FACTA UNIVERSITATIS
Series: **Electronics and Energetics** Vol. 37, Nº 1, March 2024, pp. 125 - 133
https://doi.org/10.2298/FUEE2401125K

Original scientific paper

BLOCKCHAIN AND OUTSOURCING FOR SPECIALISED BANKING COMMUNITIES

Inna Alexandrovna Kruglova[1], Valery Alexandrovich Dolbezhkin[2], Shota Andreevich Egutia[2]

[1]Anatoly Sobchak International Banking Institute, St. Petersburg. 60, Nevsky ave., St. Petersburg, Russia
[2]Department of Banking Business and Innovative Financial Technologies, Anatoly Sobchak International Banking Institute, St. Petersburg. 60, Nevsky ave., St. Petersburg, Russia

ORCID iDs: Inna Alexandrovna Kruglova https://orcid.org/0000-0002-2064-428X
Valery Alexandrovich Dolbezhkin https://orcid.org/0000-0003-2662-202X
Shota Andreevich Egutia https://orcid.org/0000-0001-8114-1689

Abstract. *This article explores the potential benefits of implementing blockchain technology and outsourcing contracts in the new market participants called specialised banking communities, formed as part of the banking sector reform in Russia. The authors compare this experience to the European model of banks' unions in institutional protection schemes (IPS), highlighting similarities and differences. They emphasize the objective properties of banking communities as subjects of production cooperation in the financial sector. The article also discusses the parameters for implementing a private blockchain network, specifically focusing on the priorities of PoS (Proof of Stake) and DPoS (Delegated Proof of Stake) consensus algorithms. To optimize operational resources, the authors recommend the use of outsourcing contracts for the better distribution of digital production capacities within these communities. Overall, this article highlights the potential of blockchain technology and outsourcing contracts in improving the efficiency and effectiveness of specialised banking communities in Russia.*

Key words: *banks, specialised banking communities, financial sector reform, blockchain, outsourcing contracts*

1. INTRODUCTION

Digitalisation of the economy causes the emergence of new exchange products, new economic relations, new economic entities on the market, which as a result significantly affects the change in the conditions of competition [1]. In the segments of the economy of nonmaterial production, and most strongly - in the financial sector, there is a rapid

Received December 1, 2023; revised January 30, 2024 and February 29, 2024; accepted March 03, 2024
Corresponding author: Inna Alexandrovna Kruglova
Anatoly Sobchak International Banking Institute, St. Petersburg. 60, Nevsky ave., St. Petersburg, Russia
E-mail: kruglovaia@ibispb.ru

fragmentation into the largest and small entities, which differ significantly in terms of competitive strength, and, despite the increasing availability of new technologies and the preservation of the practice of "niche development" of small banks, the risk of prevalence of oligopoly is objectively increasing. One of the possible compromise solutions to mitigate this risk, the authors consider a forward-looking reform of the sector, the concept of "Specialised Banking Communities" (SBC), presented by the Bank of Russia in the summer of 2023. [2]. In this publication, the authors consider small bank communities as market entities with new and positive conditions for the adoption of new digital technologies, in particular blockchain or, more generally, distributed ledger. In addition to the advantages of market stability, group protection from risks, small bank communities can obtain additional economic benefits from optimising the exploitation of their aggregate digital production resources through outsourcing. The object of the study is the reforming of the financial sector under the influence of digital economy factors. The problems and advantages of special banking communities using blockchain technology and outsourcing relationships are the subject of this study. The relevance of this study is due to the novelty of the structure reform, the inevitable occurrence of objective risks and problems in the financial sector, as well as the lack of actual publications on this topic.

The article consists of an introduction, the first section describing the essence of the structural reform of the banking sector, the second section discussing the prospects for the introduction of digital technologies in new forms of cooperation between banks and the conclusion containing the main results and judgments of the authors.

2. The Specialised Banking Communities Concept as a Reform of the Banking Sector

Creation of banking communities to reduce the significance of objective risks of the financial sector has been known for a long time, and it is most marked in numerous national systems of protection of bank deposit guarantees. The European Community practices a more universal mechanism of banks' uniting in the organisational form of "Institutional Protection Scheme" IPS [3]. IPS for a group of banks is defined (Art. 113(7) Capital Requirements Regulation (CRR) v. 2013 [4]) as "a contractual or statutory liability arrangement which protects those institutions and in particular ensures their liquidity and solvency to avoid bankruptcy where necessary" [5]. This is the main purpose of the alliances. The European IPSs have between 40 and 840 members each, and this very large size indicates the prioritisation of "market-wide" objectives for the establishment and operation of the associations. In a number of cases, the institutional protection scheme with its own reserve fund acts firstly as a deposit protection mechanism (1 in Austria, 2 in Germany). This is a significant market factor, as in the eurozone this mechanism covers 23.3% of deposits [6].

As accompanying positive features of IPS are envisaged opportunities for member banks to promote a common brand name (e.g. Raiffaizen) and to obtain transaction cost savings on co-operated deals.

The Russian version of this regulatory reform is presented in 2023 in the format of the concept of special banking communities (SBC) [2]. The main objective of the reform is to ensure stable operation of the financial sector and sustainability of the banking system of credit institutions under the objective risk of non-equilibrium competition (risk of asset concentration). The task of additional deposit protection is not relevant for Russian SBCs

due to the flawless operation of the federal system of mandatory deposit insurance since its establishment in 2004. In Russia in 2023 there are just over 300 banks operating, and the banking sector is characterised by high concentration: the first 100 banks own - 98% of the sector's assets, including the first 10 largest - 77% [7]. In general, based on the known number of banks, it is unlikely to create one or two large SBCs with more than 100 participants. The prospect is seen in the creation of a small number of associations with the number of participants of 5-20 banks.

Large systemically valuable banks can create an "umbrella" SBC under their aegis, acting as a franchisor for small and medium-sized participants. In such an organisational structure, there is an absolute leader with advantages in capital, technology, competences and defining the rules of joint work.

Another organisational form of SBCs is an "alliance", in which participants have equal or comparable status, and coordination is ensured by a specially created central body. In this variant, small banks participating in SBCs mutually complement each other, retaining a certain degree of independence, even sovereignty, in terms of a standalone client base, product brand, owners' preferences, industry/regional client competences, risk management specific to the client base, and possibly market and captive funding.

A significant feature of Russian SBCs (compared to the European IPS practice) seems to us to be the emphasis on production co-operation - accelerated mutual settlements, cross-selling, delegation of functions, and resource sharing. It is this aspect of the reform that attracts our attention, while its main objective - to increase the sustainability of the bank sector by equalising the size of competing entities - is certainly recognised, but is not the subject of study here.

In the following, we consider SBCs in the structural version of an "alliance".

The authors consider that the combination of objective properties of such associations of banks forms a specific favourable environment for the effective application of new digital technologies. Such properties of SBCs (specific in relation to other forms as groupings, associations, ecosystems) can be considered as follows:

- Homogeneous regulatory environment (practice), as all SBC participants are within the prudential supervision of the Bank of Russia;
- Practically homogeneous assortment programme within the framework of a banking licence, taking into account the commoditisation of banking products;
- Homogeneous environment (structure, sources) of useful data used for planning/ managing its market development;
- Common strategic objectives of survival, preservation of business in conditions of growing high-tech "new" competition (fintech/bigtech);
- Similar or compatible production resources, predominantly digital;
- Possibility of co-operative forms of sharing expensive technologies;
- Arbitration of conflicts of interest based on collegial management (in the version of SBC "alliance").

The creation of SBCs within the financial sector will contribute to the increase of banks' business efficiency through access of small entities to expensive resources (co-operative supply), faster introduction of new technologies into the nominal closed system of users, and increased efficiency of exploitation of production resources available in SBCs. The question of the rational number of SBC participants remains open, as the formation of a co-operative environment will require investments, the payback of which directly depends on the aggregate size of the customer markets served by SBC banks and the network revenue effect.

3. Technologies to Improve the Effectiveness of Specialised Banking Communities

Taken together, the characteristics of SBCs form specific conditions for the application of unifying technologies. Among such technologies we will single out two.

These are digital production technology of distributed ledger, in a particular case - blockchain. And organisational technology - outsourcing, in a particular case outsourcing of financial functions, (operations, microservices), i.e. actions to transform the basic resource directly affecting the characteristics of the final financial product (security, speed, accessibility).

3.1. Blockchain and distributed ledger technologies

Blockchain, which appeared in 2009, is now widely known due to the popularity of cryptocurrencies derived from it, and relatively widespread due to its objective technological advantages in the field of secure data and rights turnover. The properties of blockchain and its advantages and disadvantages of implementation in the financial sector are actively discussed in scientific and practical areas [8, 9, 10]. In banking, blockchain is used for remote and trusted customer identification, facilitating cross-border multi-currency payments, bancassurance, issuance of stablecoins and tokens both for customers and for the bank (Commercial Bank Money Token, (CBMT), JPM Coin [11], HSBC tokenised deposits) to optimise accounting policies [12], trade finance (e.g. factoring), borrower scoring, and intra-country payments [13]. The global payment system SWIFT is experimenting with blockchain in a sandbox testing triggered payments for DLT solutions, currency exchange, delivery versus payment, and liquidity preservation mechanisms [14]. The application of blockchain by banks to ensure the security and efficiency of the credit system is actively discussed by experts [15, 16]. A special place in the complex relations between blockchain and banks is occupied by CBDC - a new tool of payments and settlement built on blockchain and promoted by national central banks as a mandatory element of the monetary system of the state. This is the prospect of the next 2-5 years and banks are involved in piloting their national projects, including in Russia.

One of the barriers to the widespread use of blockchain technology in the financial sector is "scaling," i.e., the limited ability to increase the number of nodes in the network. In the case of blockchain application for performing functions in SBCs, this barrier is not significant, as the number of required nodes will not exceed several dozens (conditionally - according to the number of participant banks), and it is acceptable for all practically developed blockchain algorithms. The principles of governance and consistency of interests in SBCs determine the rationality of using a private blockchain (lesspermission), with strong verification of all nodes, which provides an additional element of protection of data circulating in the SBCs blockchain.

The small number of nodes in the SBC blockchain, which are relatively powerful compared to personal users, necessitates the distribution of typical distributed registry functionalities among participating banks. A rough example of distribution is shown in Fig. 1.

Also, based on the above properties of SBCs, we can preemptively suggest the choice of a consensus algorithm. The small number of nodes in the network and the presence of a central SBC coordinator directly imply the prioritisation of two algorithms out of the known dozen of generally applicable ones. These are Delegated Proof-of-Stake (DPoS) based on delegating validation authority to specific nodes in the network, and Proof-of-Authority (PoA) based on directly specifying validator nodes (a default list of unique nodes (dUNL) authorised at a time interval). Such algorithms have already been practically tested specifically in the financial sector, e.g. Ripple's XRPL (about 40 dUNL validators out of the

available 118 in 2022), and Hedera/Phantom (64 validators as of early 2023). Such a limited blockchain does not require coin mining, which is generally a source of volatility in the internal currency, negatively impacting the current transactions costs of nodes.

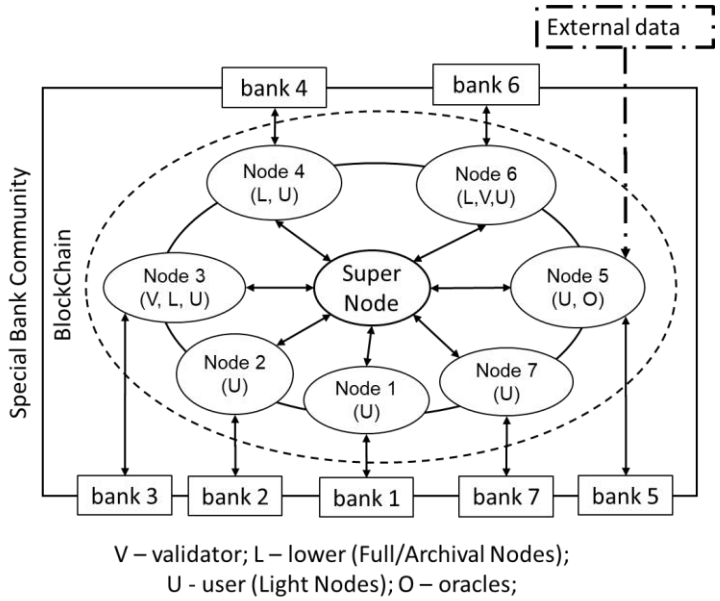

Fig. 1 A rough diagram of the distribution of blockchain functionalities in a small number of SBC nodes. Compiled by the authors.

SBC participants retain legal autonomy and while conducting their data processing for marketing policy management must each comply with personal data protection requirements. It is blockchain that makes it possible to organise a reliable exchange of significant data on a client transaction without disclosing the personal data of the bank's client. In particular, a protected and guaranteed reliable credit history of each client of any SBC participant is formed. Inevitably overlapping interests of SBC participants, e.g. in terms of customer lending, require minimising the risk of cross-lending within the SBC, since in the context of consolidated responsibility for regulatory compliance, the credit risk of internal over-lending is multiplied for the SBC. The high data security of blockchain allows to eliminate or limit overcrediting without disclosing personal data. A special case of credit risk is the simultaneous duplicate use of loan collateral by one borrower at different banks, or by multiple co-owners of the same collateral at different banks, which are fraudulent.

The direct analogy of this banking challenge to a key blockchain challenge - blocking a double-spending attack - is noted here. A "51%" attack plan is unlikely in reality, but "Finney attack" and "race attack" options should be considered. Figure 2 presents a rough scheme of interaction of credit organizations in solving this task as active nodes of the blockchain network.

Blockchain will allow to securely automate consolidated (syndicated) lending to a borrower (by parts) from the financial resources of several SBC participants, which can

both contribute to the distribution of objective credit risk of one borrower and increase the availability of credit products for clients of the participating banks.

Tokenisation of certain financial functions allows, within the framework of a closed SBC system, to form financial products to order, combining not only purely financial operations (transfer, conversion, ...), but also related services - calculation of trigger indices, e.g. credit rating, investment recommendations, etc., as well as other services.

In addition, the private blockchain will be effective, but without the specifics of SBCs, in the implementation of internal document flow between group members, and possibly for mutual A2A (P2P) payments.

Probably, the main problem of the private blockchain in the SBC (autonomous platform of tokenised settlements) will be its compatibility with external market systems built on other blockchain algorithms, for example, in other SBCs, as well as in the future - with the federal platform of digital national currency. The solution to the problem lies outside the SBCs, as an industry (sectoral) solution is needed. Either regulatory - creation of a unified standard for blockchain protocol compatibility, or technical - implementation of a transfer ("bridge") digital platform.

3.2. Outsourcing and shared resources

The association in a SBC of several economic entities similar in terms of organisational structure (due to common regulatory requirements) and production resources (due to homogeneity of the portfolio of financial services) makes the task of optimising the sharing of production resources and competences within the SBC relevant (not in the interests of the SBC, as it is generally not a financial market participant, but in the interests of the SBC participants themselves, who receive their income from servicing their clients and independent operations on the open market). Multiple duplication of functional capabilities in special areas of data processing, payment execution, clearing, ... is irrational. It is logical to build an arrangement of partial specialisation and mutual functional complementation of banks within the framework of the SBC. The authors see outsourcing as a promising mechanism for solving this problem - the use of third-party resources (relative to each SBC participant) for the performance of certain functions obligatory for the entity on a commercial basis [17, 18, 19]. In this context, two commercial banks are both the provider (supplier) of the function and its customer.

In order to ensure market/operational stability of the banks of the SBC participants, in particular - to avoid the risk of loss of continuity of financial services, partial outsourcing of functions of a single entity is preferable, i.e. each participant retains a limited "hot reserve" of production resources to perform a critical/significant function. SBC allows to create a cooperative digital network of distributed production resources (analogue of WLAN) with on-demand access. In this variant SBC realises for a group of banks the "libertarian" idea proposed [20] to the banking sector for joint opposition to risk outsourcing with fintech companies. In fact, the network of outsourcing agreements forms, from the point of view of fault tolerance, some analogue of privet blockchain net, but without cryptography, without validation, without storing copies of transaction history - which in this case are not required. In the opinion of the authors of this article, all banks participating in the SBC retain their independence in concluding contractual transactions, including outsourcing transactions, with third-party companies.

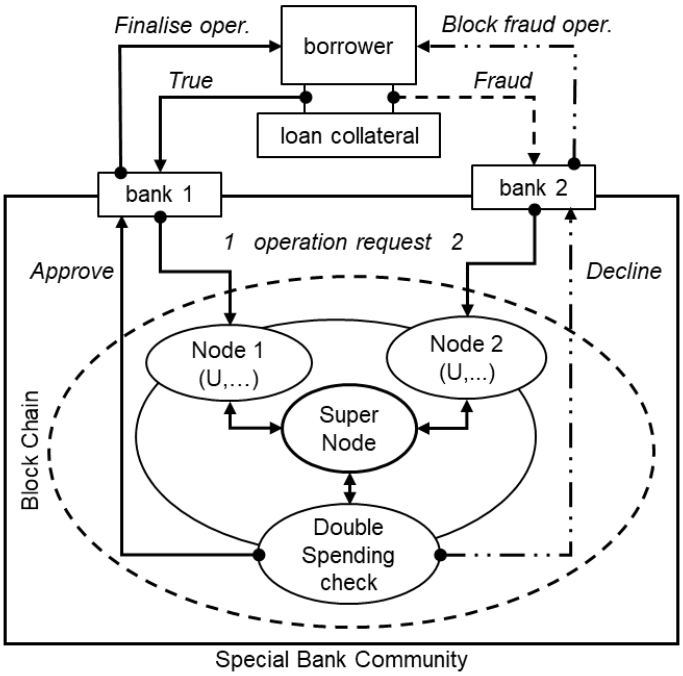

Fig. 2 Symbolic scheme of interaction of credit organizations in blocking the duplication of collateral. Compiled by the authors.

On the one hand, homogeneity within the SBC is an advantage, as the parties to the transaction are similar in terms of business models and regulatory norms. Compatibility of the subjects' management regulations and a kind of unity of SBC management reduces contractual (legal) outsourcing risks that objectively exist in outsourcing functions if the partners operate in different regulatory sectors of the economy, e.g. banks on the one hand and fintech payment services, or Big Data aggregators on the other. The SBC coordinating authority may well define a general algorithm and criteria for economically justified selection of a function provider within the SBC, possibly with a high degree of automation of its application, given the homogeneous structure and completeness of commercial banks' reporting. Probably, the price risk associated with the peculiarities of service cost formation, in particular, the asymmetry of information of the parties to the deal, is also reduced within the framework of SBC. In a homogeneous SBC environment it will be insignificant. As a result, the cost of "internal" outsourcing will be more reasonable, and a transfer pricing mechanism will be applied.

But, on the other hand, the "homogeneity" of the participants' production resources determines objective weaknesses of such a deal within the SBC. The proximity of the competences of the parties to the transaction for the performance of the function determines the low potential for commercial efficiency of outsourcing. Effective outsourcing requires a significant difference (positive gap) in the special competences of the parties, which is possible if there is a significant difference in the size and experience of the banks within the SBC, i.e. a low degree of homogeneity of the participants. Technological innovations are

expensive and are born in specialised profile hi-tech enterprises and R&D centres of the largest banks and main implementation of advanced developments comes from such centres of special competences. The competition of SBC participants among themselves for income, preventing the provision of resources for use by a partner, can also become a significant factor restraining outsourcing, and this objective contradiction should be regulated when creating SBCs.

The shared use of production resources poses challenges for SBCs in terms of optimal allocation of resources (investments) and competences in partial or even chain outsourcing. The exit of an individual bank from the SBC together with the production resources included in the value chains of other SBC entities is a particularly significant risk.

4. CONCLUSIONS

The SBC reform not only creates market structures smoothing the risks of uneven market development of small and largest banks in the financial sector, i.e. "nodes" stimulating stability of the financial sector, but also creates clusters with local conditions for the introduction of innovative technologies preferable to the implementation of technologically similar projects in the full market, in the environment of unaffiliated entities bearing objective risks. The specificity of SBCs objectively contributes to mitigation of such risks.

The homogeneity of the organisational and technological environment of SBCs determines the relative higher efficiency of blockchain and outsourcing technologies.

Interaction between banks within SBCs can be more effective when using a private blockchain to solve common tasks of participants in the areas of payments, information protection, and reduction of financial and operational risks. The main advantage of such a solution is minimizing the number of control and verification operations between banks due to the high reliability of data recorded in the blockchain. Expected implementation challenges include the limited number of SBO blockchain nodes, which reduces the number of independent copies of data, and the likely lack of compatibility between banks' business models, especially in terms of internal information security.

The homogeneity of tasks and similarity of banks' technologies in the SBC allows to increase the efficiency of exploitation of available production digital resources of the participants on the basis of active application of intragroup outsourcing.

The introduction of SBO models into the structure of the banking sector objectively depends on the regulator's activity, since it is the regulator that needs to adjust special sectoral legislation. On the other hand, the incentive is the objective fragmentation of the banking sector into a limited group of the largest universal banks and a massive group of small and medium-sized banks. The groups (Strata’s) differ radically in terms of available resources necessary for successful technological development. The SBO reform combines the key interests of the regulator in terms of competition protection and the fundamental interests of small banks in terms of market survival.

REFERENCES

[1] M.V. Sigova, V.A. Dolbezhkin, "Information as a new resource for the market economy. The banking aspect", *Problems of market economics*, no. 4, pp. 87-101, 2022.

[2] Concept of special banking communities. Bank of Russia, 2023, URL: https://cbr.ru/content/document/file/148252/20230602_bbl.pdf

[3] Institutional Protection Schemes, Declaration of institutional protection schemes in Europe, 2021, URL: https://www.bvr.de/p.nsf/0/10568748536D2608C12586B9002D8B3E/$file/210406_IPS%20Declaration%20CMDI_Summit_final.pdf

[4] Capital Requirements Regulation (CRR). EBA, 2013, URL: https://www.eba.europa.eu/regulation-and-policy/single-rulebook/interactive-single-rulebook/1142

[5] Institutional Protection Schemes – What are their differences, strengths, weaknesses, and trackrecords? Economic Governance Support Unit (EGOV) Directorate-General for Internal Policies PE 699.511, 2022, URL: https://www.europarl.europa.eu/RegData/etudes/IDAN/2022/699511/IPOL_IDA(2022)699511_EN.pdf

[6] European Banking Authority, Deposit Guarantee Schemes data, 2022, URL: https://www.eba.europa.eu/regulation-and-policy/recovery-and-resolution/deposit-guarantee-schemes-dat

[7] Review of the Russian Financial Sector and Financial Instruments 2022. Bank of Russia, 2023, URL: https://cbr.ru/collection/collection/file/43892/overview_2022.pdf

[8] I. A. Kruglova, V. A. Dolbezhkin, "Objective Barriers to the Implementation of Blockchain Technology in the Financial Sector", In Proceedings of the International Conference on Artificial Intelligence Applications and Innovations (IC-AIAI), Nicosia, Cyprus, 2018, pp. 47-50.

[9] Decentralised Finance, Bank of Russia, Moscow, 2022, URL: https://cbr.ru/Content/Document/File/141992/report_07112022.pdf

[10] P.K.Ozili, "Decentralized finance research and developments around the world", *Journal of Banking and Financial Technology*, vol. 6, pp. 117–133, 2022.

[11] Onyx by J.P. Morgan. Transforming the future of banking, JPMorgan Chase & Co., URL: https://www.jpmorgan.com/onyx/about

[12] Tokenised non-cash money in bank accounts. Bank of Russia, 2023, URL: https://www.cbr.ru/content/document/file/152926/review_token.pdf

[13] Blockchain in Financial Services: Market Forecasts, Key Opportunities & Vendor Strategies 2021-2030, URL: https://www.juniperresearch.com/researchstore/fintech-payments/blockchain-in-financial-services-research-report

[14] Swift starts beta testing CBDC connector. Ledger Insights, 2023, URL: https://www.ledgerinsights.com/swift-cbdc-connector-beta-testing/

[15] Das Fintech Traxpay und die DZ Bank haben eine Kooperation vereinbart — FinanzBusiness, 2023, URL: https://finanzbusiness.de/nachrichten/banken/article13852120.ece?utm_campaign=boerse-online.de&utm_source=traffic_deals&utm_medium=rss

[16] Z. Wang, G. Lu, Y. Gao, M. Gao, "Design and Research of Credit Bank System Based on Blockchain Oracle", *Learning and Analytics in Intelligent Systems Recent Advancements in Computational Finance and Business Analytics*, pp. 243-252, 2023.

[17] Outsourcing Risk Management in the Financial Market. A report for public consultations, Moscow, 2022, URL: http://www.cbr.ru/Content/Document/File/142481/Consultation_Paper_06122022.pdf

[18] Core principles for effective banking supervision. Basel Committee on Banking Supervision. 2012. URL: https://www.bis.org/publ/bcbs230.html

[19] Guidelines on outsourcing arrangements. EBA/GL/2019/02, URL: https://www.eba.europa.eu/regulation-and-policy/internal-governance/guidelines-on-outsourcing-arrangements

[20] S. B. Varlamova, "Principles of building a shearing system of bank outsourcing based on the libertarian model of data-processing", *Banking Services*, no. 7-8, pp. 45-52, 2020.