

Analysis of the applicability of blockchain technology in tourism

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Abstract. Digital transformation is the main trend in the development of all sectors of the economy on a global scale. A revolutionary service is currently blockchain technology, which has changed the perception of the service sector. Tourism industry enterprises are involved in the progressive process of introducing an innovative institution – blockchain as an actual driver of optimization and promotion of services. The article is devoted to the analysis of opportunities and information threats of using blockchain technology in tourism, global intermediaries operating in the online market of tourist services are identified. The features of the use of blockchain in tourism are studied, the conditions for the implementation of blockchain technology in tourism are justified, the advantages and disadvantages of using this technology in the industry are analyzed. The problems of introducing the blockchain sector into the tourism industry, which must be solved to obtain an effective result, are disclosed. The conclusion is formulated that the transition to the digital economy, the spread of digital services require further improvement of the use of the blockchain platform in the tourism industry as an innovative service resource.

1 Introduction

The modern era can be characterized as a digital era, where online services in the service sector are actively gaining momentum, displacing traditional ways of customer service due to their ergonomics. The convenience of digital services allows them to be considered as a tool that radically changes the economic content not only of commercial and industrial spheres, but also of education, science, etc.[6, 7]. Scientists state the formation of conditions for the development of a fundamentally new industry in the context of the digital economy, the quintessence of which is the "service provider organization" scheme using a certain set of service options and resources [2, 4].

The analysis of the development of the global tourism industry indicates the preservation of such global trends as automation and blockchain. This is confirmed by the technological forecast of the leading technology provider for the tourism and travel industry - SabreCorporation (NASDAQ:SABR). According to the report of this company, blockchain opens up wide technological opportunities for participants in the global tourism market [10].

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Thus, the analysis of innovative opportunities and threats to the use of blockchain technology in the tourism industry is an urgent problem.

The analysis of recent studies and publications has shown that the issue of the use of digital service in various spheres of socio-economic life of society, including in the tourism industry, is devoted to the publications of E.A. Vasyuta, E.L. Zadneprovskaya, T.N. Poddubnaya, F.R. Khatit, A.R. Rosvati, I. Radhiya, A. Mazlin et al. [1, 2, 3, 4, 6, 7, 12], including the use of blockchain technology (A.A. Nikitina, S.V. Tishchenko, I.E. Saveliev, A.S. Khalfin, etc.) [5, 8, 9]. At the same time, the problem of opportunities and threats of using blockchain technology in the tourism industry remains poorly understood, which is why the relevance of the study is connected. The purpose of the study is to analyze the opportunities and threats of the implementation of blockchain technology in the tourism sector. In accordance with the designated goal, it was supposed to solve the following tasks:

- to explore the modern international practice of using blockchain in the tourism industry;
- based on the analysis of the practical experience of using blockchain to justify the necessary conditions for the implementation of this technology in the tourism segment, as well as to reveal the advantages and disadvantages;
- to identify promising guidelines for the practical implementation of blockchain technology in the tourism industry as a driver of promotion in tourism services in the digital economy.

2 Research methodology

The research methodology is based on the use of general scientific methods of cognition: analysis of foreign and domestic practices of using blockchain in tourism; synthesis (establishing the relationship between world and domestic practices of the tourism industry using blockchain technology); generalization (allowed to identify common trends and advantages of using blockchain in the tourism industry); forecasting (determining the prospects for the implementation of blockchain in the direction of quality management customer service); a method of visual representation of data. The analysis of literature and practice allowed us to identify the conditions for the implementation of blockchain technology in tourism (the presence of global intermediary companies; the structure of the distribution market of hotel rooms in the global market of tourist services; alternative to the already well-known and popular distribution channels of IT-travel companies with more rational solutions in the distribution market of tourist services), the range of their capabilities, directions uses and disadvantages.

The study was based on a system-structural approach to understanding the phenomenon of "blockchain". The theoretical basis of the research is represented by scientific publications of foreign and Russian scientists on the problem under consideration, the informative base is information from the Internet, including information from the leading technology provider for the tourism and travel industry – Sabre Corporation (NASDAQ:SABR).

Structurally, the study includes:

- a study of the world practice of using blockchain in tourism;
- highlighting the conditions, advantages and disadvantages of implementing blockchain technology in tourism;
- determination of prospects for the use of blockchain in the tourism industry in the context of globalization and integration.

3 Research results

The modern market for the distribution of tourist services is divided among several global intermediaries. The dominant intermediary companies include:

- GDS (Global Distribution System) represented by the world's largest booking systems Amadeus, Sabre, Travelport, B2B Internet platforms. GDS enable service providers to upload current information about the hotel room stock, the availability of air tickets, car sharing, etc. to their databases. The main airlines supporting GDS include: Lufthansa, Iberia, Air France, British Airlines, KLM, Austrian, American Airlines, Delta Airlines, TWA. As a rule, GDS are focused on charging a subscription fee for providing access to their own information system and these additional costs increase the cost of tourist services.
- OTA (Online travel Agencies) represented by the largest online travel agencies of the type Booking.com , Expedia.com etc., which are marketplaces that are convenient, first of all, for hotels and connect the hotel with the end user (client), in the case of GDS with agents. At the same time, many OTA can simultaneously be connected to GDS in order to access air tickets, carsharing and the implementation of offers on their websites (for example, Booking.com). OTAs earn 10-30% commission from booking rooms, which is also an additional expense that increases the cost of tourist services. An alternative to OTA is the channel manager project and its Atom-S tool, which allows you to create a website for a tour operator with the ability to host your own tourist products that are promoted to other resources (websites of travel agencies or even companies working in another field) using convenient widgets [11].
- Channel Managers include information systems-gateways that have the ability to connect via API to a variety of OTA and GDS. They allow hotels to be participants in the mechanism of managing sales channels, booking rooms from one place, since a separate hotel can be represented simultaneously in several GDS. The Channel Managers service assumes that its commission is included in the price of hotel rooms, the size of which is insignificant compared to GDS and OTA [2].

The structure of the hotel room distribution market in the global tourism services market is shown in Figure 1.

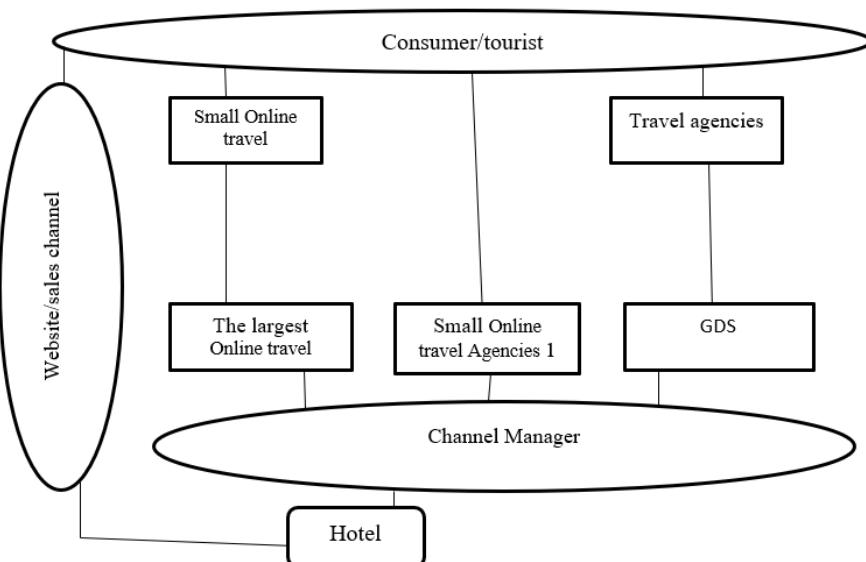


Fig. 1. Organization of the distribution market of hotel services in the world market of tourist services.

New IT-travel companies could become alternative sales channels and compete with OTA and GDS by offering better services (more relevant search results) with a lower commission, which would affect the reduction in the cost of tourist services. Of course, creating a global distribution system or a global online travel agency with a low commission

offer is an extremely difficult task for a new company, since the monopoly of GDS and global online travel agencies limits the development of innovative technologies in the market of distribution of tourist services [3,4].

The solution to the problem of democratizing the prices of tourist products and the innovativeness of the tourist market can be associated with the use of blockchain technology, which, according to Amadeus experts, is among the key strategic directions that have a revolutionary role in the field of travel due to its tremendous potential as a fundamentally new digital mechanism for the exchange of "valuable" data. Blockchain platforms for booking travel services are an open global distribution system, which is managed by a community of participants, and not by a single owner of the platform. They represent decentralized information databases, devices for storing general information of which are not connected to a centralized server, and the information is presented in the form of a repository in the format of a list of ordered records (blocks). Each repository includes information about the creation of the block, as well as links to the preliminary record. Travel service providers are provided with a technical opportunity to upload them to the system more conveniently and free of charge, arbitrarily assigning commissions for the booking procedure for agents. At the same time, a travel agency, a website, a travel startup can connect and implement these resources in the market of tourist services, receiving remuneration. Thus, this avoids a more substantial commission and extra charges of intermediaries-monopolists. Simply put, blockchain is a digital platform for storing information about transactions between consumers of services with the ability to verify their authenticity and information trail in a distributed database by recording. The subjects of the tourist market (tour operators / travel agents) are provided with their own copy of this database, which is connected to many other information carriers on the network. This database has the ability to store an ever-increasing list of ordered block records. The essential role of blockchain lies in its ability to perform three main functions in the financial services sector: registration of transactions, identification of identity, conclusion of contracts.

At the same time, blockchain technology significantly simplifies the procedure for identifying passengers while maintaining the security of their personal data; improves the mechanism for tracking luggage; improves the process of mutual settlements between travel agencies and airlines, including using cryptocurrencies.

The use of blockchain technology in the tourism services market has a wide range of opportunities, which is confirmed by many startups, some of them will be briefly described in Table 1.

Table 1. Startups using blockchain technology.

Startup name	The principle of operation
WindingTree	It is a decentralized distribution network of tourist services, improves the quality of consumer communications with manufacturers using smart contracts, removes unnecessary intermediaries, which helps to reduce the cost and simplify the selection process.
Concierge	It is a mobile application for those users (hotel customers) who wish to book hotel services without commission, have the opportunity to pay for hotel room reservations with fiat funds, cryptocurrency.
Travelflex	It is a special social application with built-in functionality for solving problems of economy and communication of tourists –payments with insignificant commission; communications with integration into social networks, etc.
CoolCousin	It is a mobile application, but with the principle of a thematic forum, where participants receive a reward in the form of tokens for posting content.
MeetnGreetMe	It is a global online platform through which tourists can get comfort services tailored to their financial capabilities and wishes.

Continuation of table 1.

GoCuboLodgeClub	A project that allows tourists to rent a mobile home, while you can pay with tokens.
BedSwap	A project of a system for recording hotel room information using distributed registry technology
Webjet	The system of accounting for hotel rooms all over the world, works on the basis of the Microsoft Azure Blockchain-as-a-Service cloud platform with support for the private version of the Ethereum blockchain; helps intermediaries in the "client – accommodation facilities" chain to receive a certain reward for an intermediary role in the booking process.
LockChain	It eliminates intermediaries, improving the quality of information search and reducing the cost of services.
TravelChain	An information service focused on assisting tourists in determining the best offers and getting a lot of useful tips in forming a travel budget.

Thus, blockchain technology is similar to the Internet in an architectural format, in which users can quickly and conveniently exchange information. In general, this technology opens the way for an innovative mechanism of data exchange between all participants of the tourist services market – from the manufacturer to the customer.

4 Discussion of results

In our country, the process of digitalization of the economy is currently actively underway in the direction of the introduction of pilot projects for the implementation of innovative ideas, including blockchain technology. For example, a number of blockchain banks are assigned the role of a tool for further virtualization of settlements. There is a clear global change in consumer behavior, including the travel industry, with a reorientation to online shopping. Thus, the UK is the leader among European countries, where the digitalization of the tourism sector amounted to more than 90%. The departure from traditional sales (tourist vouchers, transport tickets, etc.) is also largely connected with the introduction of prescribed epidemiological measures by many states, which have adapted the tourism business to the transition to digital service even more quickly as a forced measure.

Let's outline the obvious advantages of implementing blockchain in the tourism sector:

- simplification of financial transactions due to their automation, reduction of the time frame for preparation, execution of documents (for example, contracts), a significant reduction in paper document flow, transparency of operations;
- reducing the costs of financial transactions in connection with the operation in a centralized system (blockchain applications can serve as a global ledger);
- an opportunity in the client service for quick and profitable trip planning through the use of VR technologies, online booking, as well as many other electronic services;
- reducing the cost of a tourist product by reducing intermediaries for its sale, reducing advertising costs, etc.;
- improving the quality of service by switching to a digital format (transparency of transactions for the purchase of travel services; the ability to independently control the flow of funds, expanding the choice of services by tourists from alternative offers and its security based on honest ("not artificially inflated") customer reviews; tracking the movement of luggage through a decentralized database; reducing the time of check-in at the airport through the procedure of retinal scanning or basic fingerprint scanning; allows you to get accurate data of smart contracts for automating solutions for which a tourist insurance policy is required);
- automation of the identity verification procedure, as well as contractors and performers of tourist services (hotels, catering companies, transport companies, cultural enterprises (parks,

museums, theaters), sports (clubs, stadiums), health and wellness facilities and tour bureaus) and the process of purchasing tickets and replacing them;

- a global digital system of loyalty programs that allows you to accumulate bonuses when buying tourist services (the introduction of a single loyalty card that accumulates points from transport companies, car rental services, hotel chains);

- the growth of profitability indicators of contractors and performers of tourist services, which are achieved through the ergonomics of the functioning of information, trade and production activities in the tourism industry sector and getting rid of intermediaries and other third parties.

Consequently, it can be argued that the conditions for planning and implementing travel have improved with the advent of blockchain technology. At the same time, the world experience of the introduction of this technology allows us to identify certain of its shortcomings. The disadvantages of blockchain in the tourism industry are primarily related to payments in cryptocurrency, namely hacker attacks on cryptocurrency payments [8]. The following examples are an argument in favor of such a statement:

- DDS attack on a network of second-level payment channels for the Bitcoin Lightning Network blockchain. The developers did not find any network vulnerabilities, but 200 nodes, or 20% of the network, were disabled (2018);

- "Sybil attack", which is compared to a mental illness, since a hacker assigns several identifiers to one node and thus disrupts the operation of the entire network. There are no trusted nodes in temporary networks (Bitcoin, Ethereum), which results in forwarding each request to several recipients at once. At the same time, users are given the technical opportunity to have several identifiers from different nodes for use in order to divide shared resources. As a result, the received copies form redundancy, allowing you to check the independent data received from the network;

- the risk of encountering fraudulent transactions when choosing a new partner in the blockchain system (you can register from one IP address, and then self-delete and re-register from another IP address);

- "Eclipseattack" or "information eclipse" attack. This attack allows you to gain control over access to a node using certain manipulations in a temporary network (a hacker can "outshine" nodes in order to contact them only with infected nodes). As a result, the fraudster's blockchain becomes the chain of the entire consensus block;

- the need to access the Internet at any necessary moment, which is not always possible for technical reasons and causes some discomfort.

The dominant and simplest tool of a modern blockchain hacker are botnets that spread through droppers - special anonymous malware masquerading as pirated versions of licensed programs. For economic purposes, crypto hackers infect the computers of other Internet users, which results in the receipt of a certain income by cybercriminals. This can lead to the deanonymization of market participants, and the non-attachment of blockchain addresses to the identity due to the lack of strict requirements for disclosure of transaction participants – to the possibility of using these advantages by crypto fraudsters for their criminal purposes, for example, connecting infected nodes to the network and tracking the source of transactions.

A.A. Nikitina and S.V. Tishchenko formulated a number of problems on the introduction of an innovative institution – blockchain, which must be solved in order to obtain an effective result:

- legal, due to the lack of a regulatory framework related to blockchain technology: the lack of development of standards for regulating the mechanism of a distributed database, as well as the parameters of its standardization, the absence of legal norms for protecting the rights of users, as well as bringing to responsibility the participants of the transaction (registration

of users on a digital platform may provoke violations of working with personal data, which creates a certain difficulty in bringing the perpetrators to justice);

- technical: there is a possibility of technical failures with the loading, processing, transmission of data, because the database has a large volume; and the loss of the password will lead to a complete loss of access to the database;
- economic, related to the high cost of acquiring and implementing blockchain technology (technical capabilities, training of personnel to work in the blockchain system), which can sharply limit the mass innovative transfer of travel companies [5].

In the modern world, blockchain is used by the following companies in the tourism industry: Singapore Airlines, Travelport, TUI, Marriott, Webjet, AXA. In Russia, initial attempts are being made to introduce blockchain innovations, primarily in the banking system, as well as in the tourism industry. For example, the Green Track blockchain project is being implemented in the Kaluga Region in the field of nature-oriented and cultural and educational tourism. The development of a competent state policy on the legal regulation and implementation of the blockchain institute in the tourism sector is quite obvious.

5 Conclusion

Summing up, we can identify several areas of application of blockchain technology in the functioning of the tourism industry:

- in loyalty programs by providing customers with points through digital signature and transparency of their transactions;
- the online booking procedure, which makes it more reliable, because blockchain allows you to avoid mistakes when booking, overbooking, and transactions remain transparent;
- identification of passengers at airports in the presence of biometric data in the system;
- automated conclusion of contracts with insurance companies, receipt of compensation in the user's cryptocurrency wallet.

In general, the tourism industry has yet to further improve the use of blockchain technology in the direction of customer service quality management. In the future, this technology will help to implement a mechanism that allows all subjects of the tourism business to interact ergonomically, including in real time, optimizing the service based on new digital knowledge and capabilities and making the world more accessible and open for each client. Meanwhile, it is necessary to point out the initial stage of the development of blockchain innovations in the world. The lack of real results of its potential, legislative regulation in the field of domestic tourism business does not allow making a unilateral conclusion about its global positive impact on tourism companies. All this makes it possible to identify a problem field for further scientific research in this area.

The authors declare that there is no conflict of interest.

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