Cryptocurrency adoption in travel and tourism –
An exploratory study of Asia Pacific travelers

Abstract: Blockchain technologies are predicted to substantially transform the tourism industry. At present, cryptocurrencies are the most advanced application of public blockchains that promise benefits such as a universal means of payment and minimal fees through the removal of intermediaries. In the tourism industry, though many tourism vendors have been accepting cryptocurrencies and the potential of using cryptocurrencies in travel-related consumption has been intensively documented, existing knowledge about travelers' intention to use cryptocurrencies for payment purposes is limited. Traditional models do not account for the idiosyncrasies of cryptocurrencies and are therefore less appropriate to foster the understanding of travelers' adoption of travel-related payments. To fill this knowledge gap, an exploratory study was conducted with 161 travelers from the Asia-Pacific region who have previously consumed travel-related services with cryptocurrencies. Their previous usage experiences are analyzed and reported. Through harnessing the correspondence analysis, several technological contingency factors were identified, as well as positive and negative perceptual antecedents. Additionally, their levels of satisfaction and intention to re-use the technology in future trips were investigated. Based on these findings, several propositions are suggested for guiding future research on travelers' cryptocurrency adoption in the travel and tourism contexts.

Keywords: cryptocurrencies, blockchain, Bitcoin, technology adoption, contingency theory, correspondence analysis

Introduction

The globalization and digitization of travel and tourism are driving the demand for easy to use and cheap international transaction processes and payment systems. Tourists are beginning to discover that cryptocurrencies offer such opportunities - by simplifying cross-border transactions and overcoming the associated foreign currency exchange costs. However, there is still a dearth of knowledge regarding the factors and mechanisms affecting tourists' inclination to adopt cryptocurrencies for travel-related consumption.

In the year 2008, an individual or a group of software developers operating under the pseudonym 'Satoshi Nakamoto' found a way of avoiding the multiple spending of digital assets (i.e., double spending). This laid the foundation for Bitcoin, a digital currency that enables payment over the Internet without the intervention of intermediaries such as banks or credit card companies (Nakamoto, 2008). Bitcoin's open source client was released in January 2009 and initially attracted only limited attention outside dedicated circles of computer scientists and cryptographers. It was not until the mid-2010s that the economic potential of blockchain was fully recognized, which subsequently lead to far-reaching speculation about what can

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potentially be achieved with blockchain (Tapscott & Tapscott, 2016). Defined as 'a digital, decentralized, and distributed ledger in which transactions are logged and added in chronological order with the goal of creating permanent and tamper-proof records' (Treiblmaier, 2018, p. 547), blockchain is often used synonymously with distributed ledger technology, which is a broader concept that also includes technologies that do not follow a chain-like structure. In this paper, the common convention is followed and the term blockchain is used throughout, independent of the characteristics of the underlying technology. Most of the popular cryptocurrencies, such as Bitcoin, Ethereum, Litecoin, Dash, and Monero, make use of permissionless public blockchains that are open to anyone to participate in the creation and validation of transactions. As of November 2020, the cryptocurrency tracking website CoinMarketCap.com listed more than 3,700 cryptocurrencies. Bitcoin is by far the leading cryptocurrency in terms of total market capitalization (USD 250 billion). Another six, including Ethereum, Tether, XRP, Bitcoin Cash, Chainlink and Binance Coin, exceed a market capitalization of USD 4 billion respectively (CoinMarketCap, 2020).

At the end of 2017 the blockchain hype peaked with the rise of countless cryptocurrencies and the emergence of numerous Initial Coin Offerings, many of which were fraudulent and caused substantial loss among unsuspecting investors. This bubble negatively impacted the overall image of the blockchain, leading to speculation about whether the technology can make a concrete contribution to future business value generation (Kietzmann & Archer-Brown, 2019). However, the downfall of cryptocurrencies and blockchain have given way to a more differentiated perspective that calls for the identification and scrutiny of those use cases that can actually benefit from the application of a distributed ledger. In recent years, more blockchain-related studies were conducted and published in tourism and hospitality journals. For instance, some studies discuss the potential of blockchain, and especially cryptocurrencies, to foster innovative market structures and processes (Kwok & Koh, 2019). Some recent studies also posit that blockchain can work in conjunction with hospitality operations and even smart tourism frameworks (Filimonau & Naumova, 2020; Nam et al., 2019). Although much scholarly effort has been made, several researchers still argue that the tourism industry lags behind in the actual implementation of blockchain solutions (Kizildag et al., 2020).

Given that most blockchain-based applications only affect companies' backend processes and are not directly noticeable to final consumers, cryptocurrencies are presumably the single blockchain-based technology that is most visible and comprehensible for end users. Their application potential does not stop at mere payment functions but also includes the creation of dedicated coins for specific purposes. However, there is still a dearth of research and frameworks that help to better understand travelers' underlying rationale on whether or not to use cryptocurrencies for travel-related payments. Existing technology adoption models are mostly generic and do not account for the idiosyncrasies of cryptocurrencies. More specifically, neither the positive and negative consequences of blockchain nor the rapid technological change in this area are explicitly considered in these models. To close this gap and to acquire an enriched understanding of why cryptocurrencies are used by travelers, through this study we develop a comprehensive framework and identify answers to the following research

questions:

- *In what ways are cryptocurrencies being used in the travel industry?*
- *How do travelers perceive cryptocurrencies?*
- *What factors impact the adoption of cryptocurrency payments among travelers?*

An explorative survey was conducted with consumers in the Asia-Pacific region who have previously used cryptocurrencies to pay for travel-related products and services. Specifically, these travelers were asked to report the type/s of products/services that they used cryptocurrencies to pay for, their usage experiences and intention to re-use during future trips. The findings were integrated into a framework that extends previous adoption research by accounting for the idiosyncrasies of cryptocurrencies and other contingency factors. This study therefore contributes to current research by developing a theory-based model that illustrates what questions need to be further explored to better understand travelers' intention to use cryptocurrencies for travel-related consumption.

The remainder of this paper is structured as follows: In the following literature section, the term blockchain and its various use cases are explained. Then, previous research related to blockchain technologies in tourism is scrutinized. Subsequently, the methodology adopted in our study is elaborated, followed by a presentation of our results. This section follows the structure of the final model and is separated into cryptocurrency use, technological contingency factors and users' perceptual antecedents, and, finally, a discussion of various moderating variables, users' satisfaction, and their intention to pay with cryptocurrencies in the future. Finally, findings are discussed in light of previous research, various theoretical and practical implications are derived, and the paper is concluded with an outlook on future research.

Literature Review

Blockchain and Cryptocurrencies in Tourism

In view of the hype that appeared in 2017, blockchain started to attract attention in academic communities and particularly the tourism academic community in recent years. Early articles were mainly conceptual papers, pointing out various research opportunities in C2C markets (Önder & Treiblmaier, 2018), benefits of blockchain-based use cases for small island economies (Kwok & Koh, 2019), and others. Leung and Dickinger (2017) researched and reported that Bitcoin was rarely used for payments by European travelers, but they shared a very positive sentiment toward using it during future trips. Besides Leung and Dickinger, several use cases of blockchain in tourism have been proposed, including inventory management, maintenance and tracking, loyalty programs, baggage tracking, smart tourism applications, and the enabling of coopetition (i.e., simultaneous cooperation and competition) among business partners (Nam et al., 2019; Treiblmaier, 2020). Filimonau & Naumova (2020) present a comprehensive framework that illustrates the multitude of potential blockchain applications in hospitality operations connecting suppliers, brand/franchise owners, policy makers / destination management organizations, and consumers. In this regard, blockchain also

offers some potential to alleviate the negative implications of pandemics such as COVID-19 (Önder & Gunter, 2020).

Although the tourism industry has already started to work on blockchain implementations (Korže, 2019), rigorous theory-based academic research in that area is still relatively scarce. Thees et al. (2020) proposed a value chain approach that differs between primary (i.e., 'customer journey') and secondary activities as well as identifying potential blockchain-based applications ranging from itinerary planning to payment along the value chain. Rashideh (2020) based his research on the theory of disruptive innovation and applied expert interviews to investigate the impact of blockchain on tourism intermediaries in Saudi Arabia. Tham and Sigala (2020) pointed out that the benefits of cryptocurrencies go beyond mere payment purposes, and that they can contribute to sustainable tourism development by democratizing participation in economic systems and redistributing economic power. Using a social network analysis among Twitter users, Bolici et al. (2020) reveal that the exchange of blockchain-related information in tourism is characterized by a high turnover of the participants and only a few contributors that determine the topics of interest as well as the general sentiment of the discussions.

In their conceptual paper, Nam et al. (2019) underscored the incentives provided by cryptocurrencies will be the major determinant leading to the facilitation of a higher level of adoption by travelers. In the same study, the researchers emphasize that the future adoption of blockchain is not only a technological issue, but also a behavioral one that depends on consumers' attitudes and behaviors. In general, several researchers point out existing shortcomings of current blockchain research in tourism, such as missing descriptions of the underlying architecture and mechanisms (Valeri & Baggio, 2020). Table 1 summarizes the recent literature on the impact of blockchain and cryptocurrencies in tourism.

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Technology Adoption

Being one of the most researched topics in the academic community, studies on technology adoption start with the seminal work from Rogers (1962) on the diffusion of innovation which, over the years, led to the creation and refinement of numerous theories and models, like the Technology Acceptance Model (TAM), the Task-Technology Fit Model (TTF), and the Unified Theory of Acceptance of Use of Technology (UTAUT) (Venkatesh et al., 2016). All of these theories and models have gained widespread acceptance in tourism research and have been used with many modifications in a multitude of contexts. Ayeh et al. (2013), for example, applied the conventional TAM to investigate travelers' antecedents to use consumer-generated media for travel planning. Kim and Hall (2020) used UTAUT as a theoretical lens to examine the impact of digital storytelling on consumers' crowdfunding behavior. Lacka (2020) assessed the impact of location-based augmented reality games on tourism destination visits and Kamboj and Gupta (2020) modified and extended TAM to investigate the use of smartphone apps in co-creative hotel service innovation.

Combining blockchain technology and adoption research in a tourism context, Kizildag et al. (2020) proposed that the diffusion of innovation theory is an appropriate theoretical lens to understand how and why blockchain-based technologies are adopted. However, Nam et al. (2019), as well as Rashideh (2020), suggested that the theory of disruptive innovation could serve as a valid foundation to explicate the process of adopting technology. Recently, tom Dieck and Jung (2018) employed an inductive approach to propose an augmented reality acceptance model for heritage tourism sites. Through analyzing the qualitative data solicited from site visitors, they demonstrated how qualitative data could be used to extend the applicability of past theories (in their case TAM) to a new context. Considering the prominence of tom Dieck and Jung's (2018) study, a similar approach is pursued in this study using a mix of quantitative and qualitative data to create a comprehensive model for cryptocurrency adoption.

Motivations and Characteristics of Asia Pacific Travelers

According to the World Tourism Organization (2019), the Asia Pacific region is an important corridor of growth for the global tourism economy because it features a rising number of outbound tourism markets from countries such as China and India. Specifically, they report that Asian outbound tourism grew at an average rate of 7% p.a. between 2010 and 2018, with intraregional (i.e., within the Asia Pacific region) mobility accounting for 76% of all Asian outbound tourism. The rise in numbers of Asia Pacific travelers over the last decade can be explained by a combination of socio-economic factors across the continent: The increase in the middle-income population, accompanied by the ease of international mobility offered by visa-free entry and low cost carriers, has triggered waves of outbound tourism for travelers seeking time and space away from their usual place of residence (World Economic Forum, 2019).

Research has shown that Asia Pacific travelers have in the past been characterized by no-fuss travel planning and generally a high risk-avoidance mindset when travel planning, with short haul destinations likely to feature prominently in terms of short vacation breaks, or group tour typologies (Ooi, 2019). However, as tourists' tastes become increasingly sophisticated, the change in Asia Pacific traveler characteristics is revealing a greater sense of novelty, risk-taking, and engagement with a variety of global destinations (Mohsin et al., 2017). Additionally, there is increasing evidence to suggest that Asia Pacific travelers are likely to reflect a high degree of digital-savviness that incorporates the use of mobile devices, apps, social media and other technologies to further enhance their tourism experiences (Hsu et al., 2016). With digital innovation and immersion becoming a feature of several countries in the Asia Pacific region, it is evident that outbound tourists from this continent are increasingly expecting that destinations fulfil their needs and interests through a better integration of technology with their desired tourism experiences (Chon et al., 2020).

Method

An explorative questionnaire survey was conducted with cryptocurrency users in the Asia-Pacific region with the goal to better understand the current perception of cryptocurrencies and

the underlying rationale for using these assets. The survey was designed and conducted using Qualtrics and contained a mix of closed- and open-ended questions to measure respondents' views quantitatively as well as to gain additional insights that were used for model development.

Data collection was conducted over a two-week period from early- to mid-August 2019, following a pilot testing period. The Qualtrics' panel management team recruited and forwarded the online questionnaire to eligible participants. Purposive sampling was adopted in this study and all eligible participants had to meet three selection criteria: (1) having a place of residence in the Asia-Pacific region, (2) traveled in the 12 months prior to completing the survey, and (3) used cryptocurrencies during their travel. In the online questionnaire, respondents' past usage experience was firstly checked by asking them to report all type/s of services they paid for using cryptocurrencies (e.g., accommodation, car rental). Afterwards, respondents were asked to indicate their motivation to use cryptocurrencies (e.g., *"I am interested in using cryptocurrencies because a cryptocurrency account is not connected to an owner's identity information"*), their overall satisfaction with the usage experience (e.g., *"How would you rate the overall satisfaction with your previous cryptocurrency usage experience?"*), and their intention to re-use cryptocurrencies in the future (e.g., *"How likely is it that you will use cryptocurrencies during future trips?"*). The questions were adapted from validated statements in prior studies (e.g., Leung & Dickinger, 2017). The questionnaire ends by asking respondents to report their demographic and socioeconomic information (e.g., gender, age group, household income, and education qualifications). A total of 163 responses were received and two invalid cases were excluded from the analysis.

In line with the explorative nature of this study, respondents were asked to answer open-ended questions and to narrate their previous cryptocurrency usage experience, using terms that best summarize their positive experience, negative experience, and areas for improvement. A total of 2,082 terms were obtained and these responses were translated from native Asian languages (e.g., Korean, Chinese) into English. **Error! Reference source not found.** shows how the initial pool of terms was clustered by synonyms via first coding the responses into 744 independent terms, which were subsequently refined into 55 highest frequency and unique keywords that were used as a basis for a subsequent correspondence analysis, which will be explained in the following sections.

*** Please insert Figure 1 here ***

Results

Respondents' Profile

Table 2 shows the demographic profiles of the survey respondents. They represent several countries from the Asia-Pacific region, with most cryptocurrency users coming from India, Indonesia, Malaysia, the Philippines, Singapore, China, and Hong Kong (SAR). When it comes to gender, the sample population is fairly balanced with 58.4% being male and 41.6% being

female. Nearly half of the respondents (47.8%) belong to the age group of 26-35, but responses from cryptocurrency users between 18-25 (17.4%) and 36+ (34.8%), were also received. The latter group was made up of 48 users between 36 and 45 years old (29.19%) and only 8 respondents were 46 years and older. Those were combined into a single group named 36 and above. The yearly gross household income is fairly evenly distributed across the five categories that were used in the survey. When it comes to education, the majority of respondents possessed a Bachelor's (55.9%) or a Master's degree or above (27.3%), indicating a sample that exhibits a slightly above-average education, which can be explained by the fact that the use of cryptocurrencies mostly appeals to an educated audience and early technology adopters.

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Cryptocurrency Usage Experience and Underlying Motivations

The first step investigated the different ways that cryptocurrencies were used across travel-related payments and what the underlying motivation is. To be able to do so, possible payment options were first identified in the literature and on companies' websites. The option 'other' in the questionnaire was not chosen by the respondents, indicating that all possibilities of cryptocurrency payments that are currently available in the travel industry were captured.**Error! Reference source not found.** shows the results. Half the respondents had used cryptocurrencies to pay for accommodation and air tickets. A little more than one third paid for tour packages. Interestingly, all of the other options (e.g., admission tickets, souvenirs, train tickets, car rental, restaurants and cafes, public transport fares, ride sharing) were previously used by at least 10% of the respondents. Over 40% (41.6%) of respondents had previously used cryptocurrencies to pay for buying three or more types of tourism products/services. Another 26.1% claimed that they had used cryptocurrencies for two types of products/services.

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Table 3 shows the respondents' underlying motivations to use cryptocurrencies. There was general consent regarding the benefits of cryptocurrencies. The highest rating was given to cryptocurrencies' universal usability that renders local currencies unnecessary. It is also the technology itself that is especially intriguing to early adopters of a new technology. More specific benefits include cost savings (which often goes hand in hand with disintermediation), enhanced privacy, and the easy verification of transactions, which means that a personal handwritten signature is not needed for each individual transaction.

*** Please insert Table 3 here ***

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Technological Contingency Factors and Users' Perceptual Antecedents

To create categories for technological contingency factors and users' perceptual antecedents, we needed to thoroughly understand the context of usage experience expressed and determine how the different contexts associate with one another. To achieve this, we used the qualitative data analysis software NVivo 12 to cluster the respondents' qualitative comments into categories of similar meaning to avoid redundancies. For instance, similar terms such as 'exciting', 'excited', and 'excitement' were grouped as one common word – 'exciting'. This condensed the 2,082 raw terms into a total of 744 independent terms by synonyms. Among those independent terms, 182 related to positive experiences, 242 to negative experiences, and 320 to areas of improvement. Next, the 25 most frequently mentioned terms from each of those three categories were identified. Subsequently, each keyword was analyzed by the researchers for eligibility. Finally, all three categories yielded 55 final keywords that were unique and non-overlapping across categories. Next, a correspondence analysis was performed to examine how those 55 keywords corresponded with one another within and across the three categories. The analysis shows the two extracted dimensions that explain the relationship between keywords (rows) and usage experience (columns), explaining 100% of the total inertia. Dimension 1 (represented by the horizontal axis [x-axis]) and Dimension 2 (represented by the vertical axis [y-axis]) account for 65.9% and 34.1% of the total inertia or total Chi-square values, respectively. The principal inertia explains the degree of keyword variation in each axis, hence, Dimension 1 with an inertia of 0.54 had a higher keyword variation than Dimension 2 with an inertia of 0.28. The singular values (0.73 for Dimension 1 and 0.53 for Dimension 2; eigen-values) above 0.2 (Greenacre, 2017) denote the feasibility of each dimension. Both dimensions fulfill this criterion, thus indicating that there is significant dependency between keywords (rows) and usage experience (columns). Due to space constraints, we offer a sample of the keywords in Table 4. The large mass (0.106) for the keyword 'easy' indicates high row relative frequency, while also indicating a significant contribution (0.084) to the inertia of Dimension 1 as compared to Dimension 2 (0.001).

*** Please insert Table 4 here ***

Figure 3 shows the biplot that visualizes the locations of the keywords on a two-dimensional plane. The distance between keywords shows the strength of their association with one another. Physical proximity indicates similarity in quality (e.g., 'amazing' and 'cool' are indicative for the positive category), whereas remoteness signaled dissimilarity (e.g., 'fun' and 'fluctuation' belong to the opposing positive and negative categories). Keywords close to the zero-coordinates at the center of the map indicated higher average similarity (e.g., 'payment', 'cost', and 'transaction' share similarity in characteristics for all three categories), while being farther away from the center indicated higher average dissimilarity (e.g., 'happy', 'boring', and 'regulation' are unique to each respective category). Terms were further combined in the respective clusters to identify those constructs that deserved attention in future research projects. More specifically, the most important technological improvements were summarized

into categories of technological contingency factors and the positive and negative sentiments into two different kinds of perceptual antecedents. We will elaborate on these three clusters in the following sections.

*** Please insert Figure 3 here ***

Cluster: Positive antecedents

Blockchain technology, which by itself consists of a multitude of protocols, platforms, consensus mechanisms, and cryptographic primitives, is far from being fully developed. Existing applications are permanently being refined and new solutions as well as cryptocurrencies are regularly introduced to the market. Constant change is not only a feature of the technology itself, but also of its surrounding regulatory environment that is needed to provide the legal certainty that allows merchants to offer cryptocurrency payments and gives consumers the confidence that they are not operating within a legal vacuum. This is especially important in an area that is strongly associated with illegal activities, such as money laundering, extortion, and terrorism financing (Foley et al., 2019).

Based on the qualitative analysis of respondents' inputs, terms were clustered into five groups of technological contingency factors that describe the legal and economic ecosystem within which cryptocurrencies operate. These factors are (1) legislation and regulation, (2) widespread acceptance, (3) security, (4) usability, and (5) costs. The first one considers the rules and regulations that define the regulatory framework of cryptocurrencies. Obviously, this framework varies considerably between countries. The current acceptance of cryptocurrencies, which is shaped by the opinions of social connections but also by general media coverage, lays the foundation of how a technology is perceived. Security, usability, and costs are determinants that are strongly technology-driven and might differ from one cryptocurrency to the other.

These five factors determine the context within which a particular study is being conducted and therefore need to be integrated into adoption models either as drivers or as contextual variables. Additionally, researchers have to consider that it is not the actual state of the art of a specific technology, but rather its perception that finally determines consumers' intention of whether or not to use it. While this is true for most technologies, it is especially the realm of cryptocurrencies that is undergoing fundamental and constant change and it is advisable that researchers consider current developments and consumers' awareness thereof in their models. More specifically, the following five propositions are suggested as independent or contingency variables that impact positive and negative antecedents of consumers' perceptions:

P1: Legislation and regulation impact cryptocurrency development

P2: Cryptocurrency acceptance impacts cryptocurrency development

P3: Security impacts cryptocurrency development

P4: Usability impacts cryptocurrency development

P5: Costs impact cryptocurrency development

Cluster: Positive antecedents

Similarly, the positive sentiments that the travelers expressed were clustered into five categories that were labeled as novelty, ease of use, safety and reliability, hedonic aspects, and trust in cryptocurrency payment systems. The first refers to the aspect that novel systems are appealing to early adopters and technology-savvy people who enjoy trying out new technologies. Ease of use is a common construct in technology adoption research, but it gains paramount importance in the sphere of cryptocurrencies in which the complexity of the underlying technology and practices are unfamiliar to users, such as the inability to recover a private key. Interestingly, the security and reliability of the technology were highlighted by several respondents as positive as well as negative aspects of the technology (see also the section below). In other words, blockchain was simultaneously perceived as a safe technology that uses distributed ledgers to avoid or mitigate potential attacks, but it may also open new attack vectors. Finally, several respondents pointed out that the technology fulfills their hedonic needs and also has a playful character.

Trust is fundamental in the use of cryptocurrencies. Although there are no intermediaries to be trusted, users need to trust the payment system as a whole. As Shahzad et al. (2018) have found, perceived trustworthiness determines the use of cryptocurrencies. In our study, based on the qualitative feedback from the respondents, we find that the issue of trust has been mentioned in all three categories, though it was skewed toward a more positive experience. This means that respondents need to take the leap of faith in order to first use a cryptocurrency. Furthermore, we measured the respondents' level of trust toward their cryptocurrency wallet and also their level of trust in using cryptocurrency as a payment mode with 7-point Likert scales (1: very dissatisfied … 7: very satisfied; 1: very unlikely … 7: very likely). The respondents demonstrated a high trust level in using cryptocurrencies (m = 5.46, sd = 1.22) leading to intentions for future use (m = 5.59, sd = 1.39). We therefore surmise that a positive experience enhances users' perceived trust, thus increasing their intention to use cryptocurrencies. However, negative experience will undermine their intention to use. Summarizing, we propose that perceived trust resulting from prior experience with cryptocurrency use will have a significant impact on behavioral intention. It is therefore proposed that:

P6: Novelty of cryptocurrencies positively impacts users' level of satisfaction

P7: Ease of use of cryptocurrencies positively impacts users' level of satisfaction

P8: Safety and reliability of cryptocurrencies positively impact users' level of satisfaction

P9: Hedonic aspects of cryptocurrencies positively impact users' level of satisfaction

P10: Trust in cryptocurrency payment systems positively impacts users' level of satisfaction

Cluster: Negative antecedents

Interestingly, the negative categories of cryptocurrencies, as perceived by the respondents, overlapped with the positive categories. For example, several users experienced poor usability of cryptocurrency payment systems, which underscores the current early state of the technology. Additionally, several keywords were identified that indicated travelers' unhappiness with the performance of current systems. In the case of Bitcoin, by far the most widely used cryptocurrency, slow payment confirmation is a feature rather than a bug, which is caused by a laborious proof-of-work system that ensures that roughly every 10 minutes a new block is added to the blockchain. Depending on the current throughput, the actual waiting time before a transaction is finally confirmed can be much longer. In a similar vein, the lack of intermediaries yields cost savings but also leads to a decreased service level, which can deter users who are used to having contact persons and service centers at their disposal in case problems occur. Finally, the current price volatility and concerns regarding the security of blockchain are subsumed into a single category. The former is caused by speculative investments that are beyond an ordinary user's control and the latter represent a new attack vector that was created by blockchain technology and includes, amongst others, so-called 51% attacks (in which a majority of participants take over the network), sybil attacks, wallet attacks, or attacks regarding the underlying cryptography. Summarizing, the following propositions are suggested:

P11: Poor usability of cryptocurrencies negatively impacts users' level of satisfaction

P12: Low performance of cryptocurrencies negatively impacts users' level of satisfaction

P13: Missing service of cryptocurrencies negatively impacts users' level of satisfaction

P14: Volatility and insecurity negatively impact users' level of satisfaction

Moderating Variables, Satisfaction and Intention to use

To gain a better understanding of which moderating variables might be of importance in future cryptocurrency studies, four frequently used control variables, namely gender, age, education, and income, were investigated to yield different levels of satisfaction among separate user

groups. Demographic and socioeconomic variables are frequently incorporated in adoption models to account for the differences between customer groups' adoption of a new technology (Chen & Huang, 2016). Conflicting research results exist as to whether these controls exert a significant influence. For example, when it comes to the impact of age on software adoption, Morris and Venkatesh (2000) showed that younger workers' usage decisions were strongly influenced by their attitudes, while subjective norm and perceived behavioral control were more important for older workers. Ayeh et al. (2013) found that age has a significant impact on consumers' intention to use consumer-generated media for their travel planning, but not education and gender, while Chung et al. (2010) found no moderating effect of age in their technology acceptance study on online community participation. In an early TAM-based study about the use of e-mail, Gefen and Straub (1997) found that men and women differ in their perceptions, but not in the use of this technology. These few examples suffice to illustrate that moderating or control variables are highly context-dependent.

Consequently, and in line with the basic tenets of contingency theory, it is postulated that the context in which the respective constructs are applied is crucial in determining whether a variable has an important impact or not. Given the focus on the use of cryptocurrencies for payments and the exploratory nature of this study, a conscious decision was to therefore refrain from making theory-based postulations regarding the impact of moderating variables and compare the different groups of cryptocurrency users from our sample according to their demographic and socioeconomic variables. No significant effects were located for gender, $t(159) = 1.95$, $p = .052$) when it was tested for users' perception of cryptocurrencies. Similarly, a one-way ANOVA revealed that there were no significant effects for age groups ($F(4, 155) = .74$, p. $= .56$), education groups ($F(3, 157) = 1.02$, p. $= .38$) and income groups ($F(4, 156) = 2.42$, p. $= .051$). Although our sample is not representative for the general population, especially when it comes to the distribution of age, the findings can serve as a first indication that demographic and sociographic variables do not moderate the impact of perceptual antecedents on satisfaction as well as the impact of satisfaction on travelers' intention to use cryptocurrencies. Furthermore, it is proposed that gender, age, education, and income do not have a significant moderating effect on the perception of cryptocurrencies. However, this should not prevent future researchers from expanding the size and diversity of their samples in their future studies, which will be helpful in validating whether travelers' sociodemographic profiles exert a moderating impact on their level of satisfaction with cryptocurrencies.

The sample was assessed for their perceptions towards cryptocurrency payment processes, which can be seen as a strong indicator of whether cryptocurrencies in tourism will succeed in the future. We measured their level of satisfaction as well their future intention of using cryptocurrencies with 7-point Likert scales (1: very dissatisfied … 7: very satisfied; 1: very unlikely … 7: very likely). Overall, the respondents were fairly satisfied with their previous experience ($m = 5.45$, $sd = 1.27$) and mostly intended to continue their use in the future ($m = 5.59$, $sd = 1.39$). Finally, a regression was conducted on future intentions on satisfaction ($B = .89$, S.E. $= .05$) and the result was highly significant $F(1, 158) = 300.47$, $p < .001$ with an R^2 of .66, corroborating numerous previous research studies that highlighted a

strong relation between satisfaction and intention to use (Jang et al., 2006). It is therefore proposed that:

> P15: Satisfaction with the use of cryptocurrencies positively impacts the intention to use them further in the future

Figure 4 summarizes the propositions in a comprehensive model that combines several core elements of adoption theories (e.g., TAM, UTAUT) that were adjusted to fit the context of cryptocurrencies in the dotted area and introduces blockchain-specific contingency factors on the left that are of relevance for the future development of cryptocurrencies.

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Discussion

Over the past decades, technology has triggered numerous changes in the tourism industry. The Internet has led to the development of e-tourism, which is characterized by a digitization of processes and value chains in tourism (Buhalis, 2002). Subsequently, the gradual replacement of websites by sensors and smartphones, the emergence of big data, and the rise of public-private-consumer collaborations have led to the emergence of smart tourism (Gretzel et al., 2015) and the creation of models that underscore the important role of information and communication technologies (ICTs) in tourism management (Ivars-Baidal et al., 2019). Blockchain and, more specifically, cryptocurrencies, are very recent developments in the digitization of the tourism industry that hinge on the pervasiveness of ICT. As such, our exploratory findings that reveal the perceptual antecedents of cryptocurrency use in tourism offer potentially substantial implications for researchers and practitioners alike.

Theoretical Implications

Technology adoption is a very popular research topic across academic communities that helps create a better understanding regarding the underlying factors of why consumers decide on whether or not to use a specific technology. The adoption of an application by consumers ultimately decides upon its success or failure. Specifically, in tourism, the extent of technology efficacy for travel has significant impact on tourist experience and thus influences their adoption behavior (Neuhofer et al., 2015). In their search for parsimony and operationalizable theory-based theories and models, academics have substantially altered models and reduced measurement scales. Frequently, these models are used without sufficient adaption to the characteristics of the research problem at hand. However, researchers have already stressed the need to adapt existing models by integrating context-specific factors to account for the idiosyncrasies of a specific adoption situation (tom Dieck & Jung, 2018). In a similar vein, results from this exploratory study that combined qualitative and quantitative data to empirically derive several research propositions, serve to conceptualize a cryptocurrency adoption model that creates a more nuanced understanding within the academic and non-

academic tourism communities. This model also integrates previous research on cryptocurrency adoption from a consumer perspective, which is still scarce in academic literature. Notable examples include Arli et al. (2020) who investigated how knowledge of cryptocurrencies, speed of transactions, and trust in government impact trust in cryptocurrencies and subsequently loyalty to banks, and Ajouz et al. (2020) who examined individuals' intention to adopt precious metal-backed cryptocurrencies.

Technology adoption research is combined with contingency theory to derive a model that at its core contains frequently used constructs such as satisfaction and intention to use, but also includes those aspects that specifically pertain to blockchain-based technologies and especially cryptocurrencies in the tourism industry. When it comes to the measurement of these constructs, researchers can partly rely on existing scales, which most likely need to be modified to match the research context, but rigorous research is also needed to operationalize and validate measurement scales for several cryptocurrency features that are novel.

Managerial Implications

At present, only a relatively small number of individual tourism outlets including travel agencies, hotels, transportation, souvenir shops, and restaurants, offer cryptocurrency payments. This number varies widely by country and can partly be explained by different jurisdictions, fluctuating consumer demand, and availability of technological knowledge needed for the implementation and operation of cryptocurrency-enabled point of sale platforms. Additionally, offering payment with cryptocurrencies demands an initial investment from the side of the vendor. It is therefore crucial for merchants to better understand why (or why not) consumers choose this particular form of payment and which outside factors (such as legislation) potentially influence their usage intention. This study offers a first glimpse on which factors come into question.

The study has focused on the Asia-Pacific region, in which several geographical locations can be found that are fairly advanced in their use of cryptocurrencies for payment purposes and already offer a wide range of products and services that can be purchased with cryptocurrencies. The study found that the benefits of cryptocurrencies might be quite considerable for consumers, but it also became clear that a substantial amount of skepticism exists. A better understanding of technological contingency factors as well as the positive and negative perceptual antecedents that shape users' perceptions will help merchants in the tourism industry to better understand travelers' needs and to customize their offerings accordingly.

Conclusion, Limitations and Future Research

In conclusion, from a traveler's perspective, cryptocurrencies are the most tangible application of blockchain technology. Their application potentials in the tourism industry are manifold, as are the possible disadvantages. The underlying technology is complex and often poorly

understood by final consumers and the media plays a big part in shaping the attitudes of the general public toward such forms of transactions.

In this paper, a comprehensive model for cryptocurrency adoption in the tourism industry was developed, which builds on an existing theoretical foundation but extends it by incorporating positive and negative perceptual antecedents that are specific to cryptocurrencies. Furthermore, various technological contingency factors are included, which make the model dynamic and also need to be fully understood in order to grasp travelers' level of satisfaction or their intention to use. These modifications are needed to fine-tune existing adoption models that are mostly agnostic of a particular technology and do not account for the idiosyncrasies of blockchain and cryptocurrencies. Using a sample of 161 cryptocurrency users from the Asia-Pacific region, the extraction of insights from quantitative and qualitative data revealed a wide array of positive and negative aspects of cryptocurrencies that were integrated into a comprehensive model, together with several contingency factors. Furthermore, 15 research propositions are suggested, which emerged from the empirical findings.

This study has several limitations. First, the sampling process was intended to obtain a relatively homogenous sample from the Asia-Pacific region. Although participants from numerous countries are involved, their sentiments might not be representative of other regions of the world. Since an exploratory rather than a confirmatory approach was pursued, a geographical bias might not matter that much but other scholars are still strongly encouraged to apply the proposed model in different geographical regions. Second, the sample was purposefully restricted to cryptocurrency users, since the behavior and perceptions of this particular group and their experience with blockchain-based payments was of utmost interest in the study. However, it is highly probable that in basically every country non-cryptocurrency users form the majority of the population. While it is believed that the model is fairly generic and that most of the positive and negative effects of cryptocurrencies are covered, the moderating variables deserve further attention in future studies that compare users of cryptocurrencies with non-users.

The growing popularity of blockchain and cryptocurrencies in the tourism industry has induced an increasing body of research. In order to make a useful contribution to the common body of knowledge in the tourism literature and to help practitioners to better understand why (or why not) consumers choose to pay with cryptocurrencies, further empirical research is needed that is tailored to the characteristics of this technology. Given the perceptual antecedents offered in this study, the theoretical implications of technology adoption warrant further exploration of the associated theories in empirical research. We encourage researchers to take the proposed model, identify its benefits, correct its shortcomings, and further refine it to be able to better understand travelers' intentions to use cryptocurrencies for payments as an asset of choice in the future.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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Table 1. Literature on blockchain and cryptocurrencies in tourism

Authors	Methodology	Results/Findings
Leung & Dickinger (2017)	Survey	Bitcoin is infrequently used for online purchases among European travelers.
Önder & Treiblmaier (2018)	Conceptual	Suggestion of three research propositions pertaining to the emergence of trustworthy rating systems, adoption of cryptocurrencies and increasing disintermediation.
Kwok & Koh (2019)	Conceptual	Discussion of key blockchain applications to enhance tourism in small island economies.
Nam et al. (2019)	Conceptual	Discussion of the key characteristics of blockchain technology in conjunction with smart cities and tourism. Derivation of four propositions on how the technology can evolve and impact this industry.
Korže (2019)	Literature review	Examples of blockchain applications and smart contracts in the tourism industry.
Thees et al. (2020)	Content analysis	Examination of blockchain use cases along the value chain in the tourism industry.
Rashideh (2020)	Qualitative analysis of expert interviews	Identification of various factors that lead to disintermediation in the tourism industry.
Treiblmaier (2020)	Conceptual	Description of blockchain-based use cases in tourism and a suggestion for future theory-based research.
Filimonau & Naumova (2020)	Conceptual	An evaluation and framework development regarding the potential of blockchain for future integration into hospitality operations management.
Tham & Sigala (2020)	Literature review	Blockchains and cryptocurrencies increase trust, democratize participation in economic systems and re-distribute power.
Bolici et al. (2020)	Social network analysis	Tourism information networks on Twitter dealing with blockchain have a high participant turnover. Relatively few contributors determine the topics and the overall sentiments.
Valeri & Baggio (2020)	Conceptual	Discussion of potential drivers and drawbacks of blockchain adoption in tourism and suggestions for future research.
Önder & Gunter (2020)	Conceptual	Exploration and identification of use cases for blockchain in the tourism and hospitality industry.

Table 2. Respondents' demographic profile (N = 161)

Variable	Category	Frequency	Percentage
Gender	Male	94	58.4
	Female	67	41.6
Age	18-25	28	17.4
	26-35	77	47.8

	36 and above*	56	34.8
Gross annual household income	Less than USD 20,000	18	11.2
	USD 20,001 - USD 40,000	43	26.7
	USD 40,001 - USD 60,000	36	22.4
	USD 60,001 - USD 80,000	30	18.6
	More than USD 80,001	34	21.1
Education	Secondary school	14	8.7
	Diploma/Higher diploma	13	8.1
	Bachelor's degree	90	55.9
	Master's degree or above	44	27.3
Nationality	India	37	23
	Indonesia	26	16.1
	Malaysia	23	14.3
	Philippines	22	13.7
	Singapore	19	11.8
	China	14	8.7
	Hong Kong (S.A.R.)	12	7.5
	South Korea	5	3.1
	Japan	3	1.9

Table 3. Respondents' motivations to use cryptocurrencies

I am interested in using cryptocurrencies because…	Mean *(SD)*
Universal usability: Cryptocurrency works anywhere and anytime	4.06 *(1.09)*
Intriguing technology: The underlying technology of cryptocurrency is intriguing	4.01 *(1.09)*
Cost saving: Lower transaction cost is involved in cryptocurrency-based payment as compared to other payment systems	3.98 *(1.05)*
Disintermediation: Establishment of cryptocurrency account does not require credit card/bank account	3.88 *(1.14)*
Privacy: A cryptocurrency account is not connected to owner's identity information	3.75 *(1.23)*
Easy verification: Cryptocurrency-based payment does not require pin or signature for verification	3.71 *(1.31)*

Table 4. Sample descriptive statistics of correspondence map coordinates

Categories	overall mass	%inert	dimension_1 coord	sqcorr	contrib	dimension_2 coord	sqcorr	contrib
Keywords								
acceptance	0.073	0.046	0.637	0.796	0.055	0.323	0.204	0.027
boring	0.007	0.036	1.626	0.674	0.037	-1.132	0.326	0.034
convenience	0.043	0.042	-0.833	0.876	0.056	-0.313	0.124	0.015
easy	0.106	0.056	-0.650	0.994	0.084	-0.051	0.006	0.001
fun	0.007	0.003	-0.392	0.483	0.002	-0.406	0.517	0.004
hassle-free	0.007	0.007	-0.839	0.872	0.010	-0.322	0.128	0.003
regulation	0.005	0.009	0.228	0.034	0.000	1.210	0.966	0.026
security	0.058	0.020	0.278	0.277	0.008	0.449	0.723	0.042
slow	0.020	0.096	1.626	0.674	0.098	-1.132	0.326	0.092
volatile	0.007	0.013	1.160	0.916	0.019	-0.351	0.084	0.003
Experience								
POSITIVE	0.400	0.345	-0.770	0.844	0.443	-0.331	0.156	0.158
NEGATIVE	0.203	0.443	1.190	0.800	0.537	-0.596	0.200	0.260
IMPROVEMENT	0.397	0.212	0.167	0.064	0.021	0.637	0.936	0.582