Blockchain acceptance and adoption in the tourism industry

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Abstract

Tourism has always been characterized by extensive innovativeness (from theme parks and cultural&gourmet tours till a deeper service integration). Today, digital solutions represent an opportunity to expand and innovate the range of services offered. Focusing on blockchain as an emerging technological solution, the paper investigates how expert and practitioners perceive the potentialities and limitations of its adoption in tourism. To capture the attitudes expressed in the field, we analyze the ongoing discussions on a major social network: Twitter. Through a social network analysis of the flow of tweets conducted over three months, we map the current perceptions towards blockchain. Specifically, we contribute to the literature on technology acceptance and adoption by intercepting the current perceptions in the tourism industry. This paper shows how experts and practitioners are envisioning the possibilities that blockchain shape future services in the tourism sector. Our study is based on an extensive literature review and a social network analysis of a Twitter-database. This allows us to investigate the current sentiment towards blockchain, and also to envision future directions of a promising and yet under analyzed technology.

Keywords

Tourism. Blockchain. Technology acceptance. Technology adoption.

1. Recent trends in the travel and tourism industry

Tourism is a global driver of growth leading to the reduction of poverty and to the promotion of socio-economic development. Recently, the World Travel & Tourism Council stated that the global tourism industry grew at 3.9% in 2018 creating around 320 million jobs to the world economy. Furthermore, the sector generated 10.4% of worldwide economic activity in 2018.

Overall, Europe records the highest number of international visitors who were almost 673 million in 2018 while they were more than 210 million in Americas in the same year (World Tourism Organization, 2018).

Nowadays, tourism is undergoing significant changes and new business models are emerging within the sector: according to the World Economic Forum (2017), digitalization will enable an additional value of $305 billion for the sector and $700 billion for the society by 2025. Furthermore, the online travel service bookings increased rapidly by 230% from 2015 to 2016 and the higher amount of revenue was generated in the US with $93.7 billion in 2018, followed by Europe with $92.3 billion of revenue in the same year; by 2023, it is expected that China will surpass the US market (Statista, 2019).

The main transformations of the sector are enabled by the digitalization phenomenon and are largely linked to the improvement of big data management, to the rise of platform economy, and to the emergence of global value chains. On the one hand, improvement of online presence, enhancement of interactions, and development of networking structures and digital collaborations represent the principal reasons for digitalizing the business. On the other hand, the major obstacles in implementing digital technologies within the tourism industry are the lack of finance, the presence of high training costs, and the rapid technological change (Dredge, Phi, Mahadevan, Meehan, Popescu, 2018). At the European level, the Digital Tourism Network has been established with the aim to involve either tourism industry's operators and relevant stakeholders into an informal forum to strengthen the skills, to raise the awareness of developments in the smart use of technologies, and to support the integration of tourism businesses.

The evolution of new technologies, like cloud computing, wearable devices, and mobile tools, creates many opportunities but also several challenges. First and foremost, the digitalization of the industry supports the growth of online transactions and service activities; in addition, the interconnectedness between physical and digital worlds facilitates the data exchanges and improves the communication between the parties. In 2018, the use of Internet was high in European Countries such as United Kingdom, Germany and Spain with respectively more than 97, 93.5 and 87.2 percentage of Internet penetration. Other Countries like China are below the global average with almost 60% of Internet penetration, instead. One of the main trends that will reshape the future of tourism is represented by blockchain technology and its practices related to the use of digital currencies (e.g. bitcoin), the creation of smart contracts, the adoption for public services, the management of digital contents and sales, the tracking of records, the automation of supply systems, and the development of apps (Nam, Dutt, Chathoth, Khan, 2019).

The increasing use of technology adoption is enabled by the millennials generation that continues to rise over the years with around 58% of global millennials who live in Asia (Sofronov, 2018). According to the U.S. Census Bureau, they are expected to reach 73 million in population in 2019 overtaking the boomers generation. The millennials are changing the travel and tourism industry; they are full of enthusiasm and they have a stronger sense of adventure compared to previous generations. Furthermore, they prefer to opt for services at a reasonable price as well as for those which can be easily modified (Sofronov, 2018).

Recently, the so-called generation Z is also affecting the sector with people who tend to be pragmatic rather than realistic, more focused on saving money and mobile natives rather than mobile pioneers. IBM estimates that generation Z spent online 74% of its time and it usually looks for valuable travel experiences. Typically, more than 50% of gen Z-ers travels more than 50 miles every one to three months and 59% of them books their break one to three months before the departure (World Travel & Tourism Council, 2018).

The evolution of tourism, led by new generations' requirements, can negatively impact cities, communities and local infrastructures; nevertheless, there are huge opportunities for economic and social development at a global scale. The World Bank effectively reports several tourism improvements and benefits for tourism destinations, individuals, and travelers:

- *GDP growth*, with the travel and tourism sector that accounts for more than 10% of global GDP;
- *Increasing international trades* in countries like Nicaragua, Chile, Venezuela, and the Dominican Republic;
- *Boost for international investments,* with more than 806 billion dollars invested in the sector in 2016, compared to 680 billion dollars in the oil and gas industry;
- *Infrastructures' development,* like airports, roads, medical services, and mobile phone networks;
- *Support to low-income economies,* as the first or second largest source of export earnings in 20 of the 48 UN-classified Least Developed Countries;
- *Jobs' creation.* Today, tourism employs 292 million people globally;
- *Promotion of inclusive growth,* with more than 700,000 dollars of income generated for every million dollars spent on travel and tourism;
- *Reinforcing of rural communities*, with 82.7 billion dollars of revenues in 2016 resulting from rural tourism;
- *Improving cities' competitiveness;*
- *Increasing female participation;*
- *Wider market for artisans;*
- *Better conservation* with funds generated for preserving the nature;
- *Climate change awareness* with sustainable tourism initiatives implemented;
- *Protecting the culture, spreading philanthropy, and fostering intercultural exchanges.*

The achievement of these benefits calls for significant investments in digital technologies that can raise connectiveness and interdependence. Naturally, this, in turn, will transform travelers' behaviors and encourage firms' innovation.

2. Theoretical framework: technology adoption in the tourism industry

The increasing adoption of emerging technologies in the tourism sector enables businesses, customers and stakeholders to create value and to take advantage from innovation. Especially, according to Buhalis (1998), efficiency improvement, maximization of profitability, services' development, and long-term prosperity of tourism enterprises are the main benefits deriving from the use of technology. Existing literature focuses on the development of new service products with minimal cost (Min, 2008), on the overall improvement of tourists' travel experience, on provision of more intelligent platform, on information sharing within destinations and on better tourism resources allocation (Staab, Werthner, Ricci, Zipf, Gretzel, Fesenmaier, Paris, and Knoblock 2002; Neuhofer, Buhalis, and Ladkin, 2013). Moreover, Cabiddu, Lui and Piccoli (2013) find that higher performance in terms of value appropriation comes from the strategic fit between initiative and firm's objectives, synergy among the partners, and IT readiness. In addition, according to Stamboulis and Skayannis (2003), the technology adoption is able to attract feedback from customers, to raise the sense of involvement and belonging, to increase customer loyalty, and to encourage more interactive learning. Furthermore, the implementation of IT technologies empowers cost reduction, data and processes integration like administration, production, communication, and cooperation between tourism production and distribution partners (Buhalis and O'Connor, 2005; Treiblmaier and Önder, 2019; Karinsalo and Halunen, 2018). Finally, technology offers services specialization, flexible network's configurations, combination between consumer and internal business processes and stakeholders' integration Werthner (2003).

The development of intelligent and smart systems allows to create a more personalized tourism experience (Capriello and Riboldazzi, 2019) and a "more convenient, safe, exciting and sustainable living spaces for both residents and tourists" (Gretzel, Sigala, Xiang, and Koo, 2015, p. 185). Typically, interoperability, personalization and constant networking are relevant aspects connected to the use of new technologies (Buhalis and Law, 2008); moreover, intelligent systems provide support for tourist information search and decision-making process (Gretzel, 2011). The emergence of connected devices, the increasing adoption of blockchain technologies, the management of huge amount of data, the involvement of millennials in travel planning, and the use of travel packages nurture the development of economies of scale (Xiang, Magnini, Fesenmaier, 2015) and create better opportunities for action in the social media space (Wang et al., 2014). The integration between online and offline channels, the customer-centric approach, the optimization of revenue generation due to the use of predictive analytics, and the formation of new business models encourage the co-creation with multiple stakeholders (Colombo and Baggio, 2017; Neuhofer *et al.*, A., 2013; Meriläinen, 2017; Karinsalo and Halunen, 2018; Stankov and Filimonau, 2019; Buhalis and Sinarta, 2019). Research also focused on the trust related to the "availability and immutability of information" as well as on the creation of cooperative environment and "common open scheme for applications, data, transactions, and identification of the players" (Colombo & Baggio, 2017; Treiblmaier & Önder, 2018). Some of the main trends that are affecting the tourism sector are correlated to increasing level of disintermediation, higher customer engagement and interaction, provision of integrated set of experiences, growing usage of mobile devices and apps that generate positive returns (Qin, Tang, Jang, Lehto, 2017; Treiblmaier and Önder, 2018; Buhalis and Sinarta, 2019; Presenza, Messeni Petruzzelli, and Sheehan, 2019; Jeon, Ali, and Lee, 2019). For instance, the gamified mobile experiences are gaining importance (Garcia, Linaza, Gutierrez, and Garcia, 2018; Swacha, 2019); furthermore, the adoption of smart devices increases the level of knowledge and socialization of people, valorizing specific destinations' geographical attributes and building networks

between territory's resources and tourist's activities. Also, blockchain is a recent technology associated with the use of smart contracts and digital currencies that ensures high level of anonymity due to the use of wallets not directly connected to the identity of the owners (Polasik, Piotrowska, Wisniewski, Kotkowski, and Lightfoot, 2015; Leung and Dickinger, 2017). Also, (Jovicic, 2019; Pierdicca, Paolanti, Frontoni, 2019). According to Blockchain Luxembourg (2016), we assisted to an increasing usage blockchain wallet from 0.3 in 2013 to million to 7.7 million in 2016 with more than 100.000 merchants accepting Bitcoins as a payment method in 2015. The usage of blockchain allows to save time and to locate travel data in one token, facilitating the management of tickets, rationalizing operations and saving transaction costs (Goldman Sachs, 2014; Karinsalo & Halunen, 2018). Recorded benefits have been investigated in diverse sectors like the healthcare one with lower medical costs, improvement of Electronic Health Record and development of smarter medical devices (Pilkington, 2017).

The digitalization can be considered a source of competitive advantage for those companies operating in the travel and tourism industry because it reduces administrative and personnel costs for flight booking processes (Jeon *et al*., 2019), it advances the customer satisfaction (Stankov and Filimonau, 2019; Zhang, Li, Liu, and Ruan, 2019; Presenza *et al.*, 2019; Buhalis and Sinarta, 2019), and it produces clearer and more dynamic communication of information (e.g. word of mouth) within a definite network of interactions (Arenas, Goh, and Urueña, 2019; Zhang *et al.,* 2019). Finally, the data sharing and the higher accessibility (Femenia-Serra, Perles-Ribes, and Ivars-Baidal, 2018; Rueda-Esteban, 2019) create smart and agile ecosystems in which several stakeholders are involved and able to find "synergetic way to support customers in pre-, during-, and post-sales activities" (Kwok and Koh, 2018; Buhalis and Sinarta, 2019; Capriello & Riboldazzi, 2019, pag. 3).

3. Research Approach and Methods

Our starting assumption is that the communication dynamics on social network is a good proxy of the interest of the public on a specific topic. The starting point of this analysis, built on the consideration that technology and social aspects are not dichotomous but rather inseparable (Bolici & Giustiniano, 2013), was collecting a network of tweets through a specific combination of keywords (e.g. #blockchain & #tourism) which allows us to: (i) identify characteristics and dimension of public debate on the potential application and implementation of cryptocurrencies and Blockchain technology in the tourism sector; (ii) qualitatively identify nodes (profiles) which have a prominent position in the network and assess the potential and limitations of their diffusion.

We crossed a set of specific keywords related to tourism (e.g. #tourism, #travel, #hotel) with those connected with distributed technology solutions (e.g. #Blockchain, #Bitcoin, #SmartContracts). Then we have set up a specific script to automatically connect all tweets with specific occurrences of combinations of those hashtags (e.g. #tourism & #bitcoin; #tourism & #blockchain: #hotel & #bitcoin). The scripts, whose data collection activity was performed during the period 13 March - 23 June 2019, gathered 11,478 tweets, 9,304 of which including 6 combinations of those hashtags (#tourism and #bitcoin; #tourism and blockchain; #travel and #bitcoin; #travel and #blockchain; #hotel and #blockchain; #hotel and #bitcoin), which were generated by over 3 thousands accounts.

First, we performed a descriptive analysis of frequencies (both profiles and tweets) to understand how the different networks perform on the social network. Thanks to this analysis, we identified two networks: the first one is the largest and densest network (#travel with the two technological keywords), the second one is still a large network but differently from the

other one, since (i) tweets are almost evenly distributed; (ii) all tweets are mainly linked to the blockchain hashtag (#tourism with the two technological keywords.). Then, we analyzed the raw tweets to understand if there is a tendency in the number of tweets published per week. Finally, we ran a social network analysis to identify similarities, differences and prominent nodes in the network.

Social Network Analysis is based on the assumption of the importance of relationship among actors (Scott 1988; Wasserman & Faust 1994) and focuses on concepts like: (i) actors and how they act; (ii) flows, links or ties among actors; (iii) network models at the individual level (as set of opportunities and constraints); (iv) network models as structure.

4. Main Findings and Contributions

The analysis of the dataset has provided three main insights: (i) weekly distribution of tweets over the three months of analysis; (ii) information about the characteristics of each network; and (iii) the possibility to identify similarities and differences in the networks interested in different technological aspects (bitcoin vs blockchain).

The Fig 1 below represents the distribution of tweets and retweets with a specific combination of hashtags over time (#travel + one of the two technological hashtags). As it's possible to notice at a first glance, the ratio between tweets and retweets about Bitcoin and Blockchain is about 1:3, thus the number of tweets regarding the potential application of #blockchain technology in the touristic domain is larger than the ones dealing with #bitcoin.

From a frequency perspective, we can observe a continued interest from the social network, without one peak (registered in week 4) and a valley (registered in week 9, but depending on the lower number of tweets and retweets on #bitcoin & #travel).

Figure 1 – Weekly Tweets Frequency

Source: our elaboration

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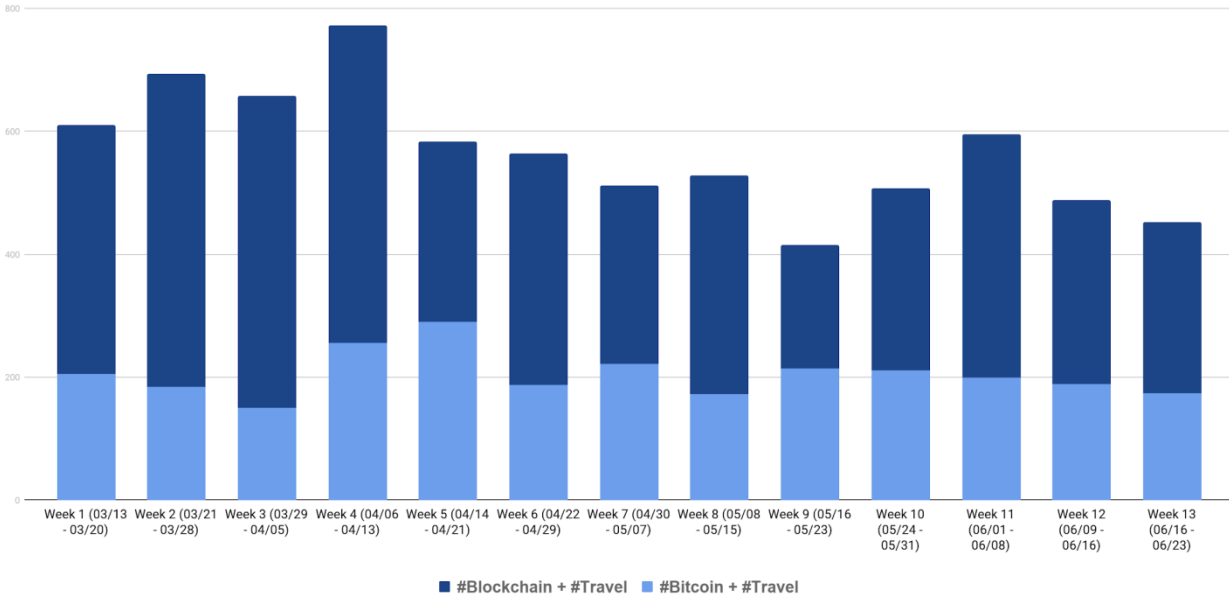
The same frequency analysis has been performed also for tweets and retweets with the other mentioned combination of hashtags (#tourism + one of the two technological hashtags). The distribution of hashtags in Fig. 2 confirms the higher interest on #blockchain topic applied to tourism.

From a distribution standpoint, while during the first two months of analysis there was a low interest on the topic for both hashtags, in the last 3 weeks of analysis we can observe a sharp increase in the number of tweets where the combination of the two hashtags (#blockchain & #tourism) is present.

Figure 2 – Weekly Tweets Frequency #Tourism
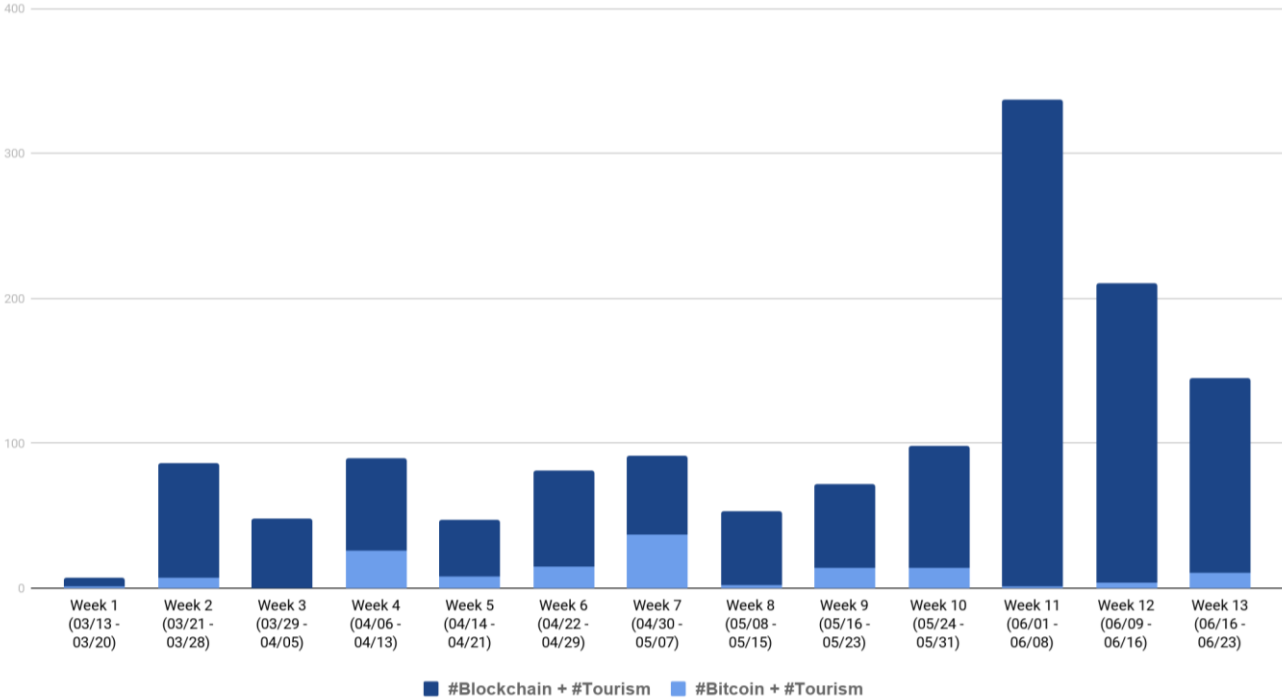
Source: our elaboration

After this frequency analysis, we represented the two networks through a SNA in order to compare their characteristics and structures.

Different color coding of the edge indicates the couple of hashtags that were in the tweet that was retweeted by a profile. Green edge indicates the fact that a profile has retweeted only posts with #blockchain and the other considered hashtag inside (#tourism or #travel); Blue indicates retweets including posts with both hashtags and the other considered hashtag (#tourism or #travel); Red indicates retweets of post with #bitcoin and the other considered hashtag (#tourism or #travel).

#Tourism Network

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The network in Figure 3 includes a total of 663 actors (Twitter Profiles) and a total of 458 tweets and 784 retweets for a total of 1,242 tweets and retweets. This network is characterized by the strong difference between nodes with #blockchain and #bitcoin, respectively 1,125 tweets/retweets and 117 tweets/retweets.

The first evidence we got from the analysis of this overlapping social network is the fact that the most active profile, belonging to profiles associated with cryptocurrencies and cryptocurrency trade, is the fact that the majority of the retweets coming from this network are associated with the hashtag #blockchain and even though there was a limited number of tweets where #bitcoin appears, only in one instance #bitcoin is not accompanied by #blockchain.

Figure 3 – Tourism Networks
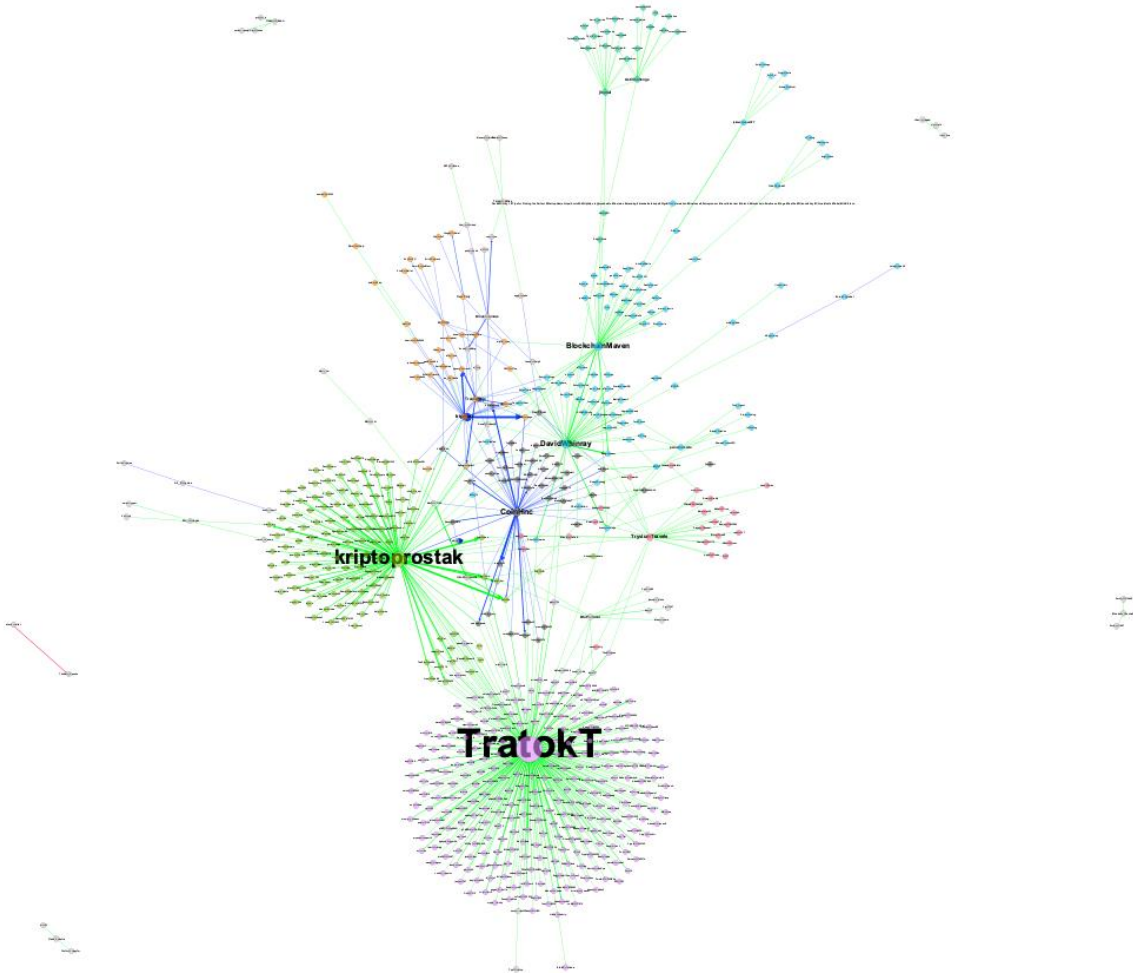
Regarding the network, its density is extremely limited (0,002) and is highly centralized around 5 different nodes (profiles) whose contents are often retweeted by the other peripheral nodes (profiles). These 5 mentioned nodes have a high engagement rate, showing that the resonance of the topic is potentially high, given that at the moment of analysis the average number of followers is limited (around 4,000),

From a content perspective, most of the tweets regard the possibility to acquire services (air travels/hotels) through blockchain/bitcoin technology.

#Travel Network

In Figure 4 the largest among the available networks, including 2,154 actors (Twitter Profiles) a total of 4,969 tweets and 2,414 retweets with an overall number of 7,383 tweets and retweets.

There is still a difference in the number of tweets and retweets in favor of #blockchain, but it is not as large as before, given that the number of tweets and retweets including the couple of hashtags #blockchain and #travel is 4,726 and for the couple #bitcoin and #travel is 2,657.

Differently from previous network, there is a larger incidence of retweets of posts containing #bitcoin or both hashtags #blockchain and #bitcoin, even though the largest incidence of retweets is still for tweets containing the hashtag #blockchain.

Figure 4 – Travel Networks
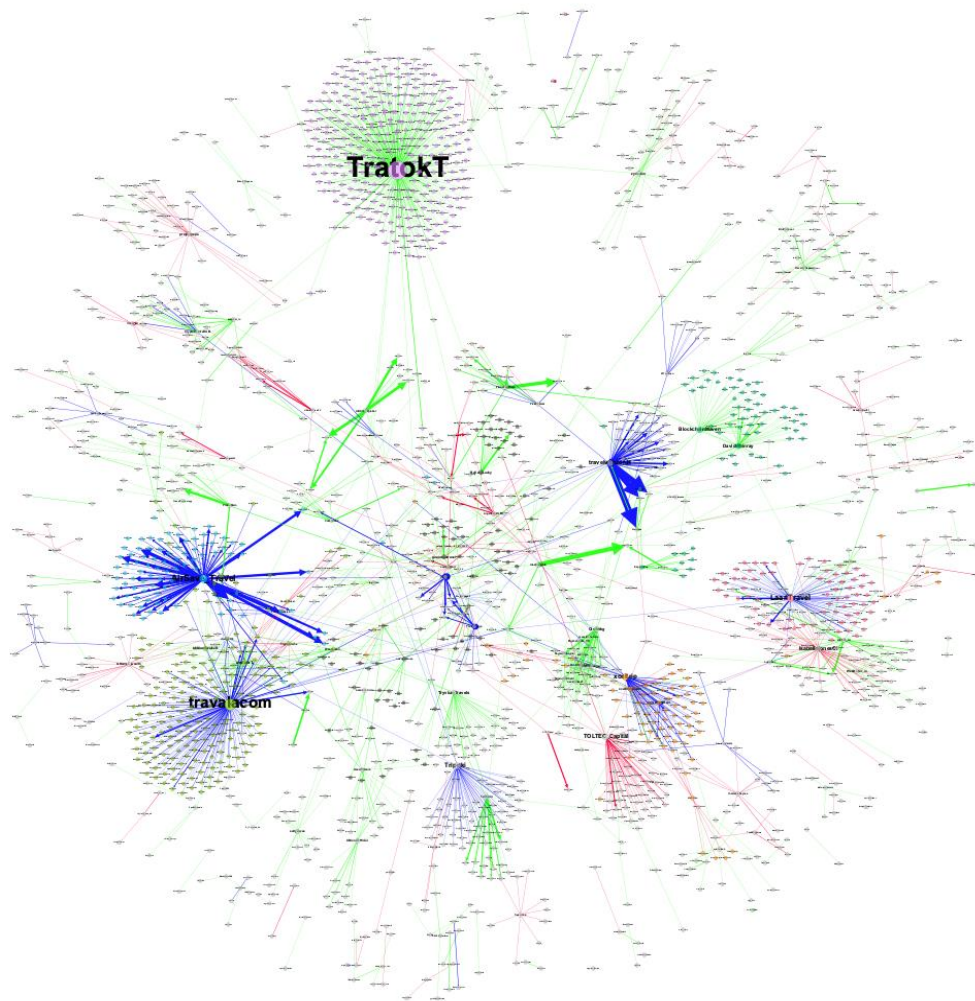
Regarding the network, it is three times larger than the previous one and this influences its density, which is almost 0 (0,0001). Again, it is a node that is highly centralized around 7 nodes (profiles) whose contents are often retweeted by the other peripheral nodes (profiles).

These 7 mentioned nodes have an engagement rate that is lower than the ones of nodes in the previous network, however since they have an average number of followers higher than profiles of previous network they are able to involve a larger number of nodes (profiles) on Twitter. It is interesting to notice how the node "TratokT" is central for both network, which testifies its ability to attract a larger number of users on his Twitter page.

From a content perspective, most of the tweets regard the possibility to acquire services (air travels/hotels) through blockchain/bitcoin technology or are associated to new cripto-currencies aimed at acquiring specific services (air travels).

Conclusions

As confirmed by several studies, ICT has been impacting the tourism sector for decades and it has had a significant role in reshaping the business models, the organization, and the

marketing strategies of the actors competing in the sector (e.g. Egger and Buhalis, 2008; Middleton et al., 2009). Our study confirms that the more recent technological wave hit the tourism sector, and that the actors in this sector are showing a growing interest towards blockchain and crypto-currencies. Indeed, through the analysis of the discourses posted on Twitter over a significant time span, we propose an exploratory analysis of the acceptance of technology solutions in this specific industry. We show that an increasing number of profiles are debating the topic. Moreover, an increasing number of tweets refer to blockchain and bitcoin in the tourism services. At a deeper level of analysis, the results of the SNA show that the #travel network has expanded more rapidly than the #tourism network. Both networks are highly centralized and the central actors are associated with cryptocurrency and cryptocurrencies trade. We also discussed the content of the tweets, providing some preliminary and yet potentially interesting, insights on how to pursue touristic services innovation through blockchain and cryptocurrencies.

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