery of the economy, the demand for it has also recovered.

6.1.   Some real cases

To counter the inconveniences they previously had arising from not quickly adapting to the Internet, TUI has decided to be a pioneer in the field of tourism and adopt blockchain technology to improve its position against its competitors. In the past, the multinational had lost an advantage over other companies such as Trivago, Expedia and Booking in certain aspects of the business.

The CEO of the TUI Group, Fritz Joussen, in 2017 already announced the implementation of blockchain technology in its reservation and payment system. The company was developing a project called BedSwap, which uses blockchain to keep real-time records of hotel inventories across Europe. This initiative would allow the creation of a joint database and would eliminate the incompleteness that currently exists between the different markets of the company.

In addition, TUI has integrated a revenue management system that allows the company to exchange beds between places with the highest demand. According to Joussen, the cloud-based customer relationship management platform, combined with the blockchain, will help generate half of the 10% annual profit that the chain envisions. Thus, TUI is committed to improving the efficiency of the company that allows it to remain at the forefront of the tourism industry.

On the other hand, we have Travala, which has created an innovative travel agency where users can plan, book, and earn AVA tokens. To get started, users access the Travala website, which functions like a traditional travel agency, with detailed information on available trips and advanced search capabilities. New users are rewarded with AVA tokens upon registration, while regular users are notified about the amount of tokens in their wallet and when they are running low.

Users can then start the reservation process, choosing between different payment options, including traditional money, AVA tokens or other

cryptocurrencies such as Bitcoin, Ethereum, Cardano, Binance Coin, Litecoin and more. The most attractive offers are reserved for those users who choose to pay with AVA tokens. Also, users can choose to pay for the entire reservation or only a part of it with said cryptocurrencies.

Once the trip is over, users can leave reviews about their experience, which are verified through the blockchain before being published and award a number of AVA tokens. In addition, tokens are also awarded for customer referrals and users are incentivized to work on their reputation on the platform as "guides". Users with the most votes as utility reviewers can receive more AVA tokens.

Travala's platform is built on three layers that form a comprehensive ecosystem. The first layer is the DApp, which functions as the platform's user interface and allows customers to browse offers and providers, complete reservations, and access the Travala wallet where AVA tokens are stored. The second layer is the protocol layer, which drives the underlying economic engine of the platform and supports the implementation of the NEP-5 smart contract standard. Every time a reservation is made, a new smart contract is created in this layer. Lastly, the consensus layer plays a key role in enabling the transfer of value on the platform, including economic transactions and reputation feedback. This is achieved through the use of proxy smart contracts, which validate the process and allow transfers to interested parties.

7. Interview with Mr. Pere Bru Serrano Torres

As my own research work, an interview has been conducted with Mr. Pere Bru Serrano Torres from Globalia Corporación Empresarial. Due to the fact that I have completed my university internships in the audit area of KPMG, I had the opportunity to participated in the team that audits Globalia and, thanks to this, it has been easier for me to carry out this interview since I used to attend the offices of Globalia every day in Llucmajor.

Mr. Serrano is not in charge of implementing blockchain technology, however he does have the responsibility of knowing all the company's operations for their accounting, which includes investments made in blockchain technology. For this reason, in addition to knowing the subject, he kindly took charge of obtaining the necessary information to carry out the interview. Also, although it is true that he could not give me exact numbers regarding how much they have invested or when they will implement it, for privacy reasons, it has definitely been very useful to see first-hand how a large company like Globalia is dealing with the issue.

So, I will present the questions asked and the textual answer that Mr. Pere Bru Serrano gave, first the original in Spanish and then the one translated into English.

7.1. In Spanish (original)

<u>¿Aplicáis la tecnología blockchain en algún área de negocio o estáis planteando hacerlo?</u>

Sí, la verdad es que estamos explorando y aplicando la tecnología blockchain en diferentes áreas de negocio. En particular, estamos enfocados en utilizarla en el ámbito de la logística y el transporte, donde creemos que puede proporcionar una mayor transparencia y eficiencia en la gestión de la cadena de suministro.

En ese sentido, estamos evaluando diferentes tipos de uso para la implementación de blockchain, como la trazabilidad de productos, la optimización de procesos de transporte y almacenamiento, y la gestión de contratos y pagos. También estamos explorando el uso de esta en otros ámbitos, como la gestión de identidad y el registro de propiedades, pero estos aún están en sus primeras fases de estudio.

<u>¿Y desde cuándo os planteáis su uso?</u>

Pues desde el departamento tecnológico se ha estado evaluando y explorando el uso de la tecnología blockchain desde hace ya varios años. Han estado siguiendo de cerca el desarrollo de esta tecnología y han analizado su potencial aplicación en nuestras áreas de negocio.

En particular, se ha observado cómo otras empresas y sectores la han utilizado, sobre todo en lo que se refiere a las ventajas y desafíos asociados a su implementación. A medida que hemos adquirido más conocimientos sobre la tecnología y sus aplicaciones, se ha comenzado a identificar casos de uso específicos en los que podría ser beneficioso aplicarla en nuestras operaciones, que son básicamente los que te he comentado antes.

Realmente tienes que pensar en lo competitivo que es el sector turístico y ya no te hablo de las Baleares, sino en general. Si no vamos renovando nuestros sistemas con las nuevas tendencias, nos podríamos quedar atrás fácilmente. Y créeme, en esta industria es mucho más fácil perder competitividad que ganarla.

<u>Por último, ¿me podrías comentar algunos de los desafíos o inconvenientes que os han surgido a la hora de estudiar su implementación?</u>

Claro. Uno de los principales desafíos ha sido la complejidad técnica asociada con la implementación de blockchain. Esta es relativamente nueva y aún no existe un consenso generalizado sobre las mejores prácticas para su implementación. Por lo tanto, ha requerido una gran cantidad de investigación y desarrollo para mirar integrarla con éxito en nuestras operaciones.

También, a la hora de hacer pruebas, hemos notado que el procesamiento de grandes cantidades de datos a través de una cadena de bloques puede ser lento y bastante costoso. Es algo en lo que aún a día de hoy estamos trabajando para conseguir un uso óptimo y fiable.

Y, por último, comentaría que la regulación y el marco legal para todo este tema de la blockchain aún se están desarrollando y no están completamente definidos. Por eso tenemos que ser realmente cuidadosos a la hora de implementarla, asegurándonos de cumplir con todas las leyes y regulaciones relevantes.

7.2. In English

Do you apply blockchain technology in any business area or are you considering doing so?

Yes, the truth is that we are exploring and applying blockchain technology in different business areas. In particular, we are focused on using it in the field of logistics and transportation, where we believe it can provide greater transparency and efficiency in supply chain management.

In this sense, we are evaluating different use cases for the implementation of blockchain, such as product traceability, optimization of transport and storage processes, and contract and payment management. We are also exploring the use of it in other areas, such as identity management and property registration, but these are still in their early study phases.

And since when do you consider using it?

Well, the technology department has been evaluating and exploring the use of blockchain technology for several years now. They have been closely following the development of this technology and have analyzed its potential application in our business areas.

In particular, it has been observed how other companies and sectors have used it, especially with regard to the advantages and challenges associated with its implementation. As we have acquired more knowledge about the technology and its applications, we have begun to identify specific use cases in which it could be beneficial to apply it in our operations, which are basically what I have mentioned before.

You really have to think about how competitive the tourism sector is and I'm not talking about the Balearic Islands anymore, but in general. If we are not renewing our systems with the new trends, we could easily fall behind. And believe me, in this industry it is much easier to lose competitiveness than to gain it.

Finally, could you tell me about some of the challenges or inconveniences that have arisen when studying its implementation?

Of course. One of the main challenges has been the technical complexity associated with blockchain implementation. This is relatively new and there is not yet a general consensus on the best practices for its implementation. Therefore, it has required a great deal of research and development to look at successfully integrating it into our operations.

Also, when testing, we have noticed that processing large amounts of data through a blockchain can be slow and quite expensive. It is something that we are still working on to this day in order to achieve optimal and reliable use.

And finally, I would comment that the regulation and legal framework for this whole blockchain issue is still being developed and is not fully defined. So, we have to be really careful when we finally implement it, making sure we comply with all the relevant laws and regulations.

7.3. Analysis

With this, I ended the interview and thanked him for his time, since it was quite a busy time of the year in his department.

The information provided on how Globalia Corporación Empresarial is exploring and applying blockchain technology in different business areas demonstrates a solid understanding of the technology and its potential impact on the company.

Analyzing the answers, we can see first-hand how the different applications that they are studying and working to implement are very consistent with those mentioned and explained in more detail earlier in the work. These are focused on the optimization of different areas of the business where the implementation of blockchain technology can make certain processes and tasks to be done much faster and in a clearer and easier way.

On the other hand, in the answers he gives us information about the challenges and obstacles that have been encountered during the implementation of blockchain, which indicates a practical knowledge and a realistic understanding of the technology and its application in the company.

The first, as will happen to the vast majority of companies that consider using it, is the fact that it is a relatively new concept, so there is no defined pattern or model of how to implement it efficiently. Secondly, he tells us that, in large processes, it sometimes has problems of being slow and costly. This clearly refers to the scalability problem that has been mentioned several times in this work. Finally, he has mentioned the difficulties when it comes to following a legal and regulatory framework, since there are pretty much none clearly defined at the moment.

To finish, I believe that this interview shows us that, if a company like Globalia is investigating the use of Blockchain technology, it is to be assumed that a large part of the companies are also doing it, at least those of a considerable size. For this reason, in my opinion, as more companies implement it, it is clear that the existing problems will be resolved or at least mitigated to a great extent, since there will already be models to follow, governments will establish legal frameworks, etc.

8. Conclusion

Blockchain technology, despite being a relatively new concept, is advancing in giant steps. More companies, especially large ones, are betting on investing in this because it can be really useful. In this work we have already seen its main utilities related to the management of reservations and payments, with security and privacy and with the management of the supply chain. Many of the advantages they include are related to improving the effectiveness and efficiency of operations, as well as making processes more precise and safer. However, these applications may only be the tip of the iceberg in terms of the potential of this technology.

Much remains to be researched and improved, as in the aspect of its transfer on a large scale without great costs or familiarizing the population with its use, but, without a doubt, it is a technology that will soon become an essential part of a

most companies, or at the very least the large ones. Therefore, those that do not include it in their processes within the company, will lose competitiveness compared to the others.

In a market as fierce as that of hospitality, this fact is especially relevant and something that cannot be afforded to ignore, especially since many of the blockchain processes of companies in this sector are those that, to this day, are already more developed than other or are developing. So why wouldn't they take advantage of it?

In fact, we have empirical evidence about it. Not only with the real cases exposed, but also with the first-hand knowledge through the interview with Mr. Serrano. He himself recognizes that, with how competitive the market is, they cannot afford to be left behind. Anything that can give an advantage must be fully explored and that is what they are doing.

Finally, and from a more personal opinion, blockchain technology is not only the future, but also the present. I believe that those companies that are pioneers in implementing it in their companies will not only enjoy the competitive advantage that it will bring them, but also the possibility of creating business with it. By this, I mean that they will also be able to sell said developed technology or models to follow for its effective use, so it is a great business opportunity, regardless of its application to the company itself.

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I would like to thank, first and for most, my family, which has been really supportive over the years. Without them I would not be here today, and I would not be the person I am.

Secondly, I cannot forget my close friends. We call ourselves ''Arreplegats'' and they have made these years super fun. When I was feeling down or stressed, I could always count on them in order to have some fun.

Also, I want to thank all the teachers I've had. Some I have liked more than other but all of them have given me knowledge that otherwise I could not have obtained and have also given me some enjoyable times and memories.

Lastly, I would of course like to thank Mr. Abel Ernesto Lucena Pimentel for leading such an interesting theme for the Bachelor's Thesis. When I emailed him to resolve some doubts for the thesis, he responded quickly and set up a meeting online to resolve them, which is something I really appreciate.

Me gustaría agradecer, primero de todo, a mi familia, pues ha me ha apoyado mucho durante los años. Sin ellos no estaría donde estoy hoy, y tampoco sería la persona que soy.

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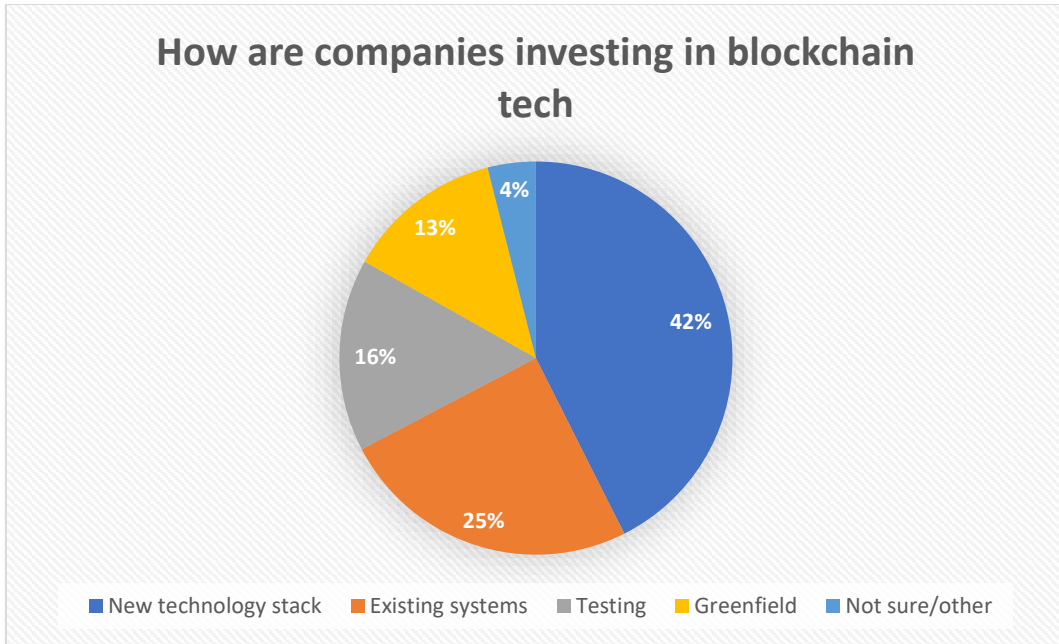
Por último, obviamente me gustaría agradecer al Señor Abel Ernesto Lucena Pimentel por liderar un tema tan interesante para el TFG. Cuando le mandé un email para resolver algunas dudas sobre este, respondió con rapidez y programó un encuentro online para resolverlas, algo que aprecié mucho.

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11.　　Exhibit I

How are companies investing in blockchain tech

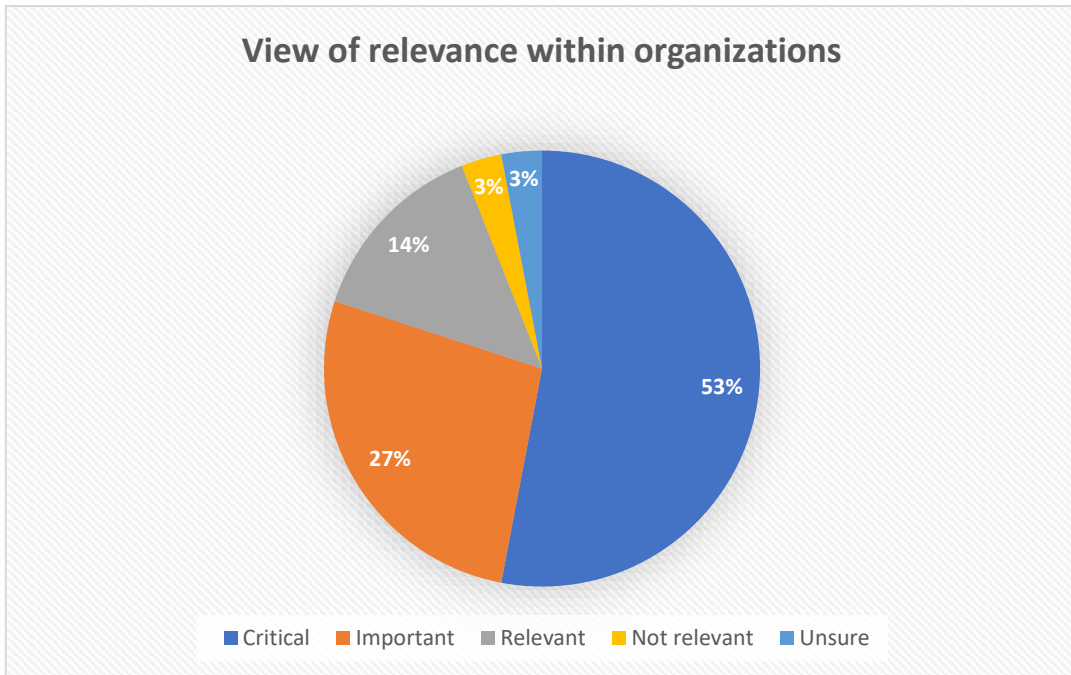- New technology stack — 42%
- Existing systems — 25%
- Testing — 16%
- Greenfield — 13%
- Not sure/other — 4%

Graphic 1. How business are investing in blockchain technology.

Source: Self-made with data from Deloitte's 2019 Blockchain Survey.

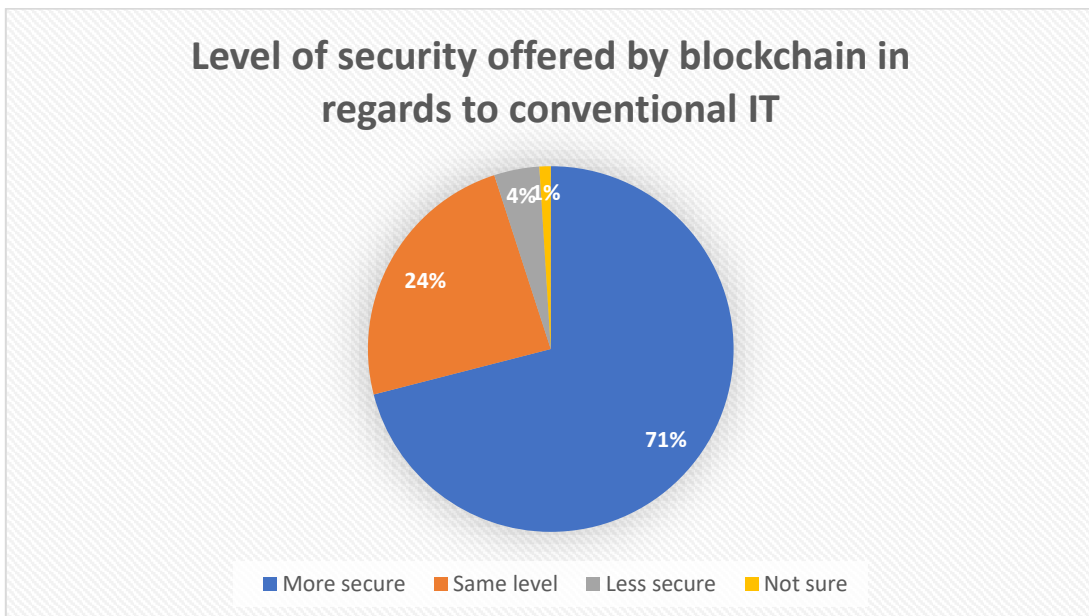**Blockhain models being implemented**
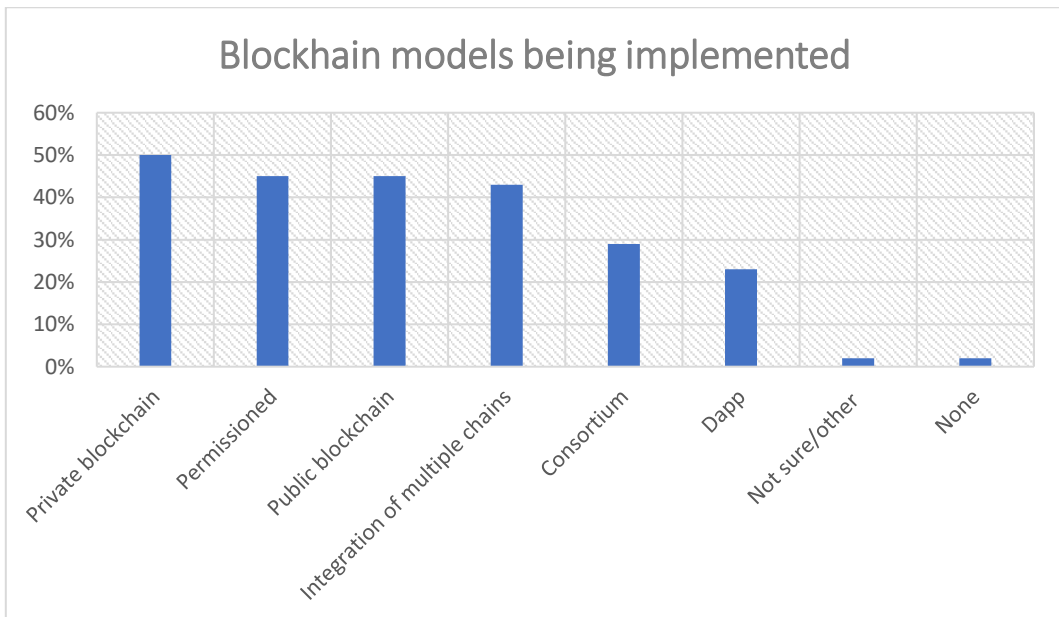
Graphic 2. Blockchain models being implemented by companies.

Source: Self-made with data from Deloitte's 2019 Blockchain Survey.

Note: Percentages surpass 100% because respondents were able to submit more than one answer.
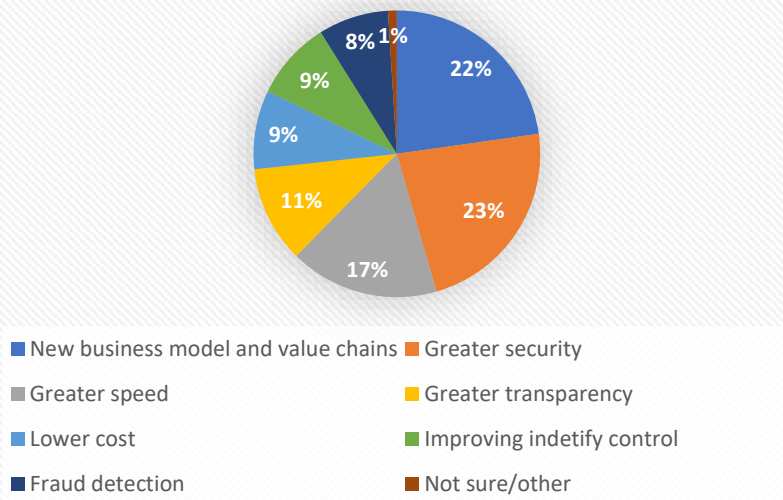
View of relevance within organizations

Critical ■ Important ■ Relevant ■ Not relevant ■ Unsure

Graphic 3. View of blockchain relevance within organizations.

Source: Self-made with data from Deloitte's 2019 Blockchain Survey.

Level of security offered by blockchain in regards to conventional IT

■ More secure ■ Same level ■ Less secure ■ Not sure

Graphic 4. Level of security offered by blockchain technology in comparison to conventional IT.

Source: Self-made with data from Deloitte's 2019 Blockchain Survey.

Blockchain benefits over existing systems

Legend:
- New business model and value chains
- Greater security
- Greater speed
- Greater transparency
- Lower cost
- Improving indetify control
- Fraud detection
- Not sure/other

Graphic 5. Blockchain benefits over conventional systems.

Source: Self-made with data from Deloitte's 2019 Blockchain Survey.