

The application of blockchain in tourism: use cases in the tourism value system

Hannes Thees^{1*}, Greta Erschbamer² and Harald Pechlaner³

¹ Catholic University Eichstaett-Ingolstadt, Chair of Tourism / Center for Entrepreneurship, Eichstaett-Ingolstadt, Germany. Pater-Philipp-Jeningen Platz 2, 85072 Eichstaett-Ingolstadt, Germany. E-Mail: Hannes.thees@ku.de

² Eurac Research, Center for Advanced Studies, Bolzano, Italy

³ Catholic University Eichstaett-Ingolstadt, Chair of Tourism / Center for Entrepreneurship. Eurac Research, Center for Advanced Studies, Bolzano, Italy

* Corresponding author

Abstract

The blockchain technology has witnessed growing interest since cryptocurrencies became popular in 2016. Not only through payment issues, but the tourism sector is also likely to be affected by the blockchain in terms of front- and back-stage processes. As the blockchain could replace traditional intermediaries, the structure of the tourism sector in the future has been discussed widely in the news. This article aims to conceptually examine the implications of blockchain along the value system in the tourism industry in order to identify its potential benefits. To address this, the methodology follows a content analysis of 175 news articles on the topic of blockchain and tourism, which are analysed through a qualitative news analysis and the method of GABEK®. The results imply blockchain applications along with the whole tourism value system, while it became apparent that traveling is streamlined through the transformation of time-intensive back-stage processes and thus offers extra value for travellers. Through its novelty in the academic discourse, the paper makes obstacles and regulations a subject of discussion, too.

Keywords: Blockchain, Use cases, Tourism Value Chain, Bitcoin, Technology Adoption

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Introduction

The phenomenon of blockchain technology (hereafter termed blockchain) has emerged in the last ten years from a discussion in the fields of decentralised computer networking and communication security. The blockchain is discussed as a key to innovation that appears to be a technical innovation that may disturb many systems over the next decade (Morabito, 2017). Although it is often used as a buzzword, it has quickly gained the attention of entrepreneurs, governments and financial institutions globally. In 2008, Satoshi Nakamoto, pseudonym of the so-called inventor of the concept of blockchain, wrote the whitepaper on Bitcoin and defined the phenomenon as a “*purely peer-to-peer version of electronic cash without going through a financial institution*” (Nakamoto, 2008). In 2015, The Economist called blockchain “*the next big thing*”, referring to the technological advancement and innovation that blockchain could bring to several areas (Economist, 2015). Already, blockchain has been discussed in relation to tourism, with headlines such as “*Blockchain Will Disrupt Expedia and Airbnb*” (Skift 2017), “*the awesome ways TUI uses blockchain to revolutionise the travel industry*” (Forbes 2018) or lately “*Blockchain gains ground in travel and tourism industry*” (TTGAsia 2020).

The introduction of blockchain into tourism raises several questions and problems concerning, for example, disruption of established business models, changing demand patterns, data management or the adoption of technology in small and medium enterprises (SMEs). The need for academic discussion on these issues was raised by Önder & Treblmeier (2018). This article aims to conceptually examine the first implications of blockchain along the value chain in the tourism industry in order to identify its potential benefits. The article poses the research question: How does blockchain technology change the traditional tourism value system? To address this, the concepts of the value chain, front- and back-stage services and technology adoption will be applied to explain the change of the single elements of the customer journey. The methodology follows a content analysis of 175 white papers, blogs and news articles on the topic of blockchain and tourism. The GABEK® method was used for qualitative analysis.

In the first section of the paper, we review the characteristics of blockchain and outline its implementation in some sectors (section 2). The theoretical part focuses on the tourism value system as this is key to a description of the changes caused by the technology (section 3). The methodology section will describe the analysis of white papers, blogs and news articles related to blockchain and tourism (section 4). The last section explains the main findings (section 5) and discusses critically possible implications for the future development of blockchain in tourism (section 6).

The blockchain in tourism: hype and application

When referring to blockchain, the focus is often on the cryptocurrency Bitcoin, as it is the most popular example of blockchain technology. Bitcoin’s leading role is supported by a google trend analysis that verifies search requests twenty times higher than for blockchain (Google trends, 2020). Additionally, a study shows that current research on blockchain is mostly focused on the system of the cryptocurrency Bitcoin rather than blockchain technology generally (Yli-Huumo *et al.*, 2016), although the understanding of blockchain offers access to plenty of possible applications.

Blockchain is a decentralised transaction and data management technology that was first developed for Bitcoin cryptocurrency. Since then, the interest in blockchain has increasingly grown because of the central attributes of the technology: it provides security, anonymity and data integrity without any third-party organisation in control of the transactions (Yli-Huumo *et al.*, 2016). Moreover, blockchain enables the creation of decentralised currencies (such as Bitcoin) and self-executing digital contracts (smart contracts). A blockchain is a form of digital ledger consisting of “blocks” of information. Each “block” contains a record of the transactions that occur within a network. In the case of

cryptocurrencies, these transactions are typically movements of currency in exchange for goods or services. Once a predetermined number of transactions are recorded, that “block” of information is added to the ledger, thus forming a “chain of blocks,” hence the term blockchain (White, 2017).

To sum up the technological characteristics of blockchain, Chen *et al.* (2018) outline four features: decentralisation (trust is built through mathematical methods rather than an authority), traceability (every transaction is traceable through the block information), immutability (once a transaction has been done, it can't be changed) and currency properties (blockchain and cryptocurrency are inseparable). Moreover, these features lead to advantages in the application of the technology such as reliability, trust, security and efficiency.

Although the subject of Bitcoin is divisive as it functions in a global market of anonymous transactions without any governmental control, the technology behind blockchain remains a vital invention, exceeding purely financial application (Crosby *et al.*, 2016). The researchers see applications in financial institutions such as banks for finance-related services, along with a vast amount of non-financial applications. Industries that rely on licensing and authentication of documents are likely to be affected: examples include health records, music licences, notarised documents, the food supply chain (Kairos Future, 2017a), insurances, land registry (Kairos Future, 2017b), etc. Although there is potential in many industries and branches, it is still uncertain how the phenomenon of blockchain will evolve (Yli-Huumo *et al.*, 2016).

In relation to the tourism industry, tourism companies, institutions and governments are confronted with the opportunities and challenges of blockchain: including the processing of transactions, the maintenance of customer databases and other fields of application. Tourism is generally based on individual services interlinked through autonomous service providers, therefore affecting the value chains of different companies within the overall system, and blockchain would need to address this. The tourism industry can be described as an industry driven by dominating players, but also including many SMEs and individual companies (Kallmünzer 2019). Moreover, technology in tourism has generated and shaped many companies operating as intermediaries (e.g. OTAs). With the rise of blockchain, this development could further generate decentralisation of services and result in a decline in the power of current intermediaries. The authors raise the assumption that the introduction of the blockchain probably changes several processes and transaction within tourism companies, but also influences the cooperation between companies.

Until now, there is little research in blockchain-related to tourism. As one of the first, Pilkington (2017) studied the fields of application in Moldova and identified cryptocurrencies, customer reviews, blockchain-based donations for heritage conservation, business model disintermediation and supply chain management. According to Willie (2019), blockchain technology has already been adopted in the hospitality industry for strategic and practical objectives, where most of all higher operational effectiveness, efficiencies and overall profitability will be increased. Also at the destination level, there are opportunities on how to adopt blockchain technology. Zupan Korze (2019) listed examples of implementation of blockchain technology and smart contracts and showed three main findings. First, he sees the tourism industry lagging behind other sectors in the adoption. Second, only a few innovators in the tourism industry are considering blockchain technology, mostly intending to increase service quality or to facilitate additional services. Third, some indicators show a possible disruptive potential of the technology on tourism businesses. Moreover, the findings of Kwok and Koh (2019) provide insights on how small island economies, such as the Caribbean and Aruba benefit from the adoption of blockchain technologies. The authors see opportunities in the increase of collaboration between

stakeholders through blockchain and a more explicitly regulated data management regarding privacy issues. Additionally, Mofokeng and Matima (2018) studied how technologies such as blockchain can be used in digital marketing by implementing virtual reality and show some examples on how the industry can positively be impacted by the implementation of virtual reality-based tourism.

The adoption of smart contracts plays a central role in the development of blockchain technology (Karagoz Zeren and Demirel 2020; Zupan Korze, 2019). Therefore, the utilisation of a smart contract system for financial payment systems in tourism enterprises will enable reliable transparent and accountable processes, where a high amount of data will be handled, whereas intermediary institutions and transfer fees will decrease rapidly.

The example of the framework of BloHost (Blockchain Enabled Smart Tourism and Hospitality Management) shows possible use cases in the tourism industry when it comes to heterogeneous payment gateways (Bodkhe *et al.*, 2019). The framework proposes a decentralised mechanism based on blockchain technology that allows individual travellers to interact with various stakeholders by using a single wallet identifier to perform payments.

Önder & Treiblmaier (2018) state the need to start an academic discussion on blockchain and tourism and therefore developed three propositions, intended to further refine and elaborate the topic in the academic community. The aim of this present article is, in part, to develop the third proposition of Önder and Teiblmaier (2018), focused on the level of disintermediation that blockchain could cause in tourism. Still, theoretical discourse on blockchain and tourism is lacking. The area needs further analysis in order to identify potential advantages. One of the current challenges of the tourism industry is its ability to adapt its business models to developing technology. Accompanied by tourism research, this process of adoption is often discussed concerning artificial intelligence (AI) and virtual reality (VR) (Ivanov& Webster 2019; Xiang 2018). Blockchain could be a further catalyser to follow up this debate and to find practical solutions to issues such as the introduction of efficient data management.

Theoretical background: technology adoption in the tourism value system

In order to explore the implications of blockchain for tourism, the concepts of the customer journey and the tourism value chain are used as a theoretical framework. As those have intersections and overlapping on a company and on a network level, they are summarised as “Tourism Value System”. This framework will be extended by the aspects of front- and back-stage activities in services. The objective is to sketch a model of the tourism value system, which could be enriched by the adoption of new technology, particularly blockchain applications. Supplementary theories and concepts are included to relate to human-computer interaction, adoption of Information and Communication Technology (ICT) by technology acceptance models and smart tourism.

The tourism value system: connecting customer journey and value chain

The tourism value system can be considered as a mixture of the value chain approach and the customer journey linking the services of more than two companies, where activities relate to front and back-stage. The customer journey presents the several steps of experience from a customer’s point of view. This relates closely to the touchpoints in multiple channels and media between service providers and customers, and are thus operated on the front-stage (Stickdorn and Schwarzenberger 2016, p. 262; Stickdorn and Zehrer 2009, p. 7; Lemon and Verhoef 2016, p. 69). Various attempts have been made to map the customer journey through blueprinting and customer input (Lemon and Verhoef 2016, p. 86). In tourism, the customer journey is linked to single companies on the one hand, such as mobility or accommodation providers, but on the other hand, it also relates to a sequence of activities during the

journey. Therefore, a journey is the result of a wide range of attractions, facilities and services of several providers (Stickdorn and Zehrer 2009, p. 7; Lane 2007; International Trade Centre and World Tourism Organization, 2015). The customer journey can also be used as an analytical framework in order to act close to the customer needs, starting from the planning stage, proceeding to the journey itself and finally including the post-stage of travel (Lane 2007, p. 248). Unlike geographically fixed customer journeys, the tourism sector is shaped by the mobility of people (Page 2011, p. 1), which results in a complex chain (Figure 1 – upper section).

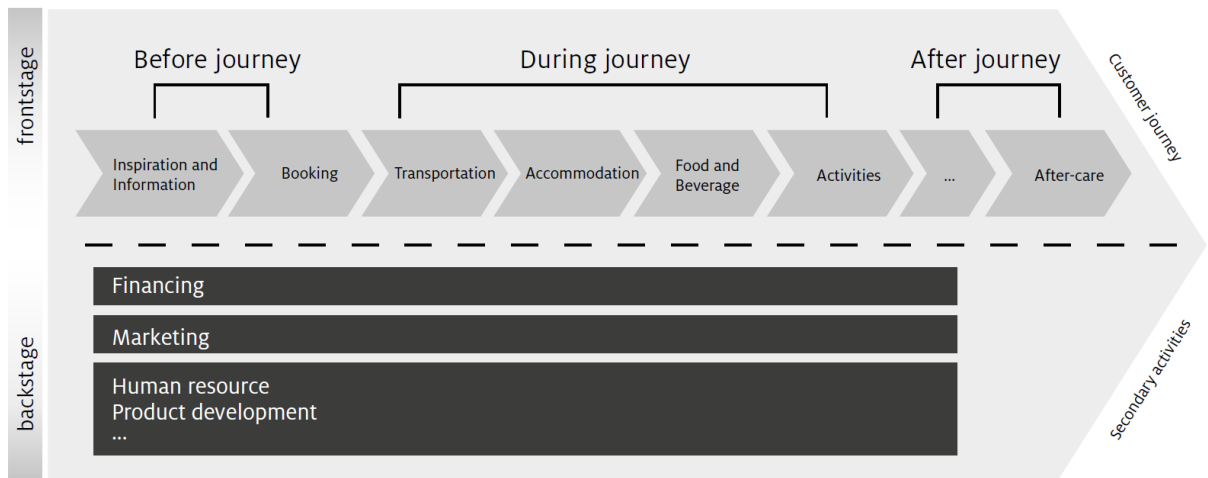


Figure 1. Value Chain in Tourism

Sources: Own elaboration, according to Porter (2010, p. 63); International Trade Centre and World Tourism Organization (2015); Pellegrin-Romeggio and Leszczyńska (2013, pp. 32–33).

As a supplementary element to the customer journey, the model of value chains, such as that introduced by Porter for manufacturing companies, can be the starting point of analysing a company's value creation. Those processes of value creation reflect consumer touchpoints, but also background processes that assist the customer journey (Stickdorn and Zehrer 2009, p. 9). Porter defines the value chain as an analytical tool that structures the activities of a company, helping it to understand the cost structure and the potentials of diversification. The value chain of a company is embedded in a value system, which includes upstream and downstream values, as well as outlays and purchasers (Porter 2000). This concept can be transferred to tourism. The necessity to transfer the model of the value chain to other industries and to adopt it at a company level has also been stated by Porter.

Several different service providers can be involved in offering a journey as a touristic product. Thus, it becomes evident that although independent, the single services are strongly interrelated and cooperation in tourism is necessary to create the whole experience of a journey, which includes many autonomous service providers in the 'production' (Damayanti *et al.* 2013, p. 141; Pechlaner *et al.* 2014, p. 5). Consequently, each service provider obtains resources from the previous value chain and transmits its resources and products to the next level (Zhang *et al.* 2009; Page 2011, p. 6; Pechlaner *et al.* 2014; Porter 2000). Network theories can also be utilised to analyse these connections. This collection of theories claims that the performance of a company depends on its resources in combination with the network resources (Tremblay 1998; Wilkinson and Young 2002, pp. 125–130; Pechlaner *et al.* 2014). Rising digitalisation and individualisation has turned tourism value chains into complex and dynamic networks (Pellegrin-Romeggio and Leszczyńska 2013, p. 28; Buhalis and Law 2008).

A useful distinction according to the value chain is introduced by the relationship between front- and back-stage operations. Besides the social aspects of the service theatre (Grove and Fisk 1992), modern services are shaped by virtual and technological elements in designing the customer's touchpoints (Glushko 2010). The service outcome emerges from the whole service system around the service encounter, which can be either front-stage (visible to the customer) or back-stage (not visible to the customer) (Glushko and Tabas 2009, p. 425; Teboul 2006). Although various terms are used within the tourism sector to describe this chain, such as travel chain, value chain, multiservice chain, they all include customer touchpoints like accommodation, food and beverage, transport or leisure activities along with back-stage activities like administration, marketing or product design (Figure 1) (Pellegrin-Romeggio and Leszczyńska 2013, pp. 32–33; Glushko 2010).

ICT adoption and the notion of smart tourism

As stated above, the tourism sector is based on a complex value system, in which ICT plays an increasing role. New technological features or innovations could likely affect not only the back-stage operations of businesses, but also the tourist's experience of the front-stage. Innovation in ICT, such as the internet or mobile applications, have had a significant effect on travel and commerce (Buhalis and Law 2008; Januszewska *et al.* 2015, p. 65; Ruiz-Molina *et al.* 2013, p. 99; Ali and J. Frew 2014, p. 9). The development of ICT applications often goes hand in hand with the rearrangement of the underlying operations and the customer touchpoints, but also initiates new value systems that businesses need to adapt to (Spencer *et al.* 2012, p. 1195). In the same way, Fesenmaier and Xiang (2017) stressed that tourism is not only a field of ICT application. Instead, technology is able to assign new meanings in tourism management (Xiang 2018, p. 149), as it applies to planning tools, online communication and also on-site technologies (Wang *et al.* 2016b, p. 563).

In tourism management, the ICT application can be divided into internal processes (e.g. hardware and software, business integrated processes) and external processes (e.g. e-marketing, online reviews). In particular, it has been argued that ICT positively affects internal efficiency through important savings in terms of time, communication costs and personnel expenses, higher reliability, accuracy and error reduction, as well as increases in productivity through the automation of tasks such as hotel check-in or bookings (Ruiz-Molina *et al.* 2013, p. 99).

In order to assess the implementation of new technologies, technology acceptance models can be consulted. Those models analyse the added value of ICT in business operations (Spencer *et al.* 2012, p. 1200). They can also address technology maturity, which helps to implement ICT in practice, for example with the help of indicators like networks, information systems, computing methodologies, and security and privacy (Wang *et al.* 2016a, p. 2; Poepplbuss *et al.* 2011). Those technology acceptance models address business characteristics, e.g. size, business age, rating category, type of corporation, technological environment and clusters, organisational action, management, motivation and strategic approaches towards ICT (Reino *et al.* 2014, p. 135; Spencer *et al.* 2012, p. 1200).

When implementing ICT in tourism, concepts like e-tourism or smart tourism are crucial. Smart tourism widened the view from the analysis of a single technology to a more multi-technology and multi-business approach. This aims to provide more relevant information, mobility or more enjoyable tourism experiences, both for customers and service providers (Gretzel *et al.* 2015, p. 181). Gretzel *et al.* (2015) also refer to the massive amounts of data, which help destinations to redefine their value propositions. Smart tourism is described "*as tourism supported by integrated efforts at a destination to collect and aggregate/harness data derived from physical infrastructure, social connections, government/organisational sources and human bodies/minds in combination with the use of advanced*

technologies to transform that data into on-site experiences and business value-propositions with a clear focus on efficiency, sustainability and experience enrichment” (Gretzel *et al.* 2015, p. 181).

In addition to a company-centric view of technology adoption, several research projects are currently being carried out in tourism to understand the customer’s reactions to current and future technologies such as artificial intelligence, service automation and robots, virtual reality and augmented reality (Ivanov & Webster 2019; Xiang 2018). Researchers and product developers are interested in smart solutions that serve tourists in an effective way (Xiang 2018, p. 149). In particular, the human-computer interaction, or the human interaction with data and machine intelligence cause obstacles while implementing such innovations (Werthner *et al.* 2015). Because of the pressure to implement new technology, companies need to change their value proposition and therefore, possibly their business model (Gretzel *et al.* 2015, p. 183).

To summarise these theoretical considerations, ICT innovation in tourism is likely to change several points in the tourism system, which unites a customer-centric view and a firms’ value creation. A further division into front- and back-stage activities is used to sketch a model of the tourism value system. Especially the customer touchpoints can be redefined and affected by the tourists’ motivations and claims. As in other cases, ICT and its applications forced the service providers to re-think their operations and to increase their overall performance (Sigala and Marinidis 2012). The well-established adaption models provide guidance for practice to implement technological advancements, but concrete blockchain adaption models remain rare (Wang *et al.*, 2016). As stressed by the previous considerations about smart tourism, tourists are demanding more and more digital services during their journey. This might be a further driver to the blockchain adaption on the supply side. Therefore, the tourism value system functions as a framework to define the possible impacts of the blockchain in this paper.

Methodology: content analysis of news on blockchain by GABEK®

This study investigated news coverage of the potential of blockchain in the tourism sector during 2017. A qualitative content analysis was used and is supported by the GABEK® method. First, theoretical considerations related to the content analysis are provided.

A content analysis records human communications using a form of coding that transforms raw data into a structured and standardised form (Kohlbacher 2006, p. 7; Babbie 2001, 304, 309) and to draw conclusions on several aspects of the communication (Mayring 2008, p. 13). Titscher *et al.* (2000, p. 55) mentioned that there is no homogenous understanding of this method, as it contains both quantitative and qualitative aspects. An early elaboration of content analysis was described by Berelson (1971, First Edition 1952). The development of content analysis is fundamentally connected to the development of mass media and international politics (Kohlbacher 2006, p. 8; Mayring 2008; Titscher *et al.* 2000, p. 55). As content analysis relates to all recorded communication, it can also be applied to news articles, e.g. in political discussions (Neuman *et al.* 1992; Semetko *et al.* 2000) or crisis management (An and Gower 2009). Recently, several research projects in the related field have tried to investigate further automation of content analysis, e.g. through artificial intelligence or machine learning (Flaounas *et al.* 2013, p. 103; Scharkow 2013; Sjøvaag and Stavelin 2012; Trilling and Jonkman 2018; van Dijk 1988). In particular, the increasing use of online portals as a means of discussing and exploring topics puts online-based texts in the spotlight.

This study processed news analysis using the GABEK® method (holistic handling of complexity) and the tool WinRelan® with its semi-automatic steps of content indexing. GABEK® is rooted in the procedures of Gestalt-building (Stumpf 1939). It performs as a research method that collects and systematises

unordered individual statements within their natural language processing, allowing all types of texts to be analysed within this setting. It has the advantage of being able to analyse the expressed experiences and knowledge of individuals in a community (Zelger 2000, p. 205, 215). The tool WinRelan® illustrates the sentences, the keywords and their linkages by producing network graphs and several lists of keywords, causalities and evaluations (Zelger 2000; Adler *et al.* 2012, p. 2). Based on interviewee's statements or sentences of any kind of text, the tool codes the keywords through the extraction of the main messages, evaluations and their perceived causes and effects (Pechlaner, Volgger 2012, pp. 929–932). The general steps of coding are sketched in Figure 2.

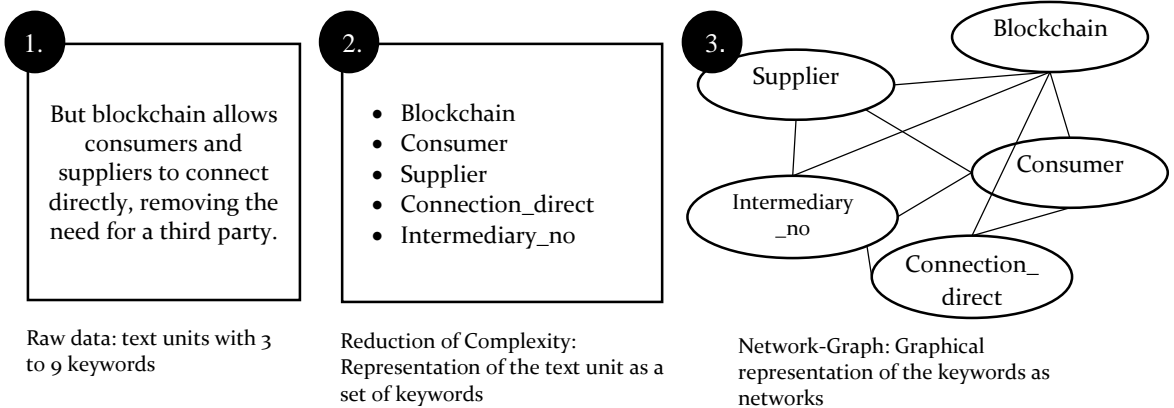


Figure 2. Steps of GABEK®-Analysis

Source: Own illustration

The conducted study applied a content analysis of news about blockchain and tourism using four steps:

1. The **topic** of the analysis followed the dimension of economic consequences (Neuman *et al.* 1992) and was broadly framed to the application of the blockchain in tourism and its side aspects.
2. **Medium category:** As scientific literature on blockchain in tourism is rare, the most recent information on the blockchain is available in news articles, which provide a convenient source of information for this research. The authors of those texts could be considered as experts or information carriers.
3. The study was not limited to a specific **medium**, such as a concrete newspaper or online platform, because content-related saturation was the central criteria. The most frequented platforms and databases related to blockchain, such as BTC, skift, coindesk, eyefortravel, forbes, t3n, springeronline were involved. Among the most important criteria during the text screening were the topic-related selection according to blockchain and tourism (including keywords like travel, hotel, tour operators, intermediaries, tourists, mobility etc), the publication date of 2017, a decent diversity and content-related saturation (e.g. legal and social aspects, case studies, research notes etc.), provability and transparency of the article's content. Using those criteria, 138 news articles, 30 whitepapers and seven press releases were selected.
4. Using the procedures for **sentence analysis within GABEK®**, the articles were automatically divided into sentences that provided from three up to nine keywords. Finally, 2,214 sentences were included in the project. Then, manual **coding** took place, which led to 2,450 keywords.

After processing those steps of analysis, the results were transferred to the previously sketched value system in tourism. In this way, GABEK® was used to navigate through the texts in order to search for the different steps on the value chain.

Results: blockchain use cases in the tourism value system

Using qualitative media analysis, the findings provide a decent database, out of which the following sections are presented: The project overview delivers a broad understanding of the issues discussed in the news articles and follows a more general procedure of GABEK®. Afterwards more detailed findings are presented by looking at the use cases of blockchain in tourism and the single stages along with the value system.

Project overview on Blockchain in tourism

To get an overview on the collected news, the most relevant keywords by nominations are: *Blockchain* (863), *travel and tourism* (238), *Bitcoin* (184), *Winding Tree* (111), *critic* (97), *payment* (93), *cooperation* (89), *potential* (87), *hotel* (81), *airline* (76) and *start-up* (64). Throughout these keywords, it can be proven that the research subject of investigating the potentials of Blockchain in travel and tourism has been met. In addition to that, about 120 news statements elaborate the relation between the *blockchain* and *travel and tourism*, while about 100 have used the keyword *potential* to discuss this relation.

The high number of nominations that represent the number of underlying text units between the keywords indicate a stable relationship within the news articles and offers ground for a textual summary. Based on the underlying text units at the lines between the keywords, an overall project description can be formulated:

Blockchain is the **disruptive technology** behind the hyped **Bitcoin**, with applications reaching **beyond banking and finance**. Several **projects** are starting to explore the **potential of blockchain in tourism**. **Understanding** blockchain's potential could inspire an industry-wide and **cross-industry collaboration to bring these business cases to life**. They could create new industry **standards**, improve the **holiday experience** and **reduce costs** across the travel industry. The advantages of blockchain are **decentralisation, transparency, reduction of fraud, security, and immutability**. Possible applications are in the fields of **identity management**, data exchange and management, **loyalty programs**, ratings, **payments**, insurance, facilitation of **bookings** and distribution, supply chain optimisation or **cooperation**. Critically discussed are privacy issues and the potential replacement of **intermediaries**. It is still **early days**, but as blockchain continues to develop, it is likely it will gradually make its way into existing industry applications.

The project overview can be further illustrated by an ontology on travel and tourism (Figure 3). An ontology shows the broadly recognised and stable opinions and beliefs of a community - in this case the news authors. This ontology is beneficial to identify features for improvement (Buber & Holzmüller 2007, p. 509). Based on the major keyword *travel and tourism*, the ontology of the news articles offers a hierarchy by several edge weights: the illustration is divided by the edge weight into the inner layer ($m > 15$), the middle layer ($m > 9$) and the outer layer ($m > 6$). The inner layer presents the most important keywords linked to *travel and tourism*: *Blockchain*, *potential* or *application*. It supports the hypothesis that *Winding Tree* is a leader in applying blockchain in tourism. The middle layer offers more applied keywords, like *booking*, *airlines*, *payment*, *loyalty programs* or *cooperation*. The outer layer shows weaker beliefs and opinions, but again more practical measures: *credit card*, *smart contracts*, *transaction*, *decentralised* or *platform*.

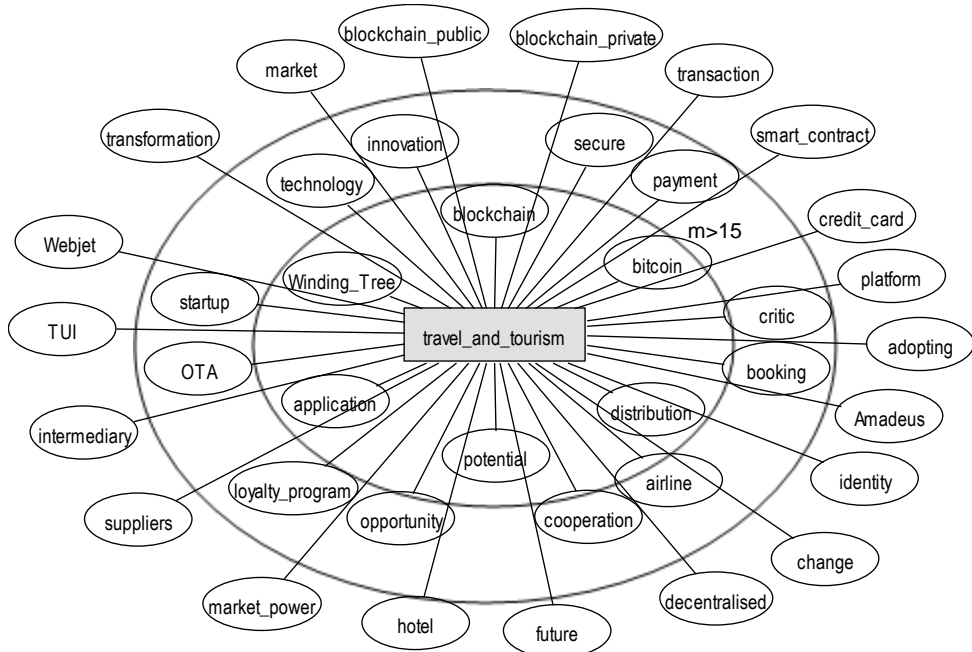


Figure 3. *Ontology on travel and tourism*

Source: Own elaboration

Structuring the blockchain-based value system

The use cases and the disruptions of the blockchain are drawn in the tourism value system (Figure 4), which is divided into primary and secondary activities. In tourism, the primary activities are also closely linked to the customer journey and recent applications and start-ups support all stages of the value chain. The little flags show applications of the blockchain at every stage of the customer journey, starting with the stage of inspiration and planning, proceeding with the journey itself and ending with aftercare. It is important to notice that several blockchain applications affect a number of stages. For this reason, those applications are illustrated as horizontal bars, e.g. automated identification with e-passports (#6). Further on, a number of those overarching applications are back-stage processes and are thus secondary activities (especially #6 and #7). Clearly defined as secondary activities are automated contracts, networking or financing. Nevertheless, many applications also have an indirect impact by streamlining the customer touchpoints and interaction on the front-stage, although the applications are often typical back-stage processes like payment and tracking. Thus, the lines between front- and back-stage are blurred. The contribution of blockchain in the tourism value system is predominantly given by streamlining front- and backstage processes, which are described in more detail afterwards.

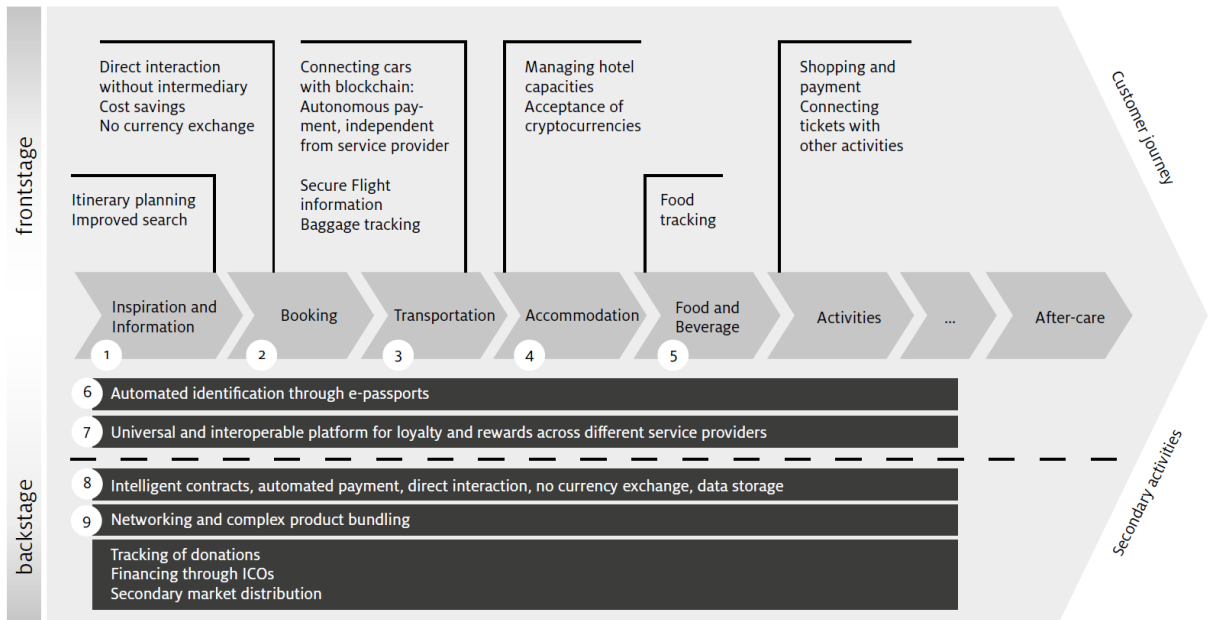


Figure 4. Use cases of blockchain in tourism

Source: Own elaboration

Description of affected stages in the value system

The potentials and use cases of the blockchain can be described at every stage of the tourism value system. An extensive database contains all information about recent activities on the value system, linked keywords and text units within the GABEK[®]-analysis and a description of potential innovations using blockchain. The following description holds information on the opportunities and challenges of blockchain at a certain stage of the value system, as well as a weakness of the current system, which is addressed by the blockchain, plus prospects about the customer value or the influence on the industry. The following description of stages in the value system is a selection of stages, which undergo a significant change through blockchain. We have selected stages from the customer journey, as well as backstage processes.

1) Inspiration and information

Forecasts have been made as to how blockchain could shape the first stage of the customer journey in relation to Itinerary planning, automatization and improved search algorithms. Blockchain creates an **opportunity** to develop an efficient and cheap way of automated assistance to inform, plan and book a trip. Especially relevant to the fragmented services in tourism, large datasets with information about ratings, experiences, evaluation or trip data are seldom accessible for travellers, constituting the **current weaknesses** at this stage. The introduction of blockchain could **influence** and change open access to that information and provide optimal planning of the trip concerning previous data. Further blockchain applications that may increase the **customer value** at this stage are real-time availability of rooms or flights and automated booking.

2) Booking

Within **forecasts**, the booking process is expected to be changed significantly by blockchain, as it improves **current weaknesses**, such as currency risk, market power or the usage of outdated

technology in GDS. **Opportunity:** Through the use of smart contracts, automatisations of background processes could allow fast and secure booking. The application of a distributed database could have **influence** as it reduces the market power of the current GDS companies as intermediaries by empowering direct relations between traveller and service provider. Therefore, the **customer value** lies in front-stage processes that might become leaner and more consumer-oriented. The booking of flights, hotel rooms or packaged tours is also closely linked to currencies and payment, which could be simplified by the introduction of a few cryptocurrencies. **Questions** arise in current blockchain projects, which use private blockchains to secure their market control and hence reduce the strength of universal linkages of private blockchains.

3) Transportation

Real-time data processing and storage are addressed in the **forecasts** on blockchain and transportation. The **current weaknesses** of transportation data systems are the non-connectivity of several providers and the obstacles in allowing multi-modal transportation. Blockchain creates an **opportunity** to collect data on each node and to validate it. This system could **influence** a flexible organisation of flight times and delays. For car travel, it improves the connectivity of car rentals and sharing systems. Blockchain thus allows additional **customer value** in streamlining time management, identity management, automated payment for cars through IoT, or cross-border charging infrastructure for electric cars. The implementation of connected services is also a **question** of cooperation and consistent regulations in data management.

4) Accommodation

Forecasts highlight that the blockchain could “lead to a big change in how hoteliers record and sell their rooms” (statement Hq8). The **opportunity** to digitise the booking processes and capacity management on a blockchain-based platform is a huge step in outpacing the **current weaknesses** of this section, such as market domination by a few GDS and OTAs, outdated software for capacity management and inefficient transactions. The introduction of the blockchain in the accommodation sector will probably **influence** and force current software solutions to innovate technically. Against the background of back-stage processes, **customer value** occurs through real-time transactions and the introduction of applications that connect traveller’s data, like digital check-in and room keys, identity management, payment or loyalty programmes. Nevertheless, the main field of application is in distribution and capacity management, which could remove the need for an intermediary and thus provide real-time and secure information about prices and capacities to suit the requirements of service providers, tour operators and travellers. **Questions** arise as to whether a shift in market power will happen and how OTAs and GDS will react to those blockchain solutions.

5) Food and beverage

Forecasts suggest that the blockchain could improve food tracking. It provides an **opportunity** to collect information such as temperature and quality of goods, shipment and delivery dates and certifications at every stage of the value chain. This could be a solution to the **current weakness** of the food industry, which intends to increase customers’ trust through traceability. This probably **influences** the transparency and also allows restaurants to streamline their supply chain, to secure food safety and to increase the **customer value** by providing detailed information, e.g. “detailed history of their steaks - from when the cow was born to what it was eating before it was served on their dinner tables” (statement Ds5). These are still pilot projects that also highlight the **questions** of international cooperation and consistent regulations in the food industry.

6) Automated identification

It is **forecasted** that blockchain could save all traveller data once and make numerous registrations redundant. By the nature of travel, numerous identification and registration processes are necessary when booking and operating flights, hotel stays and cross-border trips. The **current weaknesses** of identification and registrations are that they are time-consuming and that they are needed at every stage of the customer journey. This creates the **opportunity** to implement a blockchain-based registration process that stores data such as biometrics, and tracks travellers' bookings, including cross-border trips. The introduction of automated identification probably **influences** back-stage processes at service providers and checkpoints due to their simplification. It could also increase **customer value**, as former front-stage processes could become back-stage activities and therefore allow more efficient and convenient travelling. For example, it would no longer be necessary to stop and register at every checkpoint. **Questions** occur especially about the storage of data and whether such sensitive personal data should be stored in a public blockchain. However, if a blockchain is established for such processes, it could indeed provide a trustworthy and immutable database.

7) Loyalty programs

Closely related to registration, **forecasts** expect that blockchain will simplify loyalty programmes. **Current weaknesses** of loyalty programmes are a high fragmentation of countless loyalty points, cards and earning systems. Blockchain probably provides an **opportunity** to offer universal platforms that could collect a mixture of loyalty points from hotels, flights and activities. Once more, blockchain allows real-time transaction or earning of points. This technological improvement may **influence** the current providers by changing the matter of who sets the rules and who controls loyalty systems. This raises the **customer value** by reducing the complexity of several loyalty systems and allowing the possibility of redeeming points flexibly. **Questions** arise about the willingness of service providers to develop and implement such a universal system.

8) Transactions, contracts and payment

As indicated on several stages of the customer journey, the optimisation of transactions lies at the heart of the **forecasts** about the strengths of the blockchain in tourism. The **current weaknesses** of today's computer systems mean that there are multiple exchanges of data between various agencies and multiple verification steps, which reduce the ability to have a single global system. Blockchain creates an **opportunity** to reduce the potential for fraud, to streamline processes and to pave the way for the implementation of the Internet of Things. Therefore, it will **influence** the organisation of control, as no single unit holds control in a distributed system, and it will probably change our understanding of data management. By anonymously storing all transactions and information, it could provide **customer value** with quicker payments and cost-efficient and traceable transactions. Through the complexity of computing, **questions** arise concerning the number of possible transactions and the high energy supply needed for computing.

9) Networking and bundling

Forecasts have also been made on the effects of cooperation and shared systems on back-stage processes. Blockchain offers an **opportunity** to develop universal systems, e.g. for booking and protocols for the Internet of Things. The complexity of the technology calls for cooperation between traditional tourism service providers and experts in blockchain to develop and to test their applications. This has been highlighted by the number of joint projects that have evolved in recent years. Besides cooperation in technological issues, blockchain may also **influence** the relations between tourism service providers themselves. Through smart contracts, automatism, capacity management and tracking, blockchain supports the bundling of journeys and reduces fraud. Besides, it possibly changes

the manifestation of trust, which could become a digital asset by applying blockchain as the so-called “single source of truth”. As a blockchain is a decentralised system, it also raises **questions** about the role of intermediaries.

Discussion: the future of blockchain in tourism

This paper conceptually examines the potential and implications of blockchain in the tourism industry and visualises the changes along with the tourism value system. The discussion highlights central elements within the research: (1) Value creation for customers on the front-stage, (2) value creation for businesses on the back-stage and the role of intermediaries, (3) regulation and framework conditions (Figure 5).

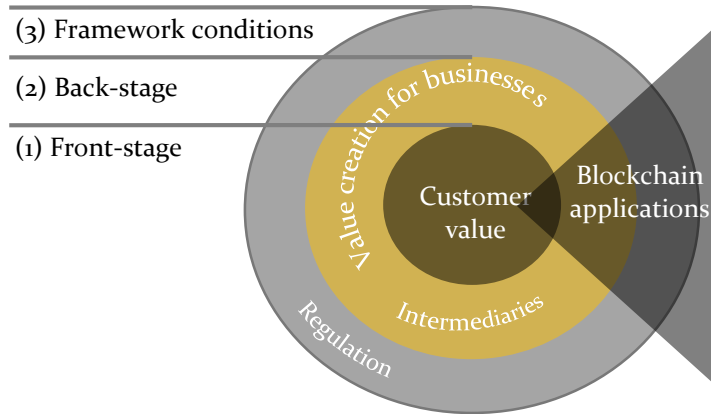


Figure 5. Structure of the discussion

Source: Own elaboration.

First, when talking about benefits and customer value generated along the customer journey, blockchain introduces various benefits. As showed in the literature, *value creation* is presented by connecting front- and back-stage operations. As modern services are shaped by virtual and technological elements in designing the customer’s touchpoints (Glushko 2010), blockchain enables the blurring of each touchpoint along the value chain so that customers do not necessarily experience them. This leads to a seamless travel booking experience for the customer and an increase in service quality (Zupan Korze 2019). Moreover, benefits such as tracking of food, luggage or even the customer themselves could lead to more simplified processes and could guarantee higher tracking security along the value chain. Compared to the notion of Smart Tourism (Gretzel *et al.* 2015, p. 181), blockchain appears less active. Rather, it predominantly provides open platforms, which also match trends of co-creation or peer-to-peer communities.

Second, its most significant impact can be seen in *back-stage processes* and their operational effectiveness (Wille 2019) such as ‘transactions’, ‘payments’, ‘booking’ and ‘data storage’. Whereas areas such as ‘inspiration and information’, ‘transportation’, ‘accommodation’ and ‘automated identification’ show many interfaces along the value chain. Some results show less evidence and implications, for example, areas such as ‘finance’, ‘insurance’ and ‘activities’, as these were not often mentioned during the screening. Probably, at this point, blockchain in combination with these areas was not often discussed and needs to be analysed further.

In relation to the *value system of businesses*, blockchain leads to benefits covering issues mostly related to cost-savings and real-time information. Moreover, it allows simplified handling of big data. All in all, blockchain is an enabler, characterised by abandoning current and hardened systems and the transfer of opportunities that result in the creation of new cooperation across businesses and branches, both within the tourism industry and across related branches such as security and information technology. In doing so, the tourism industry is not forced to react, but to support and proactively guide the transformation process. Additionally, the findings can contribute to the development of new business models when adopting blockchain (Filipova, 2018). Blockchain can also be seen as a driver for *cooperation* between companies and branches. Moreover, knowledge generation in companies is supported and needed in order to address the implications of blockchain along with the value chain.

Furthermore, the results show clear evidence for possible changes along the value chain. This leads contemporarily to a role change for *intermediaries* in the tourism industry. As the blockchain creates more equality and reduces the barriers of entry and exit for all intermediaries, there is a shift from global players towards a wide variety of stakeholders, including also smaller and medium-sized enterprises. This shift enables access for other (niche) players and automatically leads to the possibility of the disempowerment of big players in the tourism industry (e.g. GDS systems). The role of big players will diminish, as smaller and medium-sized companies will also be able to access data sources in regard to accommodation, booking, activities, etc. OTA's, for example, have to find an answer changes in the market structure, as power shifts from suppliers to consumers (Colombo & Baggio, 2017). The second wave of disintermediation could be triggered by the blockchain, which has the potential to remove "old" intermediaries such as OTAs and Global Distribution Systems (GDS) from the tourism supply chain. The case of blockchain in tourism could lead to a shift in market power, and change the role from big players (such as OTAs and GDS systems) from a leading position towards a position of intermediation between the players, as they are still in a key position for networking, marketing and guest attraction.

Third, the introduction of blockchain in tourism requires some *frame conditions* in order to develop in conformity with legal regulations. To achieve this continuous development, a form of governance needs to be introduced. At the same time, it must balance the innovative capabilities of the blockchain and the current legal framework. As the legal framework is often not given and is regulated very differently in each country, the realisation of an open blockchain does not seem achievable under the current conditions. To represent the interests of the blockchain companies and community, initial associations on blockchains have evolved, e.g. the "Blockchain Bundesverband" was founded in Germany. Until now, blockchain has been broadly perceived as an insecure transaction method, although some smaller case studies show its potential. Also, the analysis of news articles showed some concrete examples of how to use the technology, for example, with the introduction of automated identification of e-passports. Regulations and legal frameworks need to be elaborated in collaboration between countries as uniformly as possible. As blockchain aims to function on open platforms, these frameworks need to be introduced and developed with speed and with as much conformity as possible. Nevertheless, the ideal concept of the open blockchain is currently not realisable as although companies are adopting the idea of blockchain, in reality they are often limiting the open-source concept. This can be seen when tourism players introduce their own *private blockchain*, creating barriers and deciding who can join, whom they cooperate with, and, therefore, who can profit from this closed system. This results in private blockchains that do not meet the initial objective of blockchains, creating platforms that cannot fully avail of the advantages such as decentralisation, transparency, reduction of fraud, security and immutability.

Outlook

Will blockchain technology become and stay relevant for tourism? It is still uncertain in which way the implementation of blockchain will evolve (Yli-Huumo *et al.*, 2016). All the more the tourism industry seems lagging behind other sectors (Zupan Korze 2019). However, the disruptive potential is undoubted (Zupan Korze 2019). To take a more general perspective: The success of blockchain in tourism depends significantly on the overall development of the technology itself. To answer the question of future application, Wang *et al.* (2016, pp. 4-5) provide six conditions that define the potential of a blockchain solution without focusing on a certain sector:

- 1) multiple parties share data,
- 2) multiple parties update data,
- 3) requirement for verification,
- 4) intermediaries add cost and complexity,
- 5) interactions are time-sensitive and
- 6) transaction interaction (Wang *et al.* 2016a, pp. 4-5)

As those conditions are mostly relevant for tourism, the authors could envision a future relevance of blockchain in tourism. The underlying study therefore provides numerous use cases and future fields of application. One of the greatest challenges might be the implementation of those projects. Once the technology is relevant for a branch or a company, several steps of development need to be passed, as companies that don't adapt "*will lag and collapse as their success will depend on the strategic choices they make regarding the adoption of new technologies*" (Morabito 2017, p. 22). For example, Wang *et al.* (2016a) provide a step-by-step blockchain maturity model to facilitate its design and adoption by organisations. Technology maturity models or models for the adoption of technology in tourism have been discussed frequently throughout the last decade (section 3). Although some models proved their accuracy, blockchain surpasses many past innovations in technological complexity and extension on manifold branches.

Contribution to discourse and limitations

To provide a practical look at the potential of blockchain in tourism, the present study implemented a qualitative and explorative approach. It was designed to study and to better understand the implications of blockchain related to the tourism industry. Nonetheless, it has a number of limitations that should be noted and examined critically. The current discussion related to blockchain in the tourism sector seems to be very emotional. Current research on blockchain is limited to practical technological advancements, whereas its adoption in tourism has not been widely explored and the development in regard to blockchain is vivid. While blockchain is a hot topic in the current discussion about technology, many countries are doing very little about establishing its legal foundations. Each country is reacting differently also in terms of legal regulations and frame conditions, if there are any regulations at all. Also, in regard to possible applications in the tourism industry, the context conditions are changing rapidly. Concerning the current speed of transactions, Bitcoin processes fewer transactions than Visa per second, which leads to delays in processes.

Moreover, the study is limited by its methodological challenges: It should be recognised that the news-texts used are non-reactive and cannot be influenced or guided by the researcher's intentions. To provide relevance and purposeful content, the selection of texts undergoes several filters through the researcher's focus. Moreover, the socio-demographic background of the authors is not available, although the authors' name is published in the article. Finally, it cannot be said that every article is published by an expert, as some of the blog contributions were authored by leading blockchain

companies aligning their business models to the development of blockchain in the tourism industry. This could lead to a bias in the evaluation.

Further research

The study has an explorative character and could be further validated by the analysis of the numerous use cases within the tourism [block]chain. Above all, analysing a newly introduced subject such as blockchain technology in tourism is not easy or straightforward. Current research on use cases in tourism and blockchain in general are still at an early stage. The more benefits and opportunities blockchain technology is able to deliver to the tourism industry, the more research attention and willingness of implementation is warranted. This is why we propose future research about the logic of Figure 5 on:

- (1) Front-stage Research Recommendations
Blockchain-related travellers: do travellers request technological advancements and if so, what are the stages of technology advancements from a user's perspective?
- (2) Back-stage Research Recommendations
Perspective of service providers: which applications could be implemented from a realistic point of view, since current advancements favour private blockchains?
Analysis of first best-practice examples: how and to what extent do business models change and what are the implications in the tourism industry?
Intermediaries in tourism: how could the shift of market power from international lead companies to SMEs be manifested?
Cluster development and knowledge exchange: which forms of cooperation and knowledge generation need be advanced in order to enable the expansion of blockchain in the tourism industry?
- (3) Framework Conditions Research Recommendations
Identification: How could automated identification (e-passports) and data storage be developed in line with the current protection of data privacy – currently differing in every country – and contribute to innovation processes in tourism?

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