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The original version of Chapter 14, “Bitcoin Adoption as a New Technology for Payment Mechanism in a Tourism Collaborative Network,” was revised. The affiliations of Mehdi Daryaei and Abbas Khamseh were corrected.

# Bitcoin Adoption as a New Technology for Payment Mechanism in a Tourism Collaborative Network

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**Abstract.** Bitcoin is designed to operate as a fine mechanism of Collaborative Network (CN). The Tourism Industry is a particular sector in which this emerging technology, as a new mechanism of payment based on peer to peer and autonomous characteristics, could have a significant impact on growth and helps to reach untapped regions. Given its revolutionary nature, Bitcoin is not yet penetrated in this industry, while the main issue is the number of players who are connected from service providers to tourists, agencies, and suppliers. These heterogeneous players need to use Bitcoin simultaneously when compatibility is the major problem. This means that the Technology Adoption/Acceptance are affected by the behavior of the Tourism Collaborative Network (TCN). The aim of this work is to develop a Technology Acceptance/Adaptation model to evaluate the situation of Bitcoin in TCN and identify factors affecting Bitcoin acceptance/adoption in the context of CN as well.

**Keywords:** Bitcoin, Digital Currency, Cryptocurrencies, Technology Adoption, Technology Acceptance, Tourism Collaborative Network.

## 1 Introduction

According to the World Bank [2], nearly 1.7 billion people are globally unbanked, including 225 million people in China, 190 million in India, and so on. Although, one billion have smartphone and nearly 500 million have internet access [24].

Local tourist attractions or people who are living in the countries mentioned above, therefore, suffer from lots of difficulties in terms of currency exchanging or even developing local tourist attractions as well. The statistics [2] also tell us that despite technology's rapid growth and expansion in terms of banking services, the actual customer services were not satisfactory enough in recent years, at least for almost 22

percent of the world. Other sorts of tourism such as slum tourism, rural tourism, agritourism are another growing niche market built for adventurous travelers eager to place themselves in a different lifestyle [18]. Small island economies (SIE) such as Malta, the Caribbean economies, and others are experiencing massive Correspond Banking Relationships (CBRs) challenges [19] [23] that lead to isolating the trade networks. IMF<sup>1</sup> believes that loss of CBRs "could disrupt financial services" [19]. The tourism ecosystem is vast and heterogeneous in essence. UNWTO<sup>2</sup> defines [21], [22] tourism stakeholders consisted of national and local governments, tourism enterprises, establishments, and institutions that are engaged in financing the related projects. Travelers, all businesses related to traveling and even local people are part of this ecosystem. World Bank and IMF above-mentioned concerns ring the bell that the large parts of the world are still unreachable for the tourism industry only because of the inefficient financial system which imposes many restrictions on travel.

To address the problem, Bitcoin geared with blockchain technology beneath it encourages SIEs and other untapped regions to trigger a new mechanism of currency exchanging, offers a Distributed Ledger Technology that people are able to send money directly [1] in order to overcome the traditional financial system flaws [9]. As a result, financial transactions cannot be overlooked as a big part of the Tourism Collaborative Network (TCN).

The idea of CN was proposed by Camarinha-Matos and Afsarmanesh [12] which is explained as a network consisting of a broad of entities mentioning people and organizations. CNs are heterogeneous regarding their applications, environment, or their operations while they are backed with computer networks, collaborating to accomplish the common goal globally. The collaboration between individuals and their relationships is based on their shared mutual interests, their goals, and the motivations that shape a "professional virtual community" [12]. This network has consisted of groups of functions that collaborate in the specific project with each other and are using their specialties to improve the performance [7].

### 1.1 Problem Domain & Motivation

The existing financial constraints and limitations contribute to the direct impact on the traveling business and damage the TCN. The intention of employing Bitcoin as a new form of payment channel can be accomplished only by identifying factors affecting the intersection area of TCN and Bitcoin Collaborative Network (BCN), namely End-users and Merchants, to adopt Bitcoin as an innovative fashion. We introduce BCN players including Bitcoin early adopters and acceptances such as miners, traders, herders, merchants, and consumers who are willing to hold or collect Bitcoin or spend their Bitcoin in exchange for valuable services. To deal with our concerned problem, we decided to conduct an innovative way and investigate Technology Acceptance in TCN domain employing CNs Approach. As illustrated in Fig. 1 and based on the UNWTO major role players' definition, we draw a brand-new mesh to explain the relationship between two fragmented ecosystems. It is clear that the intersection as the Joint Spot

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<sup>1</sup> International Monetary Fund

<sup>2</sup> The world tourism organization

needs to function properly to put the whole ecosystem to work (see Fig. 1). To bring the Bitcoin payment as a common payment mechanism into the mainstream, the mentioned key users in Joint Spot should accept and adopt Bitcoin as a reliable payment mechanism. Therefore, the research question is "what factors contribute to Bitcoin adoption/acceptance?".

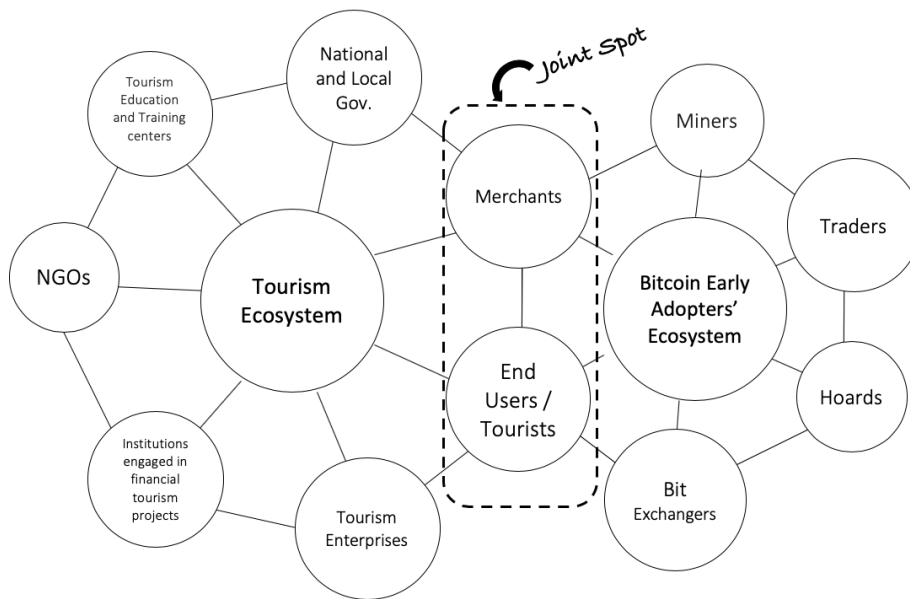


Fig. 1. TCN and BCN in a heterogeneous network context.

## 2 Foundations and Related Works

Bitcoin is "an open-source" [1] computerized application and digital currency introduced by Satoshi Nakamoto [1]. Using almost a \$40 smartphone and an internet connection everyone can perform a transaction [24]. No need to figure out technical details. Having a bitcoin wallet address everyone can send or receive bitcoin [1]. It's sort of like sending out an email. Coins that earned by the merchants can be traded and exchangeable at any online Bit Exchangers, Bit ATMs (BTM) instantly. Since there is no need to have a sophisticated technology to perform a transaction, bitcoin came into existence to cut out transaction costs associated with the intermediaries which are technically trusted provisions in nature [1], [3]. On the other side, it is a young technology then individuals have little information about its core functions. Hence, this foggy environment might negatively affect users' attitudes to adopt/accept Bitcoin on their daily basis transactions. Thus, the economic and business consequences of bitcoin

adoption are crucial for the community [8], [11] which is tied to personal characteristics and their attitudes toward use. Valuable research works focusing on peoples' behavior [15], [6] on how to achieve greater acceptance and effective utilization of information systems summarized as follows.

Accepting Bitcoin from a specific party indicates a form of trust relationship [16]. On the other hand, security should be highlighted as the major factor to influence users' decisions toward the e-payment system acceptance, lack of security provisions and become victims of the theft as a result of sensitive account information disclosure is viewed as a major barrier for online users, accordingly [16], [4], [10]. Bitcoin volatility can be addressed as an important risk factor and cause a negative mindset for tourists who intended to use Bitcoin as a payment method [19] [20].

Ref. [16] emphasizes that the lack of legal supports leads to negative impacts on users' attitudes. Researchers [8] believe that people who are willing to take risks are among the Bitcoin adopters. Ref. [13] stated that all unbaked people can join the global payment system through their private Bitcoin wallet. Studies also emphasized the importance of perceived usefulness, ease of use, and awareness that have a significant positive association, with the intention to use [14], [17], [5]. Thanks to the miners, as the instant electronic payment method, the Bitcoin platform works fast, easy, and well-proven to operate borderless transfers also [1], [14]. To investigate the mentioned factors, we reviewed the most cited previous Technology Acceptance theories which some of them are listed in Table 1.

**Table 1.** Review of the most cited Technology Acceptance Models.

Model	Dependent Variable (DV)	Role of * in CN *Volatility *Competitive Advantage *Government Regulatory	Additional Independent Variable Affecting DV	Scholar (s)
Theory of Planned Behavior	Intention, Behavior	None	Subjective norm Perceived behavioral control Attitude	Ajzen (1991)
Unified Theory of Acceptance and Use of Technology UTAUT	Behavioral Intention	None	Performance expectancy Effort expectancy Social influence Facilitating conditions	Venkatesh et al. (2003)
TAM3	Behavioral Intention	None	Subjective norm Image Job relevance Output quality Result demonstrability Computer self-efficacy Perceptions of external control	Venkatesh & Bala (2008)

			Computer anxiety Computer playfulness Perceived enjoyment Objective usability	
UTAUT2	Behavioral Intention Use Behavior	None	Performance expectancy Effort expectancy Social influence Facilitating conditions Hedonic motivation Price value Habit	Venkatesh et al. (2012)

To our knowledge, this is the first time that we integrate Technology Acceptance theories into CNs in order to explain the best performance out of TCN and for the case of Bitcoin.

### 3 Research Question and Methodological Procedures

Identifying factors affecting bitcoin adoption/acceptance would be the scope of the research. In this work and to achieve the goals, the following process shown in Fig. 2 was conducted. To perform an in-depth systematic literature review, some features of PRISMA statement [25] have been adopted. We limited our investigations scope to the factors of acceptance or non-acceptance of bitcoin technology, application of bitcoin in the tourism industry, new form of payment mechanism, use of technology acceptance theories, keywords such as acceptance of bitcoin, application of bitcoin and their security in the tourism industry. After the screening came up with 150 papers nominated and selected.

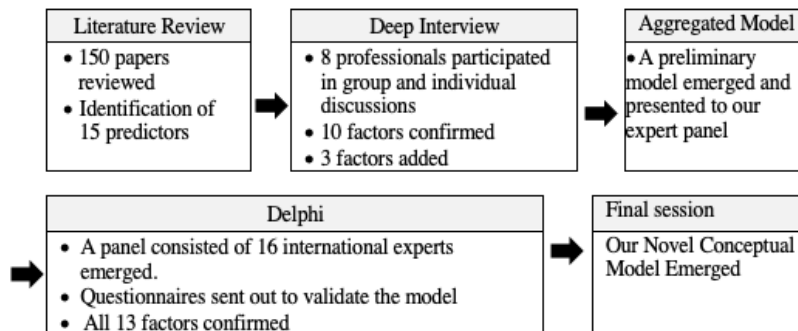


Fig. 2. Methodology process and procedures

Then in-line with the literature, we deep interviewed the factors with our 8 professionals with tourism background, either academic, travelers, or agents dealing with the ecosystem actively to obtain a better understanding of the situation. 13 factors

discussed and confirmed that have the most effects on adoption/acceptance process. Followed our group and individual discussions, our preliminary model has formed. Then, twenty-seven available experts from scholars and market experts contacted and asked to help as Delphi panelists for verifying the initial conceptual model. Structured online and offline open scale (From 0 to 10) questionnaires with an open statement box distributed. At last, sixteen professionals from Iran, Switzerland, Ukraine, Italy, Austria, and Portugal, handed back the questionnaires and engaged as a part of the research. This was followed by analyzing the questionnaires, giving feedback, and conducting several discussion sessions to make sure they are satisfied with the final result to come up with a conceptual model, as an outcome of our deep work.

#### 4 Conceptual Model

Based on the literature review, 15 factors (Computer Playfulness, Facilitating Conditions, Price Value, Loss of Private Key, Victim of Theft, Perceived Usefulness, Computer Anxiety, Trust, Awareness, Job Relevance, Gender Effect, Fast and Cheap, Technological Complexity, Risk Taking Characteristics, and Perceived Compatibility) from previous acceptance models have derived. Five factors (Habit, Computer Playfulness, Price Value, Computer Anxiety, Job Relevance) eliminated and three other factors -Volatility, Government Regulatory and Competitive Advantage- added to preliminary model as a result of the deep interview. Computer Anxiety, Job Relevance, Computer Playfulness, Price Value, and Facilitating conditions; eliminated regarding their unique definition, their scope, narrow focus and constrains on the company and employee relationship side. Volatility, Government Regulatory, and Competitive Advantage added to the model according to the new CNs approach to evaluate the model in the TCN context (see Table 2.).

**Table 2.** Constructs definition in the context of both Technology Acceptance and CN.

Predictors	Definition	Dependent Variable (DV)
Volatility	The degree that an individual perceives trade price variation over time.	Tech. Adoption /Acceptance
Competitive Advantages	The degree in which an individual perceives that the use of innovation places the business in a superior position.	Tech. Adoption /Acceptance
Government Regulatory	The degree that an individual perceives that the technology is under the authorities' control.	Tech. Adoption /Acceptance



After developing the initial model, questionnaires were sent for our international experts' panel. The result of summarizing the questionnaires, analyzing their feedbacks, and follow-up discussion ended up finalizing the list of most effective factors, presented in Table 3.

**Table 3.** Experts panel output

Predictors	Mean	Status	Direct Effects on Adoption/Acceptance
Government Regulatory Awareness	9.4	A & SA	+
Perceived Compatibility	8.8	A & SA	+
Technology Complexity	8.6	A & SA	+
Perceived Usefulness	8.6	A & SA	-
Competitive Advantages	8.5	A & SA	+
Providing Fast and Cheap Services	8.4	A & SA	+
Volatility	8.3	A & SA	+
Loss of Private Keys & Victim of Theft	8.1	<sup>3</sup> A & SA	-
Trust	8	A & SA	-
Risk Taking Personality	7.8	A & SA	+
Gender Effects	7.8	A & SA	+
	5.3	<sup>4</sup> NAg-NDg	Neutral

Considering that in the questionnaire, over 7 (the scale is between 0 to 10) is classified as Agree and Strongly Agree, it could be claimed that Government Regulatory leads to an increase in Bitcoin adoption/acceptance. The analysis of the answers to the questions showed that almost 92% Agreed that awareness of the Bitcoin mechanism and its functioning or learning of how to use Bitcoin has a positive effect on the adoption process. More than 88% agreed that Bitcoin integration with other payment systems increases the level of system compatibility. 89% believed that making Bitcoin wallet more friendly and easy to use makes Bitcoin popular. Therefore, Technology Complexity has a negative effect on the adoption/acceptance process. More than 81% believed that making the technology more usable such as joining more merchants to the ecosystem, increases Perceived Usefulness. 85% of the experts discussed that the possibility of booking services (including flights, hotels, etc.) via Bitcoin, creates a competitive advantage for related businesses leads to improve Bitcoin adoption/acceptance and helps to achieve higher customer satisfaction. The experts also agreed that -almost 86%- the quick and inexpensive nature of Bitcoin transactions enhances Bitcoin adoption special for the merchants. More than 87% of the experts agreed that Volatility has a negative effect on the adoption process and intention to use. Some of the experts mentioned that instant conversion to a defined stable coin reduces the uncertainties. Loss of Private Keys and Victim of Theft are the most mentionable

<sup>3</sup> Agree & Strongly Agree

<sup>4</sup> Nor Agree nor Disagree

risks that cryptocurrencies adopters may face. Almost 83% stated that it has a negative effect on the intention to use and should be considered as a major uncertainty. Because of the importance of both factors, we open two additional boxes and place it under the Perceived Risk factor in our conceptual model. 77% believed that Trust factor and having confidence in the proper functioning of Bitcoin technology enhances Bitcoin adoption/acceptance. More than 84% agreed that tourists or merchants with Risk Taking personality are more willing to accept Bitcoin. At last, our experts were not agreed or disagreed with the possibility of Bitcoin literacy differences between men and women (Gender Effects). Other valuable comments of our experts were mostly relied on the importance of awareness, allocating bonuses for newcomers, ease of exchange, ease of operation and wide usage, more advertising, and reducing risks.

As a result, Fig. 3 demonstrates a novel model proposed in this work. It reflects the key factors influencing the Bitcoin adoption in TCN, aiming to gain a better understanding of how two heterogeneous systems might function ideally.

The proposed conceptual model improves the previous acceptance models considering new components to give us a better and more realistic explanation of TCN players' behaviors in terms of Bitcoin technology in the context of CNs.

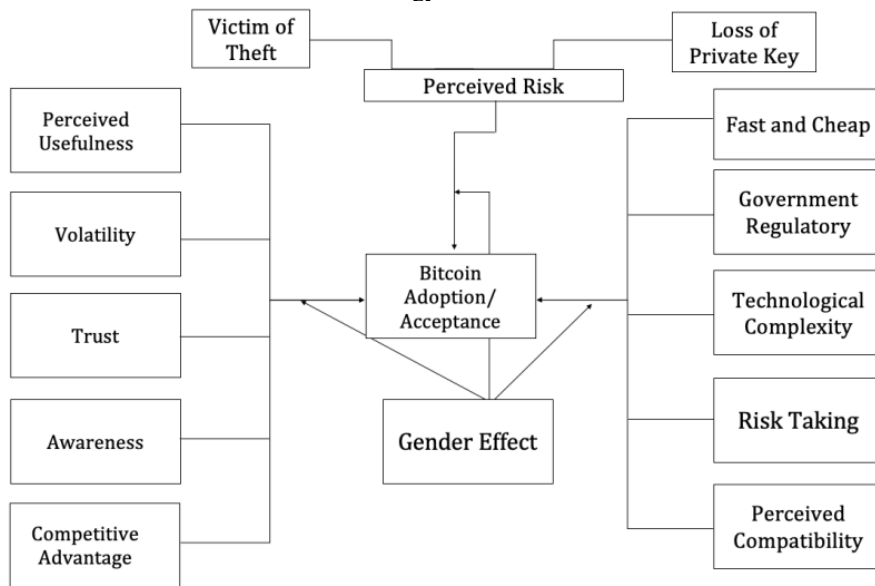


Fig. 3. Conceptual model of factors affecting Bitcoin adoption in a TCN

#### 4 Conclusion

Global financial inefficiencies and its constraints have caused a lot of inequities in the Tourism Industry to achieve sustainable development. Bitcoin promises to offer a new form of payment channel that could be a solution. To achieve a long-lasting

collaboration, heterogeneous players tend to embrace Bitcoin simultaneously as compatibility is the main challenge.

In this paper, it is claimed that a new way of looking to the form of Collaboration between TCN and BCN based on Joint Spot is introduced. To our knowledge, this is the first model that formulated the technology acceptance concept in regard to TCN and BCN ecosystems. The proposed conceptual model adds "Volatility", "Government Regulatory" and "Competitive Advantage" (see Table 2.) as three key pillars that are the most important predictors in both supply and demand side in the context of CN. However, further researches are underway to evaluate other related issues. Given the unforeseen nature and special characteristics of Bitcoin as an emerging technology to establish a novel payment mechanism, the conceptual model could be extended to the other ecosystems. The new components of the model are coming from the CN background, such as trust, which could lead to understanding better the challenge of Technology acceptance/adoption in other types of CNs such as supply chains, clusters, and so on dealing with emerging technologies. The focus of this study was limited to Bitcoin acceptance in TCN. In contrast, in further study, the adoption of cryptocurrencies and the role of smart contracts are recommended for a broader range of CNs. Also, quantifying the model and find the weights of criteria and their mutual impact would be interesting subjects for further research.

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