Opportunities for the Use of Blockchain Technology in the Tourism Industry

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Summary
It is relevant and timely for the existence and prosperity of today's tourism to build up a stock of new abilities and a set of innovations. At present, the tourism industry is experiencing a new stage in its digital transformation. The newest technologies, which are now spreading en masse and one of which is rightfully considered to be blockchain technology, enable tourists to receive tourist services directly from the producers, which not only gives the consumer the opportunity to enjoy higher quality and inexpensive products but also increases the responsibility of the producer. The article analyzes research literature on the possibility of using blockchain technology in the tourism industry. Based on an expert survey, the main problems, prospects, and advantages of the implementation of blockchain technology in the tourism industry are identified. The paper proposes and analyzes an option for the use of blockchain technology on the basis of a blockchain project with a mobile app for users and a dedicated website and public API for travel service providers.

Keywords:
blockchain technology, blockchain project, tourism industry, travel services, intermediaries.

1. Introduction

Today, the worldwide adoption of blockchain is revolutionizing many sectors of the economy, including the tourism industry. Although distributed ledger technology is still in its development and early adoption phase, its use already brings impressive results [1].

The key characteristic of blockchain technology is that data is decentralized, meaning that it is distributed to different nodes or computers that are part of the network, and each of them has a copy of all the information collected. Once a block or ledger is added, all members of the blockchain must validate it in order to get it in the copy stored in each part of the chain [2, 3]. This process ensures the security, traceability, integrity, and transparency of the data stored in the blockchain [4].

Broadly speaking, blockchain is a special technology for storing data on multiple nodes (computers) networked together, and it is based on four basic principles: a distributed database (everyone has access and no one has full control); no hierarchy (there is no master node in the blockchain); transparency (every transaction is visible to everyone who has access to the system); and unchangeable records (a record in blockchain cannot be changed or removed) [5].

These principles are indisputable advantages of blockchain technology, among which, aside from the aforementioned, are the low cost of transactions, minimization of time spent on "proof of operation" of the system by all participants, and more [6]. Simply put, a blockchain is a digital platform that stores information about transactions between users and validates them.

Blockchain is gradually and steadily being introduced into all sectors of the economy, tourism being no exception. In 2015, an international project "Drachmae" was initiated to support international tourism [7]. Its essence is to use blockchain technology to provide the services of mobile operators, which will allow them to abandon roaming and move to paying for these services in cryptocurrency.

The general issues of using blockchain in the tourism industry are reflected in the works of K. Rejeb and A. Rejeb [8], I. Önder and H. Treiblmaier [9], and A.O.J. Kwok and S.G.M. Koh [10]. A.I. Ozdemir et al. [11] give an

Manuscript received June 5, 2022
Manuscript revised June 20, 2022
https://doi.org/10.22937/IJCSNS.2022.22.6.9

assessment of the application of blockchain in travel and tourism. Studies by K. Nam et al. [12] and S.Z. Korže [13] presents the latest trends and challenges of using blockchain technology for "smart tourism", the main provisions of which are analyzed by U. Gretzel et al. [14] and C. Koo et al. [15].

Scientific studies reveal the impact of blockchain technology on various sectors of the tourism [16, 17] and hospitality industry [18, 19]. I. Tyan et al. [20] explore the application of blockchain for smart travel destinations, the main characteristics of which are described by D. Buhalis and A. Amaranggana [21]. A study by M. Valeri and R. Baggio [22] offers an analysis of problematic issues of the implementation of blockchain technology in the tourism industry.

The purpose of this study is to investigate the problems and prospects of using blockchain technology in the tourism industry.

Research objectives include:

1. to identify the main problems, prospects, and advantages of implementing blockchain technology in the tourism industry;
2. to propose and analyze an option for the use of blockchain technology based on a blockchain project with a mobile application for users and a special website and public API for producers of travel services.

Research hypothesis: optimization of various spheres of activity involved in the tourism industry by means of blockchain will increase the profits of travel companies and reduce the cost of the final product.

According to the results of the study, it can be concluded that the goal set in the study is achieved.

2. Methods

The research methods deployed in the course of the study include:

- an analysis of research literature on the use of blockchain in the tourism industry;
- an expert survey, which identified the main problems, prospects, and benefits of implementing blockchain technology in the tourism industry;
- the case study method used to examine the existing global intermediaries (GDS, OTA, Channel managers) in the market of tourist services and identify the characteristics of their activities and sources of income for the subsequent development of a blockchain project in the tourism industry based on the analysis of secondary sources;
- the methods of analysis and synthesis used to formulate a proposal and analyze the possibilities of a blockchain project with a mobile app for users and a dedicated website and public API for travel service providers.

The expert survey administered online involves 38 experts – tourism professionals specializing in the implementation of information technology in the tourism industry.

The experts were asked to voluntarily fill in a semi-formalized electronic questionnaire via e-mail.

The questionnaire includes the following questions, which were to be answered freely, without limiting the number of answer options:

1. What are the main problems of implementing blockchain technology in the tourism industry?
2. What are the prospects and benefits of implementing blockchain technology in the tourism industry?

Next, the expert opinions were ranked. The consistency of expert opinions is assessed through the concordance coefficient:

$$W = \frac{12S}{n^2(m^3 - m)};$$

where S – the sum of squares of deviations of all rank estimates of each assessment object from the mean value; n – the number of experts; m – the number of objects of assessment.

Statistical processing of the survey results, derivation of descriptive statistics (percentage of expert mentions), and calculation of the concordance coefficient were performed using the SPSS software product.

All participants were informed of the purpose of the survey and of the organizers' plan to publish the results of the survey in a summarized form.

3. Results

According to the experts, the main problems of implementing blockchain technology in the tourism industry are the following (Table 1).

Table 1: The main problems of implementing blockchain technology in the tourism industry

№	Problem	Characteristic	%*	Rank
1	Reaching consensus	The blockchain ecosphere is based on continuously reaching consensus among all participants	92%	1
2	High cost	Blockchain implementation is a complicated and expensive measure	81.5%	2
3	Imperfect legal framework	Existing laws do not fully regulate the use of blockchain	76%	3
4	Specialist training	Personnel working in the tourism industry today are not yet ready to work with the blockchain technology	71%	4

Note: compiled on the basis of the expert survey; * – the percentage of expert mentions; the value of the concordance coefficient W = 0.81 (p < 0.01), which indicates a strong consistency of expert opinions.

Despite the identified problems, the prospects that blockchain offers, the experts argue, are much more important and have a more significant impact on life (Table 2).

Table 2: Prospects and advantages of implementing blockchain technology in the tourism industry

№	Prospects and advantages	Characteristic	%*	Rank
1	Automation	One of the features of blockchain is the possibility to automate a variety of processes	92%	1
2	Savings	Savings are a direct consequence of process automation	81.5%	2
3	Loyalty	Blockchain could dramatically change the way people view loyalty programs	76%	3
4	Profit	Profit is a pleasant added benefit of implementing the evolutionary technology	71%	4
5	Transparency	The blockchain system provides a transparent scheme for the purchase and execution of the service	68.4%	5

Note: compiled on the basis of the expert survey; * – the percentage of expert mentions; the value of the concordance coefficient W = 0.78 (p < 0.01), which indicates a strong consistency of expert opinions

As shown in Table 3, the introduction of a blockchain platform can significantly reduce the costs of a travel company, the size of which depends on the size of the business (small, medium or large). Cost reduction is one of the main mechanisms for encouraging companies to move to blockchain technology.

Table 3: Comparison of two management systems by cost indicators

	Simple control system	Blockchain platform
Transaction settlement costs	+	-
Document storage expenses (archive)	+	-
Audit costs (checking the correctness of document management)	+	-
Personnel costs	The more extra work, the more staff is needed	Reduced staff and, consequently, reduced personnel costs
Intermediary costs	+	-
Transaction fee	Fees to banks	Commission to miners (percentage for creating new blocks)

Note: compiled on the basis of the expert survey

Proceeding from the results of the expert survey, we propose creating a blockchain project with a mobile app for users and a special website and a public API for producers of travel services.

Analyzing the above problems, prospects, and advantages of blockchain, we can conclude that the tourism industry needs changes, the driving force of which can be exactly blockchain.

In our view, the best way to use distributed registries technology would be to create a blockchain project with a mobile application for users and a special website and public API for producers of travel services.

3.1 “Blockchain project” case study

It is worth noting that today the tourist market is divided between several global intermediaries, which present true monopolists (Table 4).

Table 4: Intermediaries in the tourism market

Intermediary	Characteristic	Representatives
GDS	Global distribution systems, or in other words, B2B online venues, act as an intermediary between suppliers of travel services (hotels, airlines, etc.) and those who sell them (tour operators, travel agents).	Amadeus, Sabre, Travelport
OTA	Specialized travel marketplaces that connect the provider of travel services directly to the tourist. Such marketplaces act as sellers, so they take their own commission for each booking.	Booking.com, Kayar, Agoda, Momondo, etc.
Channel managers	Specialized information systems that function as aggregators of information from many GDSs and OTAs. Information is collected by connecting to public APIs. Travel service providers are able to control sales channels using the graphical interface offered by Channel managers.	MyAllocator, STAAH, Hotel Link

GDSs charge a monthly subscription fee, in exchange for which they provide access to their information systems. Providers pay for placing their resources in the database, and retailers pay for the ability to make reservations. There

may also be an additional commission for each booking. All these costs significantly add to the cost of the final product. Unfortunately, the manufacturer of travel services is forced to raise the price, even if the product or service is purchased directly.

OTAs profit from commissions for bookings. On average, this value ranges from 10 to 30%, which tourists pay extra without their own knowledge. Cooperation with OTAs is subject to many restrictions, among which "parity of rates" has the greatest impact. This is a contract between suppliers of tourist services and OTAs, which obliges the former to provide their services at a minimum price. In other words, low prices, discounts, and bargains, which are the backbone of OTA marketing campaigns, owe to extortion of the lowest possible prices from service providers, as they are not contractually allowed to put a lower price either on their own sites or offline. Violation of this contract threatens high fines and expulsion from the system.

Channel managers set a fee for using the system, but one significantly lower compared to GDSs and OTAs. Due to their progressiveness and willingness to innovate, such organizations are constantly evolving, improving their systems, and competing against both peer competitors and GDSs and OTAs [7].

The fundamental principle of the project we are proposing can be viewed as a symbiosis of GDSs and OTAs with the key difference being the presence of a blockchain that eliminates the drawbacks of the former. The standard database would be replaced by a distributed registry managed by a community of participants. Travel service providers (hotels, air carriers, and others) will be able to upload data to the system as conveniently and free of charge as possible, assigning booking commissions to agents independently. To do so, they will be provided with both a public API, which will allow quick uploading of the necessary data, and the usual website, which will act as a minimum level of accessibility, that is, anyone will be able to upload data to the system without even knowing about the blockchain. Blockchain will eliminate the 10-30% commission that monopolists charge. The end consumer will only benefit, because using the system will only require them to have a phone connected to the Internet, which will greatly simplify the procedure for purchasing a tour, and the absence of large commissions will allow visiting new destinations. Another advantage that blockchain provides, as mentioned earlier, is identity identification and automation. The tourist will only need to have a phone to fully process a tour. All confirmations, contracts, and necessary certificates will be taken care of by the system automatically.

Since there are no agency commissions or subscription fees for using the platform, the price for the end consumer can be reduced. Travel service providers, instead of the usual 15-30%, will only need to add a booking fee for agencies to the base price.

It is also worth noting that fair competition will create barriers to unreasonable price increases. As a consequence, travel intermediary companies are expected to completely abandon the use of GDSs and OTAs in the future. A drastically new approach to the distribution of tourist services will also encourage suppliers to give up GDSs because they will no longer have to pay for the placement of their resources. This, in turn, will lead to a decrease in the average price level and will only play into the hands of tourists. Thus, considering blockchain in the framework of tourism, we can conclude that such a symbiosis will be very profitable for the tourism industry.

4. Discussion

Let us now take a closer look at the main problems of implementing blockchain technology in the tourism industry.

Speaking about reaching consensus among all blockchain participants, it should be noted that there are many representatives of various travel companies in the Russian travel market, which creates certain limitations and problems for the implementation of blockchain [23]. Therefore, first of all, as confirmed by I. Önder and H. Treiblmaier [9], before the direct implementation of the technology, an agreement will need to be reached between market participants, starting from the type of blockchain (if every participant does not choose to create their own) to the discussion of various procedures, rules, and regulations [24].

Another issue is the imperfection of the legal framework. Russia lacks clear rules on the use of this technology and the payment of damages coming as a result of its operation, the existing distributed database regulation standards do not comply with international ones [25]. I.E. Mikheeva et al. [26] also point out that Russia does not have a precise definition of a "smart contract", which makes it impossible to consider the conditions, rules, and procedures for their conclusion, and also entails a complete absence of consumer rights protection. The same applies to the mechanism of criminal or administrative liability [27].

High cost. I. Önder and H. Treiblmaier [17] also note the high cost of the hardware required for blockchain operation, which immediately creates a certain barrier for entry into this innovative technology, as only large and some medium-sized travel companies can allocate enough funds.

At the same time, the tourism industry staff currently lacks both basic theoretical knowledge and valuable practical skills in the framework of blockchain technology implementation, which points to the problem of training specialists. A study by M. Zsarnoczky [7] confirms that the introduction of blockchain is a gradual process, which is why even the initial stages will require additional

expenditures on training and retraining specialists in the blockchain system.

In light of the above, while the cost of moving any business to blockchain will decrease over time, one should be prepared for high costs at the beginning of the process.
Speaking of the prospects and benefits of implementing blockchain technology in the tourism industry, the following should be noted.

First, blockchain provides opportunities for automation such as reduced time to prepare and execute contracts, less or no paperwork, automatic identity verification, and automated hotel or airline verification. Automatic refund and purchase of tickets in case the system finds a better offer will be a standard situation. There can be many such combinations and operations, as the possibilities of blockchain programming are endless. A distributed registry works according to a certain computable logic, which can be configured with various algorithms and enable automatic transactions. Today, in the travel industry, breach of contract terms is regulated by various legal mechanisms, the judicial system, which is always associated with long processes, waste of money, and not necessarily fair decisions. Blockchain may change this state of affairs, as it will not only speed up, simplify, and reduce the cost of contracting, but also prevent any attempts of a party to deliberately violate the terms of the contract and get away with it [12].

Second, blockchain can reduce the cost of the tourist product and improve the quality of services (by reducing the cost of creating and promoting websites, advertising fees, intermediary services). In addition, the use of cryptocurrencies and the blockchain system will reduce the cost of currency transactions. There will also be savings in the time spent on travel preparations, because the system will operate around the clock and all year round, being able to process any request at any time [20].

Third, an advantage lies in the participation of consumers of travel services in the global loyalty system, the accumulation of bonus points when purchasing tours (a single loyalty card, which accumulates points from all hotel chains, airlines, car rental services).
Fourth, organizations providing tourism services will increase profits by optimizing trade, information, and production activities [10].

Fifth, the use of blockchain technology will guarantee the transparency of transactions in the travel services market. Smart contracts can be used as a tool to verify each component of the transaction. The transfer of payment for the service will only occur after the service is performed and the buyer confirms there are no claims on their part. Each blockchain participant will be able to view the transactions performed in the system. In addition, the rating system, which in most cases is purchased, will fall by the wayside. The purchase of fake votes, agreements with websites to remove unwanted comments, and other unscrupulous actions of the modern service industry will become a thing of the past with blockchain. This means that every comment, review, opinion, and rating will be honest. Choices will be safe and based on trustworthy information. The assurance of honesty, as well as the absence of a rating purchase system, will expand the choice by including a variety of alternative offers [17].

The listed advantages will eventually lead to the qualitative improvement of tourism with the help of blockchain, which can be used in several areas of tourism. First, among these are loyalty programs, where loyalty points can be assigned to each customer through a digital signature and their transactions are transparent. Second, online booking could become much safer, as blockchain would be able to avoid errors in booking. At the same time, all transactions would be transparent and the payment process would be automated. Third, the identification process at airports can also be connected to blockchain, if a passenger's biometric data is recorded in the system, a specialized machine reads it, and the information about it is passed on through a regular transaction. Fourth, blockchain allows for the automation of the execution of contracts with insurance companies to automatically receive compensation in cryptocurrency.

5. Conclusion

The results of the conducted research confirm the hypothesis that optimization of various spheres of activity involved in the tourism industry by means of blockchain will increase the profits of travel companies and reduce the cost of the final product.

Meanwhile, the issue of studying and implementing blockchain in the tourism industry is very acute today. Distributed registries technology has the potential to dramatically transform the travel industry, which has long called for the implementation of the latest technology. With the use of blockchain technology, a whole new approach to the creation and distribution of the tourism product will be opened to tourists. The tourism industry will be able to eliminate intermediaries, which significantly raise the prices of services. Representatives of the hotel and restaurant business, transportation, and other areas of activity involved in tourism will be able to serve customers instantly without having to deal with the failures of payment and information systems.

The small size of the expert sample can be considered a limitation of our study. The prospects of further research may lie in assessing the effectiveness of introducing stablecoins and various national digital currencies in the tourism industry. At first glance, a system of administration that is rather complicated for an ordinary user is unlikely to have support among consumers of travel services. However, we argue that in times of economic and geopolitical changes,

users are trying to diversify their risks and save on commissions, thereby turning their attention to new products and services.

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