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ТЕХНОЛОГИЯ РАСПРЕДЕЛЕННОГО РЕЕСТРА И БАНКИ: ТЕНДЕНЦИИ И ПЕРСПЕКТИВЫ

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Аннотация

Исследование направлено на выявление основных тенденций внедрения технологии распределенного реестра (DLT) в традиционный банковский бизнес. Оно содержит базовый анализ, эмпирический анализ практических примеров DLT, выявление существующих барьеров реализации, прогноз DLT и среднесрочных объемов рынка криптовалют в банковском секторе. Даны рекомендации по перспективам практического использования технологий банками и финансовыми компаниями. Основное внимание в исследовании уделяется самой технологии (DLT), а не анализу рынка криптовалют как одному из «продуктов» технологии. Финансовый сектор (BFSI), как сейчас, так и в среднесрочной перспективе, сохраняет свою роль в качестве «основного игрока» в процессах реализации DLT. В банковской отрасли существует возможность быстрого изменения существующих бизнес-моделей и процессов в контексте «невещественности» предоставляемых услуг и быстрого развития цифровых технологий. Это вызывает у банков внимание к DLT. В стратегических перспективах предпочтение должно быть отдано проектам с более низким энергопотреблением при обеспечении необходимой скорости и безопасности транзакций.

Ключевые слова

Технология распределенного реестра (DLT), банки, блокчейн, майнинг, интерфейс прикладного программирования (API), криптовалюта, банковские услуги, финансовые услуги и страхование (BFSI), технология «знай своего клиента» (KYC), торговое финансирование.

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DISTRIBUTED LEDGER TECHNOLOGY AND BANKS: TRENDS AND PROSPECTS

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Abstract

The research focuses on the identification of main trends in implementation distributed ledger technology (DLT) into the traditional banking business. It contains basic background analysis, an empirical analysis of practical examples of DLT, identification of existing implementation barriers, forecast of DLT and cryptocurrencies medium-term market volumes in the banking. Recommendations on the prospects for practical use of technology by banks and financial companies are given. The focus of the study is on the technology itself (DLT), rather than on the cryptocurrency market analysis, as one of the «products» of the technology. The financial sector (BFSI), both now and in the medium term, retains its role as a «main player» in the DLT implementation processes. In the banking industry, there is the possibility of rapidly modifying existing business models and processes in the context of the «immateriality» of the services provided and the rapid development of digital technologies. This causes their attention to DLT. In the strategic prospects, implementation preference should be given to projects with lower energy consumption while ensuring the required speed and security of transactions.

Keywords

Distributed Ledger Technology (DLT), Banks, Blockchain, Mining, Application Programming Interface (API), Cryptocurrency, Banking, financial services and insurance (BFSI) Sector, Know Your Customer (KYC) Technology, Trade Finance.

1 Introduction

Banks, as an element of the financial sector of the economy, are pioneers in the implementation of distributed ledger technology (DLT). On the one hand, this is connected with the understanding by banks of their own role in ensuring the effective functioning of the economy and modern market infrastructure: speed and reliability of transactions, optimal redistribution of resources between sectors and economic entities. On the other hand, due to their high degree of technological readiness for operational and high-quality digitalization of services and business models [25; 26; 27].

Of course, the commercial component of the participation of banks in the «breakthrough» technologies of digital transformation of the economy is also very important. The intangibility of banking services predetermines the possibility of their quick implementation and scaling, which ensures a high profitability of introducing new financial solutions demanded by the market. DLT is one of the illustrative examples.

2 Theoretical Grounding and Methodology

The research focuses on the identification of main trends in implementation DLT into the traditional banking business. It contains basic background analysis, an empirical analysis of practical examples of DLT, identification of existing implementation barriers, forecast of DLT and cryptocurrencies medium-term market volumes in the banking. Recommendations on the prospects for practical use of technology by banks and financial companies are given. The focus of the study is on the technology itself (DLT), rather than on the cryptocurrency market analysis, as one of the «products» of the technology for which «the final point has not yet been set» (in case of its social expediency and final legitimization).

The DLT theme is quite new in world science. Its theoretical base is only being formed. The analysts are based on practical cases of technology implementation, described in Internet resources (on websites and in press releases of news feeds) of the developers themselves, the companies «trailblazers» of implementation, as well as financial regulators and banking associations. Such as, Microsoft, Hyperledger, Cointelegraph, R3, SWIFT, MarcoPolo, CBR and others. In the course of work on the study, information from more than three dozen sources was analyzed and systematized, 22 of them are given direct links.

DLT is an approach to the exchange and storage of information, in which [5]:

- «each participant may have a full copy of the registry;
- synchronization of copies of the registry is based on a protocol for achieving a distributed consensus, that is, an agreement among the participants to add new information;
- each participant of interaction can have access to the transaction history»

Distributed ledgers allow us to keep up-to-date copies of the database decentralized (on several nodes), thereby providing enhanced operational stability. In this case, the information is shared (equivalent copies are distributed in different parts of the world), with synchronization using special algorithms.

Blockchain is only one type of DLT system, i.e. not all DLT systems are blockchain. Ethereum technology is a significant development of the blockchain, focused on the possibility of creating functional applications, including new cryptocurrencies, and also has a tool to fulfill the pre-prescribed conditions, which are referred to in the publications as «smart contracts». Another technology of the DLT family is the directed acyclic graph system (DAG), an alternative to the blockchain technology, which has a high potential for increased usage. DAG does not use a chain of blocks, but a network, which allows for more transactions per unit of time and solving scaling problems that limit the spread of the classic blockchain.

It is expected that Blockchain scaling, which controls the number of computers / nodes required to verify each transaction and efficiently divide work, will be fast enough to provide the Internet of things and compete with the main payment intermediaries (VISA and SWIFT) of the banking world [3].

The banking sector is focused mainly on the development of closed and hybrid DLT networks in connection with the possibility of creating mechanisms for managing the network, restricting access to it, as well as controlling and supervising the actions of participants. The key benefits of implementing DLT for financial sector participants are: continuity and assurance of transaction processing, greater transparency of calculations, a transition from documenting the processes to digitalization, and increased stability due to data replication. When making cross-border payments, DLT-based solutions allow direct execution of transactions, bypassing various intermediaries. This not only speeds up payments, improving the quality of customer service, but also allows banks and customers to save on commission fees to intermediaries.

International standardization of DLT speeds up and simplifies the process of interaction of banks and payment systems from different countries with each other. One example of standardization is the development Interledger Protocol (ILP) for use as a uniform open standard.

The prerequisites for applying DLT in the banking business are:

- lack of uniform standards and «open» communication of payment and trading systems with each other,
- local nature of critical data for risk analysis,
- slow, inflexible, and, therefore, costly integration of unrelated IT systems of various participants in different banks, customers and markets,
- the inefficiency of cash flow, liquidity and risk management in the context of fragmented storage and the lack of universal solutions,
- duplication of functions and, incurred by each parties to financial transactions, the costs of transactions, reconciliation, accounting and control functions.

3 Empirical Analysis, Trends and Cases

Analysis of practical examples of the implementation of projects related to the DLT shows that nowadays advanced technologies in the financial sector are very quickly transformed into economically viable projects, as there are no restrictions related to the physical movement of products in space. Inspired by the impressive growth of the cryptocurrency market in 2012–14, many of the largest banks and exchanges started to launch their own DLT implementation projects

since 2016. Established in December 2016 with the participation of the Russian banking regulator, the Association for the Development of Financial Technologies (FinTech) selected the following technological solutions related to DLT to test the possible implementation:

- depository accounting of electronic mortgage bonds,
- decentralized ledger of digital bank guarantees,
- support trade finance using letters of credit (with the exception of paper workflow, which will reduce the overall average duration of transactions by 15 days),
- direct system of exchange of financial communications (bypassing financial intermediaries) with the identification of counterparties, their control and archiving.

Distributed ledger technologies allow us to capture meaningful data in real time, automatically check them and distribute them to the right units. Costly and time-consuming data reconciliations are eliminated, and instant verification reduces the risk of fraud. In addition, data integrity is guaranteed, and a high-tech platform provides up-to-date analytics. In the areas of payments and retail lending, a reduction in time and labor costs for approval is expected, a reduction in the risk of errors in the framework of transactions by 43% [13]. Currently, 90% of North American and European banks are exploring DLT. The potential cost savings on compliance according to experts is 30–50% [17].

If financial institutions trust the DLT records as a sign that the obligations are fulfilled and the funds are irrevocable as soon as the settlements are completed, the beneficiary banks could speed up the process of transferring funds to customer accounts, from days or more, to a few seconds. The development of DLT as a result of the introduction of related physical technologies (quantum technologies, new materials, and so on) will require a longer period of development and adaptation, which may slow down their implementation in the medium term.

Anyway, in the current market conditions, banks are forced to rapidly introduce modern digital technologies, including DLT, because otherwise they will quickly lose their leadership to companies of related industries: IT-integrators, Internet platforms, social networks and mobile operators. For example, one of the largest Russian mobile operators Megafon, in cooperation with Sberbank and Alfa-Bank, has already successfully used DLT not only when placing its own bonds on the market, but also in a payment transaction with its partner MegaLabs under a renewable loan agreement [9].

Other examples of DLT implementation in the banking sector:

At the level of banking regulators and international financial development institutions:

In 2017, the **World Bank** established a blockchain laboratory to use the blockchain as a tool for building and restoring trust in institutions [10], and also launched a pilot project to issue two-year DLT-based experimental bonds to finance sustainable development in developing countries.

The **ECON committee** in the summer of 2018 included cryptographic tools and blockchain as an integral element of the European Fintech revolution [11], and also decided to exempt cryptocurrency transactions from VAT [8].

The **Bank of England (BoE)** set a modernization task based on the country's DLT payment system by 2020, began developing its own digital currency, as well as regulating ICO. According to the calculations of the Bank, only the creation of new national cryptocurrencies within individual countries and unions will allow states to get an additional 3% of GDP growth. This figure is achieved through new low-cost transactions.

The US was the first country to begin regulating the ICO. As early as July 2017, the **US Securities and Exchange Commission** (SEC) published its position on ICO and digital assets, stating that ICO can sometimes be viewed as securities.

In September 2018, the **People's Bank of China**, together with five commercial banks, launched a pilot project to create a blockchain platform for financial trading in Shenzhen [6]. The technology reduces corporate and trade financing costs, including through online factoring, settles cross-border payments, and solves problems with financing low-credit companies due to online credit risk control and information security support. The advantages of the technology are also: high speed of payments, transparency and the impossibility of fakes. If the experiment succeeds, it is planned to create similar ecosystems in 9 different cities in China.

Representatives of **Western Union** said they are testing Ripple technology – a promising development in the field of DLT, which makes it possible to carry out almost instant global transactions. In addition to the development of projects for the implementation of distributed registries in international payment systems, **Ripple** developed Xpring technology to incorporate the untapped potential of the XRP registry and the Ripple experience beyond the company's main focus. The main directions of implementation are in the areas of identification of subjects of transactions, trade finance and confirmation of the origin of goods.

In 2018, with the support of the FinTech association, the Russian national project-platform **MasterChain** was launched, whose members are: **Bank of Rus-**

sia, Sberbank, VTB, Alfa-Bank, Tinkoff Bank, Rostelecom and some other Russian financial institutions. The basis of the platform is the Swiss development Ethereum. MasterChain supports smart contracts and is open to new members. The project is designed to «digitize» and, therefore, speed up and reduce the cost of such processes as: registration of rights and mortgages on real estate, trade finance, ensuring the execution of tenders and large contracts, combating fraud and already has several completed cases [18].

At the level of commercial banks

Bank of America Merrill Lynch in collaboration with Microsoft have created a centralized data warehouse based on DLT. As a result of the digital automation of the credit assessment process, the time for issuing standby letters of credit (SBLC) was reduced from 3–5 weeks to 3–5 days. The solution also reduced the risk of counterparties and increased audit transparency [1].

The largest Dutch banks controlling 90% of the country's retail banking market (**ABN AMRO, BNG, ING Group, Rabobank, SNS**) already use DLT in their operations. Two of them (ABN AMRO and Rabobank) also joined the innovative project SWIFT (proof the concept, PoC) of cross-border payments, based on DLT. This concept allows banks to reconcile their international nostro accounts in real time (there are more than two dozen global banks from different countries participating in this project) [21].

In early 2018, a consortium of 61 banks of Japan and Korea (**Japanese Bank Consortium**), which controls more than 80% of national banking assets, created the digital application «MoneyTap» on the Ripple blockchain platform for making retail payments [7]. This application allows you to make payments 24/7.

In 2015, the Swiss bank **UBS** launched its own internal blockchain program called «Crypto 2.0 Pathfinder», and in collaboration with **Microsoft** is developing an autonomous distributed reporting reconciliation system (Madrec) – an infrastructure that allows each participant to submit and correct their own data on Blockchain Ethereum for on-line review [1].

In 2013, the **R3 banking consortium** (R3 CEV LLC) was established in US to test and develop blockchain products in the financial sector for such tasks as new trading and settlement platforms, securities issue support systems, interbank payments. In 2016, the consortium together with leading blockchain companies created an open platform **Corda** 1.0., In 2018 introduced Corda Enterprise – a commercial distribution of Corda to meet the needs of the business sector. Now the R3 consortium includes more than 70 major international financial organizations, such as Goldman Sachs, Citigroup, Bank of America, Morgan Stanley and others

[20]. The project works with an ecosystem of more than 200 banks, financial institutions, regulators, trade associations, professional services firms and digital technology companies.

In 2017, in cooperation with R3, using DLT, one of the fastest growing global trade finance networks **MarcoPolo** was launched. The network uses open application code (API) and Corda technology, which together promotes «seamless» data integration, creates the best experience in working with clients, reducing costs, time and risks. The potential of the market for financing world trade is huge and amounts to about 40 trillion USD [17]. Network services are already used by: ING, Commerzbank, BNP Paribas, Anglo-Gulf Trade Bank, NatWest, Natixis, Bangkok Bank, Standard Chartered Bank, OP Group, SMBC, DNB, Danske Bank and LBBW. In addition to banks, other members of the trading ecosystem can join the Marco Polo network, including ERP providers, credit insurers, B2B networks, logistics companies, service providers and others. **Commerzbank** participating in the project sees a great future in the use of DLT in trade finance «which is a very manual paper business» [2], by ensuring the «seamless» integration of all participants in transactions using the API.

Thanks to the DLT, the possibility of attracting **«Islamic» banking and financing**, previously available only to large institutional investors due to the financial and legal complexity of issuing, has been greatly simplified. So, Jibrel recently announced a partnership with **Abu Dhabi Global Market** (ADGM) and **Al Hilal Bank** to create the next generation of compatible deals with **Sukuk bonds**.

According to the representative of the largest Russian private bank **Alfa-Bank**, «the implementation of corporate settlements at the interbank level using the technology of distributed ledgers opens up new opportunities for the entire market» [9].

Existing barriers to DLT implementation in the banking sector:

Protection of information

A key role in ensuring the security of distributed ledger systems is played by cryptography, since, in the event of the loss or disclosure of cryptographic keys or access data, there is a risk of incurring irreparable losses of money and assets. Distributed information storage implies a copy of a distributed ledger for each network participant, which makes it difficult to ensure the confidentiality of stored data and the delimitation of access for different network participants.

Technological restrictions on data storage and speed

The need to store large amounts of data with multiple copies requires an IT infrastructure with a high potential for expanding the «memory» capacity. Cryptograph-

ic checks and matching algorithms increase the waiting time and limit the number of transfers that distributed ledger networks can process simultaneously. «For example, one of the urgent tasks of the Bitcoin network based on the blockchain technology is overcoming the network's limitation of seven transactions per second. For comparison: the operator of VISA payment cards regularly processes 2,000 transactions per second, and its peak load is 56,000 transactions per second»[5].

The problem of low performance of the blockchain was observed, for example, in the Ethereum network at the end of 2017 after the launch of CryptoKitties, an application based on the DLT. For the month of operation, the number of transactions in the Ethereum network increased 20 times, and by the end of the month 25% of the network computing power was spent on CryptoKitties, while the Ethereum network itself almost stopped, there were significant backlogs in transactions. The poor performance of many current DLT solutions is an obstacle to the active use of cryptocurrencies as a means of payment.

High power consumption to maintain platforms

The development of technology requires high energy consumption, due to the need for significant computing power to implement the key blockchain algorithm (mining). The annual power consumption of a crypto network is equivalent to the energy consumption of some countries.

Restrictions artificially created by large corporations, part of the income of which is generated by performing intermediary functions

These restrictions have a negative impact on the pace of DLT implementation, but in the long run these barriers will be overcome as a result of the overall transition to the global digital economy.

Legislative (normative) regulation

The need to comply with the introduced laws and regulations for working with appropriate technologies often leads to higher costs of implementing DLT. However, in the long run, this regulation has a positive effect on the market, since makes it more "transparent" by minimizing the risks of fraud.

As India's experience has shown, the restrictions imposed on cryptocurrency services to banks in order to limit overall cryptocurrency activity in the country are not effective, since they lead to the creation of P2P platforms that completely force banks out of retail traffic when calculating with digital money.

Forecast of DLT and cryptocurrency market volumes in the banking business segment in the medium term (until 2024)

The total volume of the DLT development market in 2015 amounted to 509 million USD, in 2016 it exceeded 600 million USD, and in 2017 it increased

to more than 700 million USD. According to analysts of the Market Reports Center agency and TechStartups platform information in the medium term (until 2024) the market volume can reach from 7.5 to 61 billion USD [15; 22]. According to forecasts of the American analytical company Transparency Market Research, the global DLT market in 2024 will reach $ 20 billion [12]. In August 2018, Business Insider estimated the potential of the DLT market by 2024 at 16 billion USD [14], which, in our opinion, is a more realistic forecast for the implementation of the optimistic scenario (due to the active introduction of DLT into various areas of society, changes in processes and business-models). The average annual growth rate (CAGR) of the market volume is forecasted at the level of + 75%.

The share of the financial sector (BFSI) in the total DLT market is currently around 30%. Experts predict that in the medium term (3–5 years) it will even increase to 35%, while maintaining the sector's leading position in the market.

The leader in investing in the development of DLT is the United States, providing more than 30% of global investment. Following were Western Europe, China and the Asia-Pacific region. At the same time, Canada (87%) and Japan (109%) demonstrate the highest rates of average annual growth in technology spending (CAGR). By the end of 2017, the market volume in Russia reached 1 billion RUR. The total capitalization of the cryptocurrency market in the medium term (until 2024), according to various estimates, can range from 1.5 to 10 billion USD. The basis of this forecast was the assumption of the use of cryptocurrency as a payment, not a speculative tool.

4 Practical recommendations on the prospects for the use of DLT in the banking business

In our opinion, the key areas of BFSI technology application in the near future will be:

Cross-Border Payments and Clearing

The use of DLT in cross-border calculations will eliminate unnecessary links of national trusted intermediaries by creating a single center for information exchange. This will reduce the number of operations for reconciliation and harmonization, and, therefore, to save time and financial costs. An example of such an innovative platform is Clear, which uses smart contracts. This solution supports system scalability, contract confidentiality and first-class business logic [4].

The introduction of DLT allows you to increase the speed of the transaction while reducing their cost for customers, which creates a positive effect on the development of world trade as a whole. Technologies significantly speed up existing communication systems, including SWIFT, which processes payments up to 3 days.

Foreign Exchange (FX) operations: purchase and sale of foreign currencies and other exchange-traded assets

DLTs provide high speed of carrying out these operations while maximally satisfying the wishes of the clients carrying out these transactions. The search for pairs of the most optimal transactions for clients is performed using special algorithms within the framework of uniform global registries. The most well-known platform for such transactions is Ripple, which has open program codes (API), as well as an unchanged fixed amount of internal cryptocurrency emitted, which is a universal «asset swap standard». The procedure for the coordinated exchange of assets does not exceed a few seconds and is low cost, since does not require mining.

Global data storage and standardization

DLT by creating a unified information exchange center can potentially facilitate auditing and tax operations, as well as simplify regulatory reporting (by standardizing data records), which at the global level will provide significant time and cost savings. DLT can selectively provide «paperless» access to internal information of banks for banking supervisors and auditors, which, on the one hand, reduces the risk of subsequent fraud, and on the other hand, it saves banks time and resources on interacting with controllers. Centralization also provides increased transparency of operations for banks and customers.

The development of technology «Know Your Customer» (KYC / AML) to collect and centralize customer information allows banks to have a complete understanding of customer transactions, while simplifying reporting in the context of countering money laundering and reducing transaction monitoring costs.

Consumer lending, corporate and trade finance

Due to the ability of the parties in the trade chain to register their activities and carry out activity checks, DLT provides faster and less costly supply chain management for all participants in the process. Together with the standardization and digitalization of the processes of documentary support of transactions, this significantly speeds up transactions while maintaining a high level of control and trust. This increases the efficiency of the use of liquidity, as well as business management in general.

DLT effectively helps to implement corporate, interbank and trade finance schemes, incl. on the principle of «Islamic finance», in which investors are provided with shared property and receive periodic payments proportional to the invested capital.

Customer loyalty program support

Implementing loyalty programs with the help of DLT increases the value of points for all participants: customers (due to their liquidity and potential cost growth) and for banks and their partners in a loyalty program. It reduces costs through the use of smart contracts that provide current and transparent operational data to legacy systems and reduce the risk of errors and fraud. Examples of projects in this area are Qiibee and Remloyalty, providing a high degree of reliability and liquidity of using loyalty points.

Lending, operations with securities and other financial assets

DLT has a high potential for minimizing internal costs and risks of banks in operations with securities and other assets due to the organization of a unified accounting infrastructure. This applies not only to trading, but also to mortgage lending (centralized storage and digitalization of «mortgages»), as well as corporate lending (accounting and control of collateral, credit risk assessment).

In the future, DLT will provide an opportunity to review the traditional ways of creating, owning and transferring financial assets. Bank customers will be able to access their accounts for the accounting of investments and other assets, as well as transactional data through a direct «connection to the ledger» in real time. Banks and other financial intermediaries will be able to significantly reduce transaction processing cycles through «clearing» in a global system. The availability of information about the payments made and received in real time allows both banks and customers to know the current balance of all accounts and fund their clients more efficiently and reasonably, effectively managing liquidity.

5 Main Conclusions

The financial sector (BFSI), both now and in the medium term, retains its role as a «locomotive» in the DLT implementation processes. In the banking industry, there is the possibility of rapidly modifying existing business models and processes in the context of the «immateriality» of the services provided and the rapid development of «digital» technologies. This causes their attention to DLT.

The possibility of forming only one statement available to all participants in the transaction process, stored in a secure format and a legally significant document, ensures the attractiveness of the DLT for both banks and customers. It is necessary to strive for this goal: both technologically and legally.

In the strategic prospects, implementation preference should be given to projects with lower energy consumption while ensuring the required speed and security of transactions.

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