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Diploma Thesis

Transaction system of banking sector

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In Prague on 05.04.2020 _____

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Transaction system of banking sector

Abstract

The dissertation will analyze the participants in the financial market and transactions flow data. The theoretical part includes a description of money and transaction history, how the four-way payment system and legal laws of transactions were changed and created.

The practical part includes the analysis of modern forms of transactions between banks and financial participants using high-tech companies such as SWIFT, automated clearing houses (ACH) and a distributed ledger system such as Ripple. We will look at how banks can be changed and what a new messaging standard for payments will give us: ISO 20022. In the practical part, we describe the difference in the movement of funds in centralized and distributed ledger systems.

Keywords: Transaction system, centralization system, distributed system, SWIFT, Ripple, central banks, payment systems, RTGS, blockchain.

Transakční systém bankovního sektoru

Abstrakt

Disertační práce bude analyzovat účastníky finančního trhu a údaje o transakcích. Teoretická část obsahuje popis historie peněz a transakcí, jak byl změněn a vytvořen čtyřcestný platební systém a právní zákony transakcí.

Praktická část zahrnuje analýzu moderních forem transakcí mezi bankami a finančními účastníky pomocí high-tech společností, jako je SWIFT, automatizované clearingové domy (ACH) a distribuovaný účetní systém, jako je Ripple. Budeme se zabývat tím, jak lze změnit banky a jaké nové standardy pro zasílání zpráv nám poskytnou: ISO 20022. V praktické části popisujeme rozdíl ve pohybu prostředků v centralizovaných a distribuovaných systémech účetních knih.

Klíčová slova: Transakční systém, centralizační systém, distribuovaný systém, SWIFT, Ripple, centrální banky, platební systémy, blockchain.

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List of abbreviations

SWIFT	Society for Worldwide Interbank Financial Telecommunications
RTGS	Real-time gross settlement
C2B	Consumer-to-business
B2C	Business-to-Consumer
P2P	Peer-to-peer
ACH	Automated clearing house
ILP	Interledger Protocol
API	Application programming interface
ECB	European Central Bank
SEPA	Single Euro Payments Area
CHIPS	Clearing House Interbank Payments System
SPFS	System for Transfer of Financial Messages
EFT	Electronic funds transfer
ATM	Automated teller machine
ODFI	Originating Depository Financial Institution
RDFI	Receiving depository financial institution
GPT	general purpose technology
ISO	International Organization for Standardization
NFC	Near-field communication
BIS	Bank for International Settlements

1 Introduction

Since primitive times, we have always been accompanied by communication and exchange as people. Exchange of ideas, values, things, products, money. Our modern society is built and operates on an interchange, without it our existence would be greatly complicated.

In the modern world our exchange has reached a digital level and is denoted by the word - transaction. The channels through which transactions take place in society are equivalent to the capillary system in the human body through which all the necessary trace elements arrive.

So, for example, a company engaged in the production of high-tech equipment buys raw materials from several other companies, those, as distributors, buy raw materials from manufacturers, and those who pay wages to workers get raw materials, which ultimately buy products from a high-tech company. And this whole process directly depends on the communication channels, their speed and quality, without the necessary level of reliability, the whole system may collapse.

A high-tech company will send money to suppliers of raw materials, and if the money does not come exactly on time that is necessary for the customer, then the raw materials will not arrive on time and the entire business process inside the company may be violated, which will lead to losses for all participants in the chain, without exception.

Therefore, the transactional system in the modern world plays one of the main roles of a sustainable and progressive future.

Representatives of transaction systems are various companies, but almost all of them work and provide their services through special intermediaries, banks. Banks are universal intermediaries within the entire exchange system. It is who carry out the entire process of transactions between their accounts and ultimately transfer the desired amount from point A to point B.

How quickly and reliably banks make transactions between their customer accounts determines to some extent the economies of countries.

A country that is not connected to a common transaction network may simply not survive in the modern world. Therefore, the transaction factor has both legal and social characteristics.

We will start by looking at what money is, why we use it, and what it should be. After all, money is the resource that passes billions through the network of transactions.

2 Objectives and Methodology

2.1 Objectives

The main objective of the thesis is to show the algorithm of transactions in the interbank system with description of the main payment systems a ways developing. The theoretical part describes the basics of transactions. The practical part is the analysis of data transactions in payment systems.

2.2 Methodology

Research of documentary and reports Analysis of companies that works with their own payment system or is an expert in the subject. Also it includes SWOT and PESTLE analysis. Theoretical part includes description of transactions history, legal laws, modern forms of transactions between banks. The practical part includes the analysis of the difference in the in a centralized and distributed systems.

3 Literature Review

3.1 Fundamentals/Evolution of transactions and money

For the most complete understanding of the transaction system, we need to consider it structurally. Therefore, we will find out what money is and where the transaction comes from.

A transaction is a case when someone buys or sells something, or when money is exchanged, or the activity of buying or selling something.[1]

Transactions are the result of interactions between people in order to exchange values. Money is the equivalent serving as a measure of the value of any goods and services.[2]

From the definition we understand that money is a product or object that assume the role of a universal means of payment. In other words, it is a product that serves for exchange for other goods.

Money solves the problem that has faced humanity since its inception: "How to move economic value in space and time as efficiently as possible." A primitive way of exchanging values was the exchange of one product for another.

This direct exchange process is called barter. This form of exchange works only in narrow areas with a few range of goods and services.

For example, in a hypothetical community isolated from the world with few amount of people, where there is not much place for the separation of labour and the market, so each individual will be able to produce main goods and directly exchange them with a neighbour. Barter has always been present in human society and is exist today in exceptional situations.

Exploring human behaviour in a market environment, Carl Menger, the creator of the Austrian school of economics and the founder of marginal analysis, singled out a key characteristic that allows a product to assume the function of a means of payment, and called it market attractiveness, or liquidity of the product.

Liquidity - the property of assets to be quickly sold at a price close to the market[3].

[1] Cambridge University Press https://dictionary.cambridge.org.
[2] Money // Big Russian Encyclopedia: [in 35 vols.] / Ch. ed. Yu.S. Osipov. - M.: Great Russian Encyclopedia, 2004—2017

It turns out that we can find a product, or a means of payment, which will be equally valuable to all market participants, as well as close it possible to market value, provided that the problem of desire mismatch in all its three aspects is successfully resolved: scale, space and time.

The property of scale implies that the means of payment should be divided into small or large parts, which allows the owner to exchange values in any quantity. Since many things of our world possess scalability and easy movement in space, the third aspect is the most difficult task for accepting a means of payment - this is time.

To solve the problem of time, the means of payment must have a stable value, which will allow the owner to accumulate it. There are two types of means of payment: hard, which stock is difficult to increase, and soft, which stock is increase easily and quickly.

To become reliable, a means of payment must meet two mandatory requirements: its value must increase with increasing demand, but at the same time, its manufacturers must not allow an increase in supply, without allowing prices to drop sharply.

Since ancient times, the main contender in this asset contest has been gold, which retains its monetary status due to two unique physical properties that distinguish it from other materials:

1. gold is chemically stable and almost impossible to destroy;
2. gold is not synthesized from other materials, it is only extracted from ore, which is extremely rare on the planet.

With a constantly low inflow of quantity, gold manages to maintain monetary status throughout the history of mankind, as central banks continue to maintain its substantial reserve to provide paper money, and some commercial banks own gold to provide capital.

The official reserves of central banks are about 33 thousand tons this is approximately one sixth of the total gold mined in the world.

Table 1: Central Banks with the Most Gold Reserves

[3] Brigham J., Erhardt M. Analysis of financial statements // Financial Management = Financial management. Theory and Practice / Per. from English under. ed. Ph.D. E. A. Dorofeeva .. - 10th ed. - St. Petersburg: Peter, 2007. - P. 121—122. - 960 s. - ISBN 5-94723-537-4

Country	Population 2018	Gold reserves 2009 (tonnes)	Gold reserves 2019 (tonnes)	Gold reserves % change	Gold reserves per head (grams)
United States	327,167,434	8,133	8,133	0%	25.01
Germany	82,927,922	3,407	3,370	-1%	40.75
Italy	60,431,283	2,452	2,452	0%	40.5
France	66,987,244	2,435	2,436	0%	36.3
Russia	144,478,050	649	2,113	226%	14.62
China	1,392,730,000	1,054	1,853	76%	1.34
Switzerland	8,516,543	1,040	1,040	0%	123.06
Japan	126,529,100	765	765	0%	6.04
Netherlands	17,231,017	612	612	0%	35.75
India	1,352,617,328	558	600	8%	0.45
Portugal	10,281,762	383	383	0%	37.14
Uzbekistan	32,955,400	175	355	103%	10.95
Kazakhstan	18,276,499	70	350	397%	19.43
Saudi Arabia	33,699,947	323	323	0%	9.81
United Kingdom	66,488,991	310	310	0%	4.7

Source: World Gold Council, 2019

In the Table 1 we can see the top countries with the most gold reserves. We also note that according to the Basel III document, gold moved from the third category of asset

security to the first[4]. In simple words, previously, gold was evaluated by banks as an asset to ensure capital at 50% of the market value, and after the adoption of the document Basel 3 will be valued at 100% of the value, according to the market. It means that the liquidity of gold will increase.

Basel III is an internationally agreed set of measures developed by the Basel Committee on Banking Supervision in response to the financial crisis of 2007-09. The measures aim to strengthen the regulation, supervision and risk management of banks. Like all Basel Committee standards, Basel III standards are minimum requirements which apply to internationally active banks. Members are committed to implementing and applying standards in their jurisdictions within the time frame established by the Committee.[5]

Table 2: Total Gold Mined

Sectors	Tonnes	%
Jewellery	90,718	47.70%
Private investment	40,035	21.10%
Official sector	32,575	17.10%
Other	26,711	14.10%
Total	190,039	100.00%

Source: World Gold Council, 2019

The total increase in gold production is 2,500-3,000 tons, which is approximately 1.5% of the total number of previously mined reserves, which shows its value in the long term.

Technological progress has led us to the next monetary system, the gold standard. The gold standard is a monetary system in which there is a free conversion of currency to gold[6]. In other words, money under the Gold Standard was secured by gold. This system became widespread in the 19th century.

[4] Basel III: Finalising post-crisis reforms, December 2017, p.28, ISBN 978- 92-9. Available from: https://www.bis.org/bcbs/publ/d424.pdf. Accessed from: 2017
[5] https://www.bis.org/bcbs/basel3.htm. Accessed from: 2017
[6] L.Gold Standard // Net Encyclopedia / ed. by R. Wharples. 2001.

After that, in 1944 the Gold Standard was replaced by the Bretton Woods system. This year, at the Bretton Woods conference was apply a fixed price for gold - $35 per troy ounce. Since then, the dollar has become the predominant means of international payments, foreign exchange interventions and reserve assets. The conference marked the beginning of the International Monetary Fund (IMF)[7]. The agreement was created to balance the supply and demand of currencies through their free trade.

The Bretton Woods system was replaced in 1976 by the Jamaican. According to the Jamaican currency system, rates are set not by the state, but by the market. Money is provided by the economic grow of countries, their authority, exchange rates fluctuate due to current world events. And money is not backed by gold.[8]

So, after 1976, fiat money appeared that exists to this day and is actively used by the world's population. Fiat money can exist in various forms: banknotes, coins, electronic, non-cash money and the like.

Fiat money is a currency without intrinsic value, which is set as money, often by state regulation. Fiat money is valuable only because the government supports its value and the parties involved in the exchange agree with their value[9].

With the advent of fiat money, the era of electronic money is coming with the emergence of modern transactions. Electronic money [10]is the issuer's monetary obligations in electronic form, which are on electronic media at the user's disposal. Such monetary obligations meet the following three criteria:

1. They are fixed and stored on electronic media.
2. Issued by the issuer upon receipt of funds from other persons in an amount not less than the issued monetary value.
3. Accepted as a means of payment by organizations other than the issuer.

In 1972, the US Federal Reserve Bank organized an automatic clearing house to provide the US National Bank and commercial banks with an electronic alternative for servicing payment checks. In 1993, David Chaum, Ph.D. in Computer Science and

[7] “The Bretton Woods System” by Jesse Russell, Ronald Cohn, 01 September 2013
[8] “The International Monetary System, 1945-1981” by Robert Solomon, 1982
[9] "Famous Myths of "Fiat Money" Goldberg, Dror,Journal of Money, Credit and Banking, p.37 (5): 957–967. 2005
[10] Directive 2000/46 / EC of the European Parliament and of the Council, Article 1, 2000

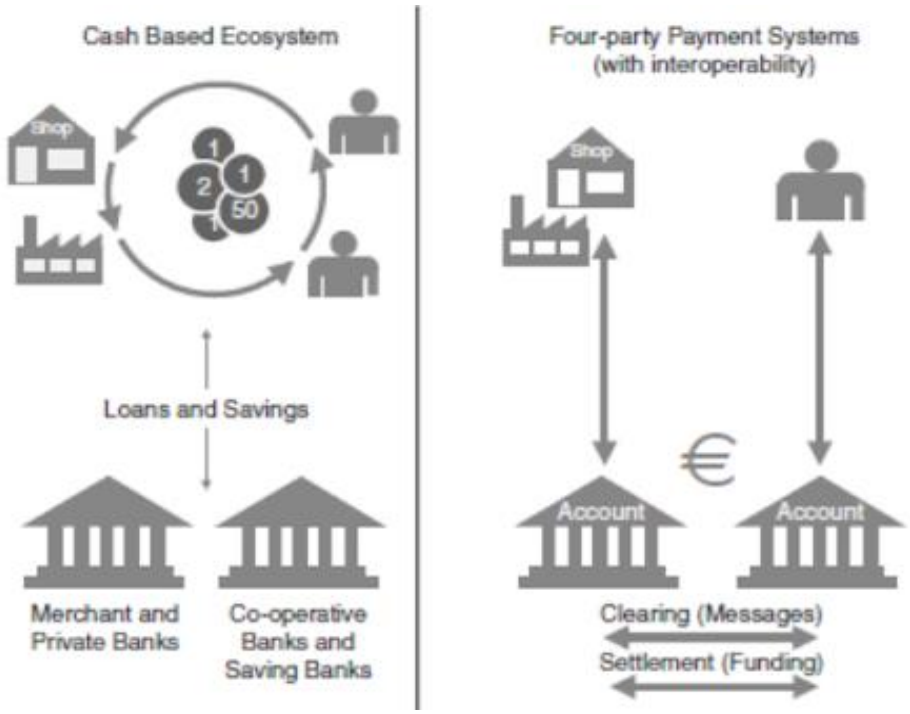
Management, University of California, proposed a new technology. It was an eCash system.

In 1993, the central banks of the European Union began to study the phenomenon of electronic money, which at that time were considered prepaid cards. The results of this analysis were published in May 1994 and became official recognition of the existence of electronic money.

Along with this, the Internet developed and, starting in 1993, a jump began not only in electronic money based on cards, but also in online electronic money. Since 1996, the Bank for International Settlements, with the support of world central banks, regularly analyzes the development of electronic money and related systems.

Around this point, as shown in Figure 1, we moved from one cash ecosystem calculation scheme to another, the "four-party" payment system.

Figure 1: Schematic development from an ash-based economy (left) to the current "four-party" payment system with interoperable bank(right)



Source: Jakub Gorka, *Transforming Payment Systems in Europe*, 2016

In 2000, the European Parliament was adopted by Directive 2000/46 / EC, which was supposed to define an electronic structure and allow it to create its own electronic money, provided that such an issue would be licensed and controlled.

Currently, we also notice a pluralism of payment methods, from cash to payment in virtual currencies. All these methods in one way or another affect the economy. Therefore, new payment methods are considered by countries as a prospect for economic growth and development. The faster and more efficient and safer the payment, the faster the business processes within the companies will be carried out, the production and exchange of resources will be more profitable. In general, this will lead to an acceleration of the economy and shorten the business process cycles, which may favorably affect the final consumer.

In this table, we present new ways of making payments over the past few years as a possible replacement for cash.

Table 3: Innovative Payments as a Cash Replacement

Payment instruments	**Innovation range**		**Transaction type**		**Substitute for cash**
	incremental	**radical**	**face-to-face**	**online**	
Contactless cards	x		x		+++
Proximity mobile payments(NFC)		x	x		+++
Rmote mobile payments		x		x	+
Online payments		x		x	+
e-purse/e-wallet		x	x	x	++
e-credit transfer	x			x	+
Virtual currencies		x		x	++

Source: Jakub Gorka, *Transforming Payment Systems in Europe*, 2016

Table 3 shows the most famous payment methods, where the number of pluses determines the level of significance in the general relation to all other methods and cash.

We are think that contactless cards and mobile payments are the most used methods as an alternative to cash. In the future, hesitation towards electronic wallets, that is, online payments and virtual currencies, is possible. Because today there are already visible examples when it is easier for people to order products via the Internet using online payment, rather than go to the store and pay with a contactless card. This is due to the development of the “Customer Experience” direction within companies. Where are all the possible amenities for customers to decide on the purchased goods.

Today, almost all national currencies are fiat money. Banknotes and coins of the national currency are the only legal means of cash settlement. They are the unconditional

obligations of the central bank for their adoption at face value in all types of payments. The state obliges citizens of its country and business entities to accept all banknotes and coins that are officially in circulation as a legal means of payment throughout the country.

3.2 Payment systems

The set of processes and technologies that transfer cash value from one entity or person to another are designated as a payment system[11]. The payments themselves are made for various reasons, for example, the purchase of goods, payment for services or money transfer. Payments can be in different currencies and different methods are used for their delivery, cash, checks, electronic payments and plastic cards. All payments go through payment systems.

The essence of the payment system is that it uses cash substitutes, such as electronic messages to create debits and credits, which transfer value from one side to another. The cost that is transmitted through the payment system is usually stored in deposit accounts with banks or other financial institutions. Since debits and credits are recorded on the accounts of financial institutions, all of them are connected to a set of payment systems that they use to process payments in the interests of their customers. If the bank operates in several countries with different jurisdictions and currencies, then it is connected to the payment systems in each of the countries in which it operates, either directly or through the appropriate intermediary bank. Banks usually for settlements in many countries maintain accounts with the country's central bank and participate in central bank payment systems (RTGS).

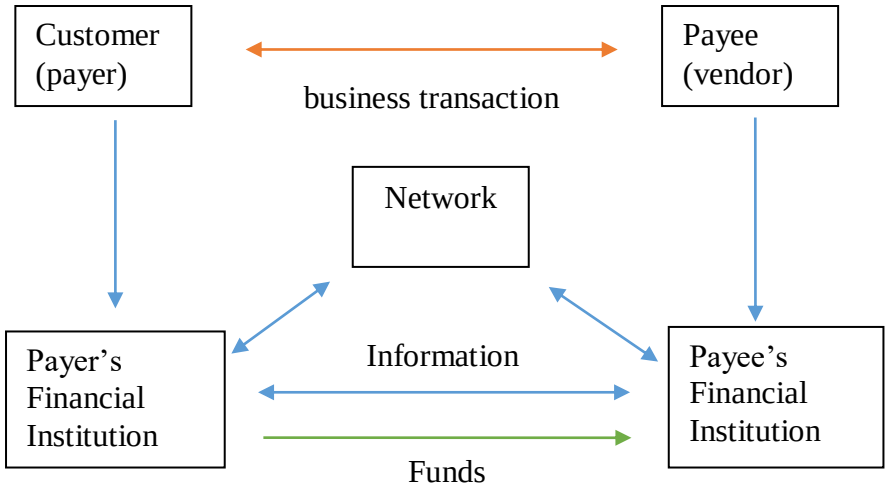
In the European Union, the payment system is more modernized due to the creation and launch of the Single European Payment Zone (SEPA)[12] in 2008, under the leadership of the European Central Bank (ECB). SEPA was created to provide standardized processing of payments and fees in all countries of the Eurozone.

In the classical scheme associated with the traditional banking system, four participants participate in transactions:

[11] Fundamentals of Global Payment Systems and Practices, Treasury Alliance Group llc., 2018
[12] Single Euro Payments Area (SEPA): cross-border direct debits now a reality, Available: https://ec.europa.eu/commission/presscorner/detail/en/IP_09_1665

- Payer: makes a payment and the transaction amount is debited from his bank account.
- Bank or financial institution of the payer (Issuing Bank): processes the transaction on behalf of the payer.
- Beneficiary's financial institution (Acquiring Bank): processes the transaction on behalf of the beneficiary and, as a rule, holds the amount in the account.
- Beneficiary: receives the amount of the loan payment to his account.

Figure 2: Four corners payment model



Source: Fundamentals of Global Payment Systems and Practices, Treasury Alliance Group llc., 2018

The Figure 2 show that both banks can choose to transfer payment instructions and funds directly to each other. Also, banks can use various intermediaries to facilitate the transaction. In the diagram, these intermediaries are called "network".

The central cell in reality is the central banks of different countries, such as the US Federal Reserve (Federal Reserve Bank), the European Central Bank (ECB), as well as clearing centers, such as CHIPS. There are mechanisms for transmitting information, for simplicity they can be visualized as communication channels, for example, such as SPFS in Russia or the Society for Worldwide Interbank Financial Telecommunications (SWIFT).

System providers and card systems such as Visa and MasterCard, which are outside the quadrangular model, are also involved in the payment process.

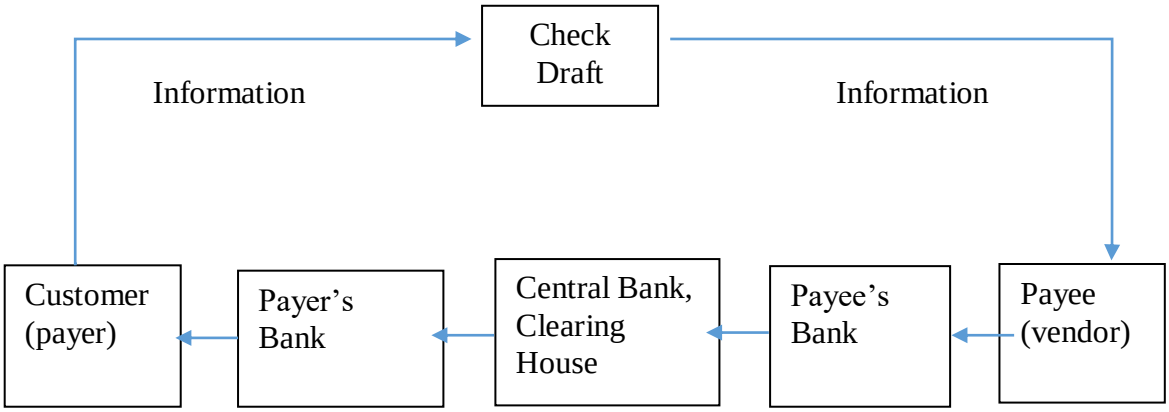
Non-traditional payment systems, such as blockchain, almost completely bypass the banking system, performing the functions of a financial institution, currency and network, changing the quadrangular system to a tripartite one.

A transaction system consists of several stages. It all starts with payment instructions. This is the information contained in the bank transfer and the instructions come from the payer and inform the bank making the payment data for the transaction to the beneficiary through the recipient bank's network. That is, if the beneficiary's bank is not connected to SWIFT, then through this communication channel the transaction will not be possible and others will use it. After the step of the instruction, the second step, the generation of payment, passes. This is when instructions are entered into the system of a financial institution. Then the third stage is clearing. This is a process in which banks use payment information to transfer money between themselves on behalf of the payer and beneficiary (recipient). And everything ends with the last fourth stage, settlement. The settlement occurs when the amount is credited to the beneficiary's (recipient's) bank account and debited from the payer's bank account. The final settlement occurs when banks irrevocably transfer the value to each other.

The creators of payments and their processors can use various channels for transactions, and each of them has its own performance characteristics, rules and settlement mechanisms. Generally speaking, all existing payment systems can be placed in one of the following five payment channels.

The first and most obsolete channel is paper systems such as checks. Payments are initiated when one side writes on paper instructions for paying for goods or services received from the other side. These systems are one of the oldest forms of cashless payment systems. Checks are a common channel based on paper documents, and although they are in decline, they are still used in the United States for example. The process of using the check is shown in the figure below.

Figure 3: The process of exchanging value through checks (check clearing).



Source: Fundamentals of Global Payment Systems and Practices, Treasury Alliance Group llc., 2018

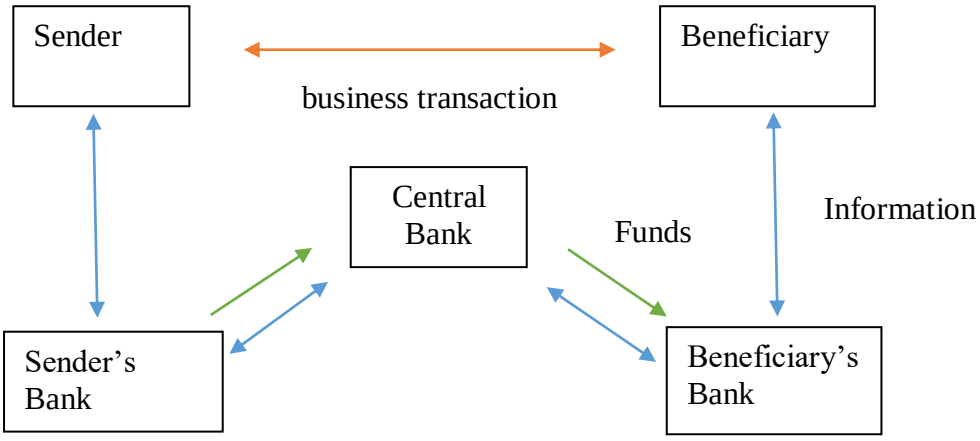
There are two sides to the picture, the person making the payment, the payer, is referred to as "Customer" and the person receiving the payment "Payee". The check is mailed or otherwise handed over to the recipient. The recipient deposits the goods with his bank, and then the bank can determine how he will receive the payment.

The value of the check is usually provided to the recipient on a temporary basis for one or two days. The transfer of value is preliminary, since the recipient's bank has not received final confirmation from the buyer's bank that the check is valid.

When using checks, they are registered in the registry system when scanning at retail outlets.

The second payment system is RTGS (Real-Time Gross Settlement System) and other high-value payments. This payment system is most often used between participants in the business segment. RTGS systems are usually used for high-value transactions, this is necessary to accelerate business processes within companies. Also, payments within this system require and receive immediate clearing. Schematically, this type of payment is shown in the Figure 4 below.

Figure 4: The process of Real-Time Gross Settlement System (high-value transfer system



Source: Fundamentals of Global Payment Systems and Practices, Treasury Alliance Group llc., 2018

The payment process within this system is as follows. To transfer money to the recipient, the initiator of the transaction sends a request to the bank of which he is a client. The instructions of the sender indicate all the necessary details, for example, the name of the recipient, the bank of the recipient, etc. The sender bank then uses direct access to the RTGS system to instruct the beneficiary bank to debit their account with the central bank and credit the beneficiary. The instruction is final and irrevocable, and since the beneficiary's bank receives funds from the central bank, it immediately and wholly provides funds to the beneficiary.

An important point regarding this type of system is that the central bank acts as the guarantor of the system for both banks. The recipient bank can rely on funds from the central bank in the event that the sending bank cannot properly cover its account with the central bank. This makes the system more reliable.

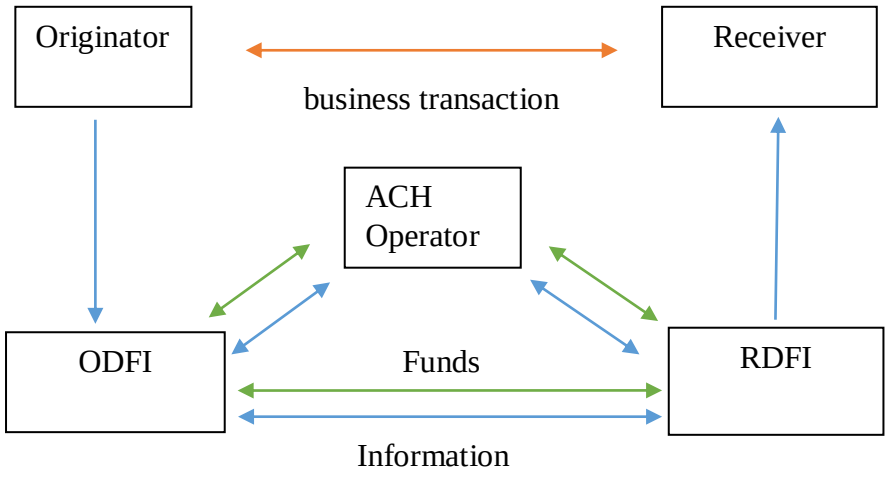
How the sender structures his message to the bank will determine the speed, cost and risk with which the bank can complete the transaction. There are several ways in which the sender can instruct his bank to make a payment the most common is the SWIFT system, which we will examine in detail in the next chapter.

The third system is electronic funds transfer (EFT). This is a broad term that includes many types of electronic payments, such as ACH and electronic transfers. Electronic payment systems are becoming more common in the world of different payments, as many companies are moving from traditional systems to more efficient and cheaper methods of electronic payments, such as ACH. Other types of transactions that are considered EFT

include ATMs, virtual cards, electronic checks and bank transactions on a personal computer.

The ACH (Automated Clearing House) organization in the USA and BACS in the UK were created to handle large volumes of relatively small transfers. Due to the fact that in these transfers there were no requirements of immediateness and finality, participants daily exchange batches of transfers, paying the transfers the next day.

Figure 5: The process in the US ACH system

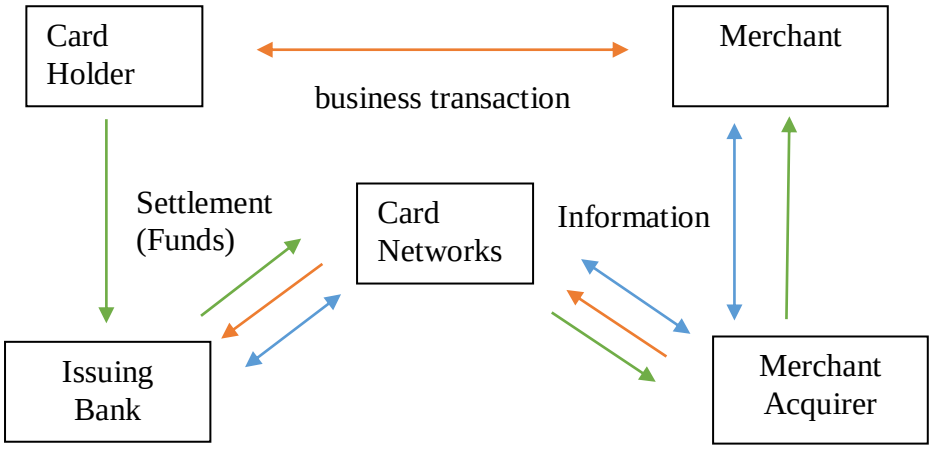


Source: Fundamentals of Global Payment Systems and Practices, Treasury Alliance Group llc., 2018

Payers, called senders in the ACH world, provide their banks - ODFI (initiating depository financial institutions) with payment instructions. Unlike the system described above, each instruction package sent to ODFI usually has several payments. ODFI processes the instructions and sends a file of all client instructions to its ACC operator. The ACH operator then distributes all payments in all packages to the appropriate RDFI (receiving depository financial institutions), which then lend to individual beneficiaries (recipients).

The fourth payment system is card-based payments. Maps are presented as a ubiquitous and rapidly growing segment. This is the most popular method for making and accepting payments. Card channels also support e-commerce, such as mobile wallets, which is the current global trend. Schematically, this system is depicted below.

Figure 6: The process in the Cared payment system



Source: Fundamentals of Global Payment Systems and Practices, Treasury Alliance Group llc., 2018

The analyzing the scheme, we see four participants with one common network. This is an example of a classic transaction in a store. The cardholder makes a payment at the seller's terminal, the seller receives transaction information and sends it to his merchant acquirer for authorization. As a rule, these are banks, but there may be other financial institutions. The acquiring bank requests authorization for the transaction through the appropriate card network from the issuing bank, if there is a sufficient amount of funds in the buyer's account, the bank confirms the operation and then transfers the funds to the seller's bank. The last step is to fix the funds of the acquiring bank in the seller's account.

The explosion of mobile applications, cryptocurrencies and alternative payment methods has created several payment methods that do not fit into the previous four channels. Although the rules for calculating and transferring value for this channel are not suspended. Therefore, we brought them out as a separate fifth payment system.

3.3 Legal regulation

Legal support is one of the necessary conditions for the functioning of the payment system. The development of a transparent, comprehensive and reliable legal mechanism for the payment system is the basis that defines the rights and obligations of all entities of the payment system. Such a legal mechanism is established by general and special laws, contracts, international agreements and various provisions.

A reliable, transparent legal mechanism that ensures the functioning of the payment system reduces legal uncertainty and risk for its participants.

The regulatory framework should clearly define the responsibilities of participants, rules and procedures for working with payment systems. And in this case, conditions are created for the introduction of new payment instruments and payment technologies between payment systems.

If the legal support for partially developed payment systems is not developed or is not properly developed, national central banks can also help in monitoring legal regulation and important issues that may affect the payment system.

In order to regulate relations in the national payment system, the Government of the Russian Federation and federal executive bodies can adopt normative legal acts, and the Bank of Russia - normative acts (within their powers in the cases provided for by Law No. 161-Federal law and other federal laws). The main legal norms relating to the national payment system of Russia are contained in this Law.

In accordance with Article 2 of Federal Law No. 161-Federal Law "On the National Payment System", the legislation of the Russian Federation on the payment system is based on the Constitution of the Russian Federation, international treaties of the Russian Federation and consists of this Law and other federal laws.

The most important sources of legal norms governing legal relations in the payment system on the territory of the Russian Federation are:

- Federal Law of June 27, 2011 No. 161-Federal Law "On the National Payment System"
- Bank of Russia Ordinance No. 2693-U, dated September 14, 2011, "On the Procedure for the Control of Money Transfer Operators, Being Credit Organizations, over the Activities of Banking Payment Agents
- Bank of Russia Ordinance No. 2694-U, dated September 14, 2011, "On the Procedure for Notifying the Bank of Russia by an Electronic Money Operator of the Start of Activities for the Transfer of Electronic Money
- Bank of Russia Ordinance No. 2695-U, dated September 14, 2011, "On Requirements for Ensuring the Uninterrupted Transmission of Electronic Money"
- Bank of Russia Instruction dated September 15, 2011 No. 137-I "On Mandatory Ratios of Non-Banking Credit Organizations Eligible to Make Money Transfers without Opening Bank Accounts and Related Other Banking Operations, and Peculiarities of the Bank of Russia Supervising Their Compliance"

- Bank of Russia Regulation No. 375-P dated March 2, 2012 "On requirements for the rules of internal control of a credit institution in order to counter the legalization (laundering) of proceeds from crime and the financing of terrorism"
- Bank of Russia Ordinance No. 2840-U, dated June 25, 2012, "On Requirements for Operational Risk Management by Non-Banking Credit Organizations Eligible to Make Money Transfers without Opening Bank Accounts and Other Banking Operations Related to It
- Bank of Russia Regulation of May 31, 2012 No. 379-P "On the uninterrupted operation of payment systems and risk analysis in payment systems"
- Bank of Russia Regulation No. 378-P of May 2, 2012 "On the Procedure for Submitting to the Bank of Russia an Application for Registration of a Payment System Operator"

A large number of regulations relating to the payment market, their diversified nature and scale (global, regional or national) makes it difficult to assess their impact on the development of cashless transactions. Because the introduced regulations are mainly aimed at improving the efficiency of the market.

Laws reflect some trends in the payment market, which can be traced in recent years. Table 4 shows the most important European and world regulatory acts directly or indirectly related to the payment market and their impact on its form and functioning, as well as the most important areas observed on the payment market.

Table 4: Influence of regulatory framework on the payment market

Sphere of regulation	**Examples of impact of regulation on payment market**	**Selected regulations**
Systemic risk reduction and control	Searching by banks for the most stable, long-term sources of financing; Growth in safety and reliability of payment systems, and trust in payment instruments	Anti-money laundering and combating the financing of terrorism (AML/CFT, 2005) Basel III (2010)
Transparency of services	Increase in transparency of the structure of payment costs and prices of payment services; Reduction of the possibility to collect hidden fees	PSD (2007) PAD directive (2014) MIF Regulation (2015)
Standardisation	Stimulating competition through development of a common market standard; Automation of the payment service, reduction of its costs and creation of new	SEPA SEPA – SCT SDD and SCF standards

	sources of income;	
Convergence	Increase in competitiveness in market through blurring the differences between various types of settlement and clearing systems	TARGET2 ACH Frequent Settlement

Source: Own case study on the basis of Capgemini and RBS, 2013

A definite majority of regulations occurring recently, while opening access to new markets for new PSPs, leads to defragmentation of the payment process. As a result, the payment value chain will be disaggregated and a payment process will be handled by specialized PSPs. Establishment of legal frameworks for payment innovations stimulates their development, establishes trust in them and encourages using them in payments.

This, in turn, may lead to change in payment habits, particularly in reducing cash transactions.

4 Practical Part

4.1 From a centralized to a distributed model

The very definition of a centralized system stems from its names. This is all not consistent with the system. For a visual understanding of this system, the phrase "all roads lead in Rome" is perfect. All this emanates and where it all comes. In accordance with centralized models used in accordance with the principles of organization and management. When did we decide to pay attention to it in our work and compare these two systems?

It is likely that this system was used in ancient times, but we did not find such information. Therefore, we distributed the official version of the appearance of the distribution system, which was indicated in the book. During the Cold War, Paul Baran designed the first distributed relay node architecture as a system that allows the US military to always be able to communicate even when one of the nodes is destroyed or incapacitated.

The new system must be damaged as a result of a physical attack. The distributed network shown in Fig. 1, on the right side of the three Figures redirecting communication around or on the surface of the damaged points, where the channels can become ineffective damage. Even after disconnecting the parts, the distributed network remains stable. This is different from centralized systems that can be completely destroyed when attacking a central site or hub.

The decentralized network shown in Figure 7 is a mixture of a centralized network and a distributed network of Paul Baran. This network, as well as a centralized one, can be destroyed by an attack that affects only a certain number of nodes. The number of nodes that must be attacked in order to erase or significantly change the functionality of a decentralized network changes as the relative size of nodes of a central nature changes. Also, a decentralized network can be destroyed or made vulnerable as a result of an attack on one node if this single node is connected to a sufficiently large proportion of the nodes of the decentralized network.

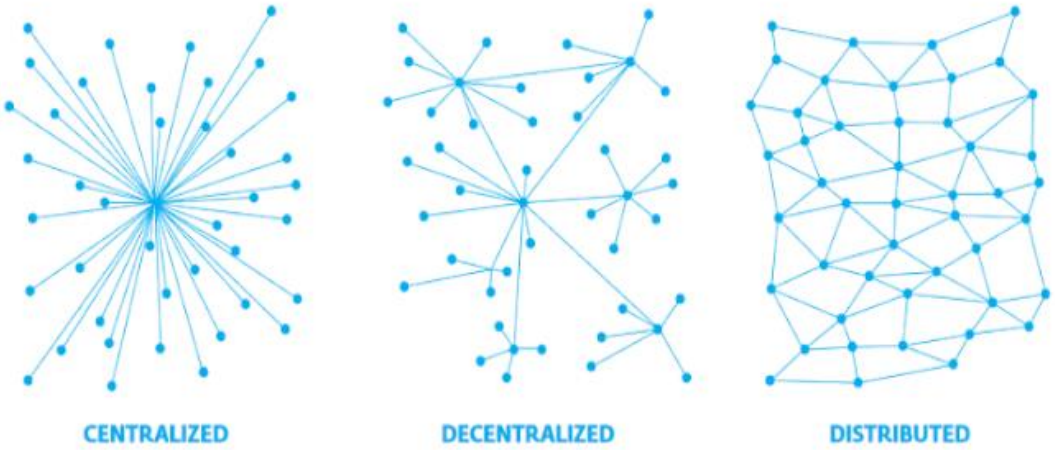
In order to disable a decentralized or centralized network, both physical attacks and network damage, the influence of third parties, data sharing and interception can be used.

Exposure to a wide range of threat types underlines the importance of a distributed network.

Blockchain represents a database that functions as a distributed network, hence the term “distributed registry”. Blockchain is often referred to as “radical innovation” or general purpose technology (GPT), not unlike a steam engine or electric motor. In other words, a technology that can create “subsequent innovation and increased productivity in many industries.”

In the official Satoshi document “Bitcoin: an electronic money system in a peer-to-peer network”, the term “decentralization” is not used, but the term “distributed registry” is used to describe the blockchain network.

Figure 7 – Kinds of transaction systems



Source: Paul Baran, on distributed communications networks, 1962

4.1.1 SWIFT System

SWIFT stands for Society for Worldwide Interbank Financial Telecommunications. Translated into Russian, this means “Community of Worldwide Interbank Financial Telecommunications”, the main goal of this community is to transmit interbank information in an international format.

In the past, interbank messages were carried out by mail and telegraph, but such methods of transmitting information are ineffective in a large amount of data. There were also errors during interbank operations related to the functioning systems of various banks and the lack of common standards.

The development of such a system began in the early sixties. Representatives of the sixty largest European and American banks gathered several times to discuss issues of concern to everyone - the creation of a unified system of standardization in the banking sector. For this purpose, it was decided to use accurate computing technology - computers that provided the most efficient data transfer system.

Direct work on this system, capable of round-the-clock exchange of financial information with high protection and control, began in early 1968. Already in 1972, the creators prepared an official project and made the necessary calculations for the profitability of this system.

In May 1973, with the participation of 239 banks located in 15 countries of the world, a payment system called SWIFT was created and established. Its developers worked for more than four years for the practical implementation of this institution, and on May 9, 1977, the international network responsible for data transfer was officially launched. At the end of the same year, the number of banks wishing to join SWIFT increased to 586. Every day, the community transmitted 450 thousand electronic messages.

Today, more than 11 thousand financial organizations and banks, which are located in 190 countries, are part of SWIFT. Despite the rather large distance from each other, they can freely exchange messages and interact around the clock.

The company (SWIFT) belongs to its members, and in order to become a member of the organization, you must have a banking license. In return, Members own shares in the company and have voting rights.

There are two more classes of users:

a) Sub-members must be> 90% owned by the member and are usually affiliates. Although they have full access to the system, they do not have voting rights or shares.

b) Participants may be other types of financial institutions, they have access to a limited set of messages and do not have ownership rights.

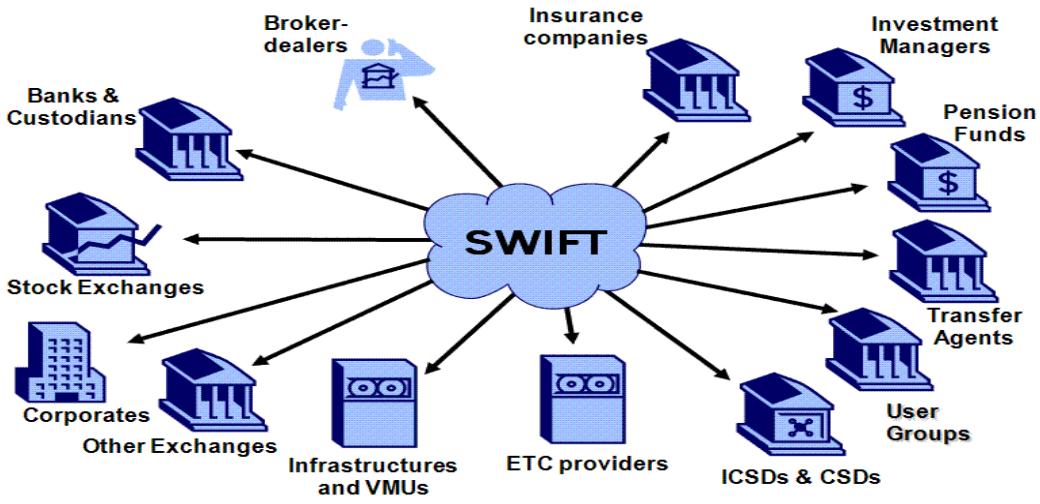
Each state has its own association of SWIFT participants, in Russia it is ROSSWIFT. The organizational structure of which is as follows. The supreme governing body of SWIFT is the annual General Meeting of the Association. In between meetings, the Association is managed by the Committees, which are a permanent collegial governing body of the Association. The Committee is elected by the General Meeting of the Members of the Association from among the Members of the Association and reports to it.

The principles of formation and the quantitative composition of the Association Committee are determined by the General Meeting of Association Members. The work of the Association Committee is carried out by representatives from each Member of the Association elected to the Association Committee. The Chairman of the Committee is the Chairman of the National Group.

Although the network was originally designed to support the requirements of treasury and correspondent banking, over the years it has allowed other institutions to access services, although in some cases only to a limited extent. Currently, the following categories of organizations can access the service:

- Banks
- Trading Institutions
- Money Brokers
- Securities Dealers
- Investment Management Institutions
- Clearing systems and central depositories
- Recognized Exchanges
- trust and fiduciary service companies
- Treasury counterparties

Figure 8 - SWIFT members



Source: Research Briefs “How Blockchain Could Disrupt Banking”, 2018

All classes of participants pay an initial entry fee and an annual support fee, although the amounts vary for each class. In addition, users are charged for each message for a Unit length of 325 or 1950 characters, depending on the type of message. The fee also varies depending on the level and route, while the amounts are reduced for users with large volumes and those messages that go along the most common routes, such as the UK - USA.

Table 5 - The most popular destinations in Russia

USA	4,9%
United Kingdom	3,3%
Germany	3%
Belarus	1,6%
Kazakhstan	1,1%

Source: Annual RosSWIFT Report, 2018

In 2019, the respondents to Russia were 349 Russian financial companies, including the Bank of Russia and the largest banks in the country, more than half of all credit organizations in Russia. For clarity, imagine the total number of banks in the Russian Federation.

Table 6 - Information on the banking system of the Russian Federation (2020)

Date	01.01.2020
1. Existing Kredit Organisations	442
- banks	402
- with a universal license	266
- with a basic license	136
- nonbank Kredit Organisations	40

Source: Central Bank of Russian Federation, 2020

By this indicator, Russia ranks second in the world after the United States. To become a member of SWIFT, the company must pay an entry fee, as well as purchase a set of hardware and software.

All information in the SWIFT system is sent in messages. Initially SWIFT offers two main types of messages, GPA and FIN. The GPA messages is a general-purpose application that allows only system messages that is messages from a user to SWIFT and vice versa, and not from one user to another. The FIN messages is a financial application which is a user-to-user service, containing system messages and service messages, for example confirmations.

In addition, SWIFT provides a number of services, the cost of which exceeds the usual fee, these are Interbank file transfer (IFT) for mass messaging, for example, with a low net cost, with large volumes of retail payments. Next one is Directory services it's an automated and centralized service of standard billing instructions. The RTGS (Y-copy) is mainly used to send a copy of the message or its parts to a third party, for example, to the central bank.

To send messages you must have the SWIFT address of the other party. SWIFT addresses are used to indicate the final destination of the message and to indicate the parties in the message. Using strictly coded addresses in combination with a fixed message format allows you to automate processing.

The term "SWIFT address" actually refers only to a subset of bank identification codes (BICs). In other words, you do not need to be a user of the SWIFT network to have a BIC, and therefore they can be used in other information transfer networks. It is important to note that SWIFT is a recognized body of ISO (International Organization for Standardization) for their appointment.

Table 7 - General BIC Address Format

AAAA	BB	CC	(D)	(EEE)
Bank	Country	Location	LT	Branch

The first four characters indicate the bank code, for example, DEUT (Deutsche Bank), NWBK (NatWest).

The next two characters are the ISO country code, for example, GB (UK), DE (Germany), RU (Russia).

The next two characters are the location code, in some large financial centers, such as London and New York, two, 2L and 22, 33 and 3N, respectively.

These characters, the first 8, represent mandatory parts and usually in the message body it will be a normal format, for example NWBKGB2L (NatWest London), DEUTDEFF (Deutsche Bank Frankfurt).

The presence of 0 (zero) in eight characters means that it is an address for testing and training. Test & Training is a tool that SWIFT provides its users to test something new without interfering with transactions. When an organization first joins SWIFT, it must spend two months sending test messages and training before they are allowed to start work.

If desired, a three-character branch code can be added at the end of the address. For example, NWBKGB2LBIR may be a branch in Birmingham. These codes are mainly used for internal routing within the bank, since the branches themselves do not have a direct connection.

The logical terminal identifier, the ninth character, is present in the message header and identifies the connection of the logical channel to SWIFT. Some organizations may use more than 1 LT, and they will be called A, B, C, etc. For example, NWBKGB2LA. They are not published in the BIC directory, so all addresses in the message that identify the sender or other parties will not contain this symbol. Thus, LT will always be padded with up to 12 characters, and SWIFT addresses are 8 or 11 characters.

- All SWIFT messages include:
- Main title
- Application title
- Custom title
- Text
- Trailers

The SWIFT transaction process can be divided into two parts: message delivery and payment calculation.

A typical corporate currency payment will be as follows:

- The client sends the payment instruction to the bank branch
- The branch sends the instruction to the SWIFT Bank branch
- Client branch sends (Direct) notification to the beneficiary's bank
- The service department instructs the payment to its currency correspondent (correspondent of the sender)

- The correspondent transfers funds to the correspondent bank of the recipient bank (usually through local clearing. Clearing can be distinguished: through the institutions of the Central Bank and major commercial banks; through special interbank organizations - settlement (clearing) chambers; through the clearing department (settlement center) of the parent bank.

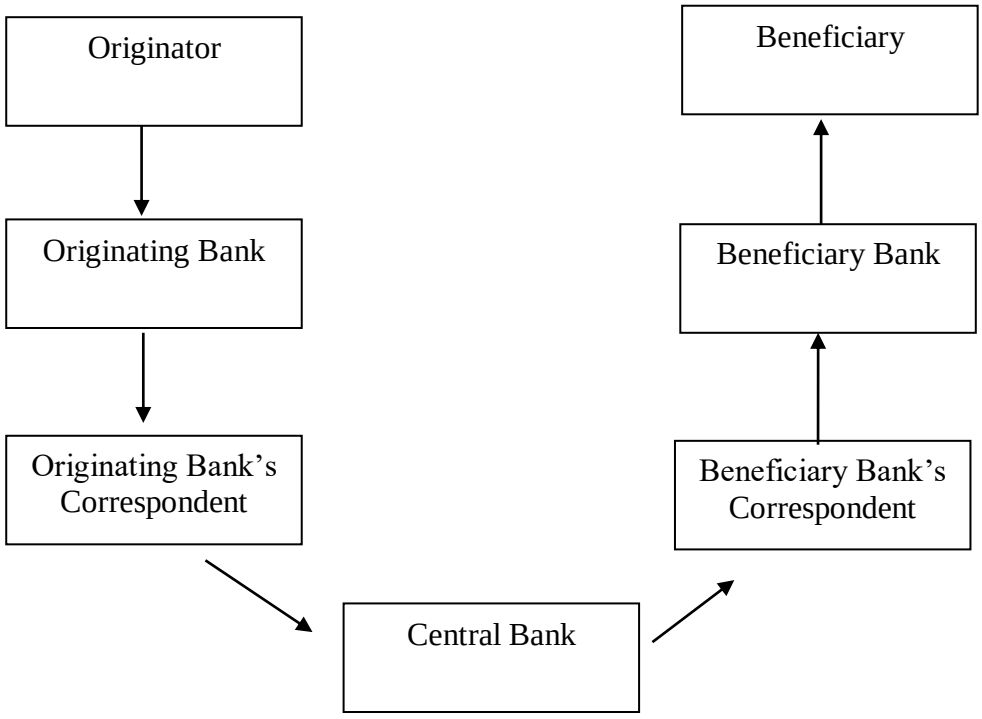
- The correspondent of the Beneficiary's Bank transfers funds to the country / regional branch of SWIFT of the Beneficiary's Bank.

- The SWIFT service branch credits funds to the books of the beneficiary's bank branch and sends a credit message

- The branch of the beneficiary's bank credits the recipient and sends a message to the recipient

- The currency correspondent sends an extract from the account to the beneficiary's bank service department

Figure 9 - Way of international payment

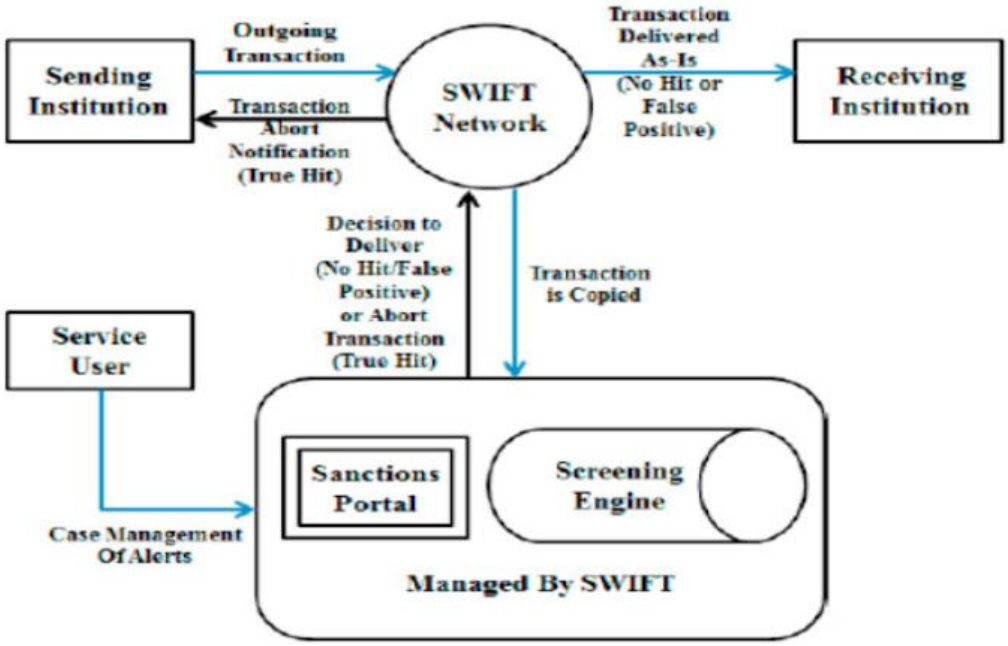


Source: "Ripple vs. SWIFT: Transforming Cross Border Remittance Using Blockchain Technology", Tianyi Qiu, Ruidong Zhang, Yuan Gao, 2018

The user of the service is sent to the sending institution to request a transfer of funds to another institution in another country; the sending organization will ask the sender to

enter the details of the transaction. Transaction details will be automatically converted to a standard SWIFT-encoded message, which will then be sent via the SWIFT network using a computer terminal. And as soon as the receiving institution receives the message, the SWIFT network will also send a copy of the transaction back to the sender's terminal. The sender will receive an update on the entire process with a status report and can click the trigger to stop the transaction at the transferring institution at any time.

Figure 10 - SWIFT transaction process



Source: C. Allison, "What is SWIFT? Tracking how money moves internationally from bank to bank", 2018

The sender immediately receives a notification field: the positive result is ACK, the negative is NAK. Each message is automatically assigned an incoming number.

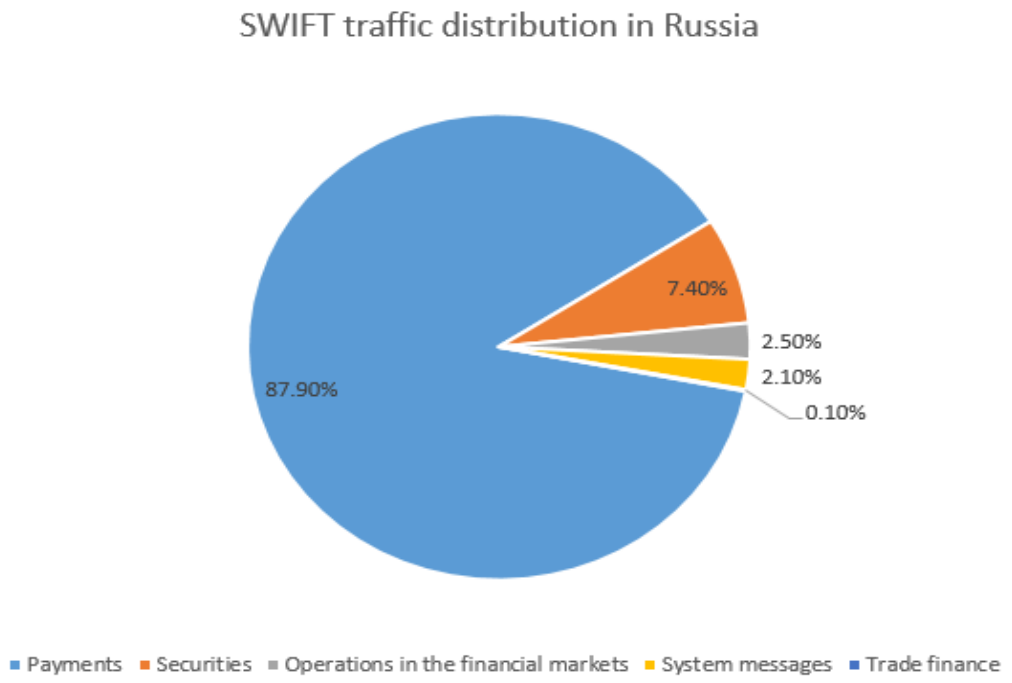
All messages are stored in a regional processor, and then sent for processing to the next operations center. There SWIFT is engaged in their processing:

- checks syntax
- creates new headers and converts messages to outgoing form
- adds trailers
- copies and encrypts messages for storage

After analyzing the structure of the transactions themselves within SWIFT, we can begin to consider the proportion of ongoing transactions in Russia and the world. According to the results of 2018, the largest weight in the structure of the traffic of

messages sent by Russian users is consistently occupied by payments (including interbank and client payments, as well as statements, status reports, etc.). They account for 89.7%, and by this indicator Russia occupies the 6th place in the world. Next come operations with securities - 7.4%. The share of transactions in financial markets (including confirmations of Forex transactions, money market transactions and transactions with precious metals) is 2.5%. The share of internal traffic (transfer of financial messages between Russian organizations) in 2018 amounted to 79.3% of the total number of messages sent by Russian users. Based on this, we can conclude that SWIFT is the main channel for transactions between banks in Russia.

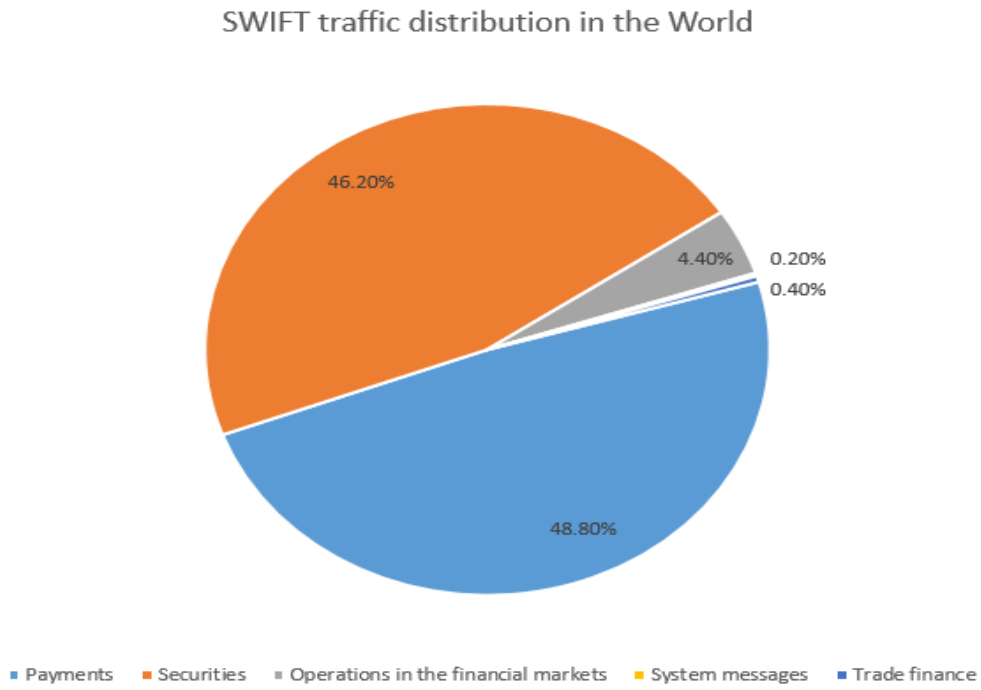
Figure 11 - SWIFT Traffic in Russia (2018)



Source: Russian SWIFT Community, 2018

For comparison, we can see how traffic is distributed throughout the world. The largest weight in the structure of the traffic of messages sent by users all over the world is occupied by payments with a total share of 48.8%. Operations with securities follow, their value is comparable with payments of 46.2%. The share of operations in the financial markets is 4.4%. This is followed by trade financing of 0.5% and system messages with an indicator of 0.5%.

Figure 12 - Distribution of SWIFT traffic in the world (2018)



Source: Russian SWIFT Community, 2018

At the end of this chapter, we will examine the strengths and weaknesses of this company. The incredible scale of the spread of SWIFT in the world allows you to transfer to the account of any well-known bank, while the amount is limited only by permissible values that do not violate the economic legislation of a particular state.

The political influence of SWIFT is more than great. We indicated above that almost all countries of the world are members of this network, the number of companies of which exceeds 11 thousand. If you disconnect this or that company or country from this system, then it will lose the possibility of exchanging, conducting transactions in the global sense of the word and it will have to use other ways to implement them. There were several cases when countries were threatened with disconnection from SWIFT, and some were even disconnected. It is also important to note that the United States has access to all the data of this system, which makes it not anonymous to the participants and obviously a strong player in political relations.

To understand the economic significance, we will present the SWIFT system as a human arterial system, blood that carries all the necessary trace elements to ensure human life is equivalent to money for the economy. SWIFT is a global player in the economic relations between countries and companies. As this network develops or lags, business

processes within companies will also accelerate or slowdown, which directly affects their effectiveness.

SWOT Analysis of SWIFT:

Strengths. The main advantages of SWIFT are the affiliate network, reliability and many years of experience. This network is widespread and very popular throughout the world, which allows payments to almost all countries. SWIFT covers losses incurred by customers in the event of errors within the system.

Weak spots. The main disadvantages of SWIFT are the length of the transaction, a centralized data transfer system that directly affects the price and time of the transactions themselves. Also, control (since 2011) over this system of the US Department of State, which monitors all payments. High entry threshold to become a member of the SWIFT system.

Capabilities. SWIFT introduces a new standardization of ISO 20022, and also modernizes the transaction system itself, seeking to reduce and reduce the cost of it implementation.

Threats. There are competitors with more advanced software and unique technology, such as Ripple. Also, some countries are creating their own replacement for SWIFT, due to the possible threat of disconnection, for example, SPFS in Russia.

The SWIFT system is global and has an impact on the global economy. The speed and cost of transactions of that company affects end users. Fortunately, the company does not stand still and modernizes its system. What will this ultimately lead to, we will see in a few years.

4.2 Analysis of transactions within a distributed registry, blockchain

A new technology that was created by an unknown author and is designed to change all forms of exchange and accounting in the digital age, blockchain. Despite its potential to revolutionize finance, healthcare, the supply chain, and countless industries, blockchain technology is still very new. However, since the concept of the blockchain was first introduced, this area has exploded, and companies and ideas have grown in all directions. With this explosion of companies and ideas, there is a lot of debate about what really is blockchain. If we go back to the very beginning and ask the creator of the first real blockchain, Satoshi Nakamoto, he will say: “A blockchain is a tree structure starting with a

genesis block at the root, and each block can have several candidates to become the next block".[13]

From a layman's point of view, this means that there is a source block, and then each new block is built on the latter, creating a higher / longer structure. Since each part is called a block, and they are infinitely connected with each other, it is customary to call them blockchain.

This is a technology that allows transactions between peers in a single network (P2P network). Transactions of this type assume that each network member can carry out a transaction directly with any other network member without involving a third-party intermediary, but there are projects created on the basis of this technology and do not threaten the presence of a third party, for example Ripple and R3(Corda).

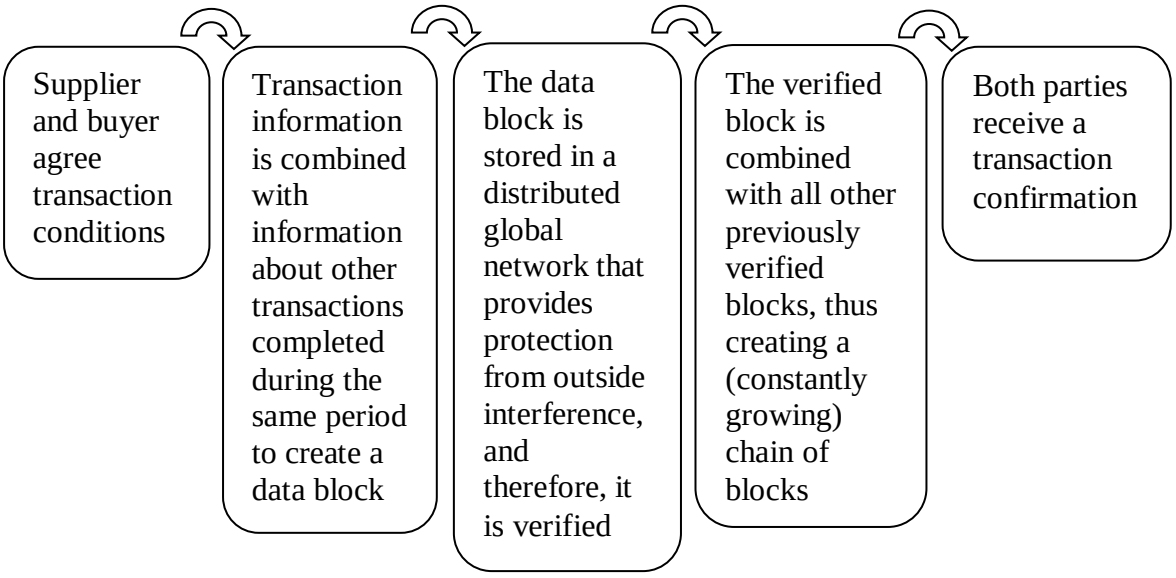
The innovation of the "blockchain" technology is that information about transactions is no longer stored in a centralized database, but transferred to the computers of all network participants that store data locally. The first application based on blockchain technology was the Bitcoin application for cryptocurrency (Bitcoin). In recent years, bitcoin has served as the basis for the creation of other blockchain applications, most of which are currently being developed in the financial sector. Most recently, a number of companies were created and individual projects were launched, the purpose of which is to apply the principles of blockchain in other industrie. In general, it is believed that blockchain applications are a very promising technology, but so far they are still at the development stages.

In essence, a blockchain is a digital contract that allows a specific person to directly (within the framework of a P2P network) make a transaction with another person and bill him. According to the concept of a peer-to-peer network (P2P), information about all transactions is stored on a computer network, including the supplier and buyer computers involved in the transaction, as well as the computers of many other network participants. Traditional intermediaries, such as a bank, are no longer required in this model, since other network participants act as witnesses of each transaction between the supplier and the buyer, and therefore can subsequently provide confirmation of the transaction details, since

[13] Robert Deng, Handbook of Blockchain, Digital Finance, and Inclusion: Cryptocurrency, FinTech, InsurTech, Regulation, ChinaTech, Mobile Security, and Distributed Ledger, 2017

the relevant information is transmitted to the network and stored locally on computers all participants.

Figure 13 – Process of blockchain



Source: PwC Report “Blockchain - new opportunities for producers and consumers of electricity”, 2016

For example, if the supplier and the buyer agree to carry out the transaction, they determine the variables of the transaction, indicating the recipient, sender and transaction amount, as well as other information. All information related to a specific transaction is then combined with detailed information on other transactions conducted during the same time period to create a new data block.

Information on each transaction is encrypted and transmitted to a large number of personal computers, each of which carries out local data storage. Network participants automatically confirm transactions.

Verification of data stored in blocks is carried out using algorithms that assign a unique hash code to each block. Each such hash code is a sequence of numbers and letters, which is created on the basis of information stored in the corresponding data block. If any information related to a particular transaction is subsequently changed as a result of unauthorized interference or due to data transfer errors, then the algorithm applied to the changed block will no longer give the correct hash code, and therefore will report an error.

Verification (from Latin verus - true and facio - I do) verification, empirical confirmation of the theoretical provisions of science by comparing them with observed

objects, sensory data, experiment. Verification is the act of showing or verifying that something is true or accurate[14].

All combinations of numbers and letters are constantly checked for their correctness, and a chain of data blocks, i.e. a blockchain, is formed from individual data blocks. Due to the fact that these combinations of numbers and letters are sequentially connected with each other, the integrity of the information stored in the chain of data blocks cannot be violated.

The verification process ensures that all participants can replenish the block chain, but subsequent changes to the records are not possible. This allows you to carry out operations on a P2P network directly between individuals or organizations that previously usually required the services of an intermediary in order to legally reflect their operations.

For example, if at present a bank is required to participate in a financial transaction between the two parties as an intermediary, then in the case of using blockchain technology, the same operation can be carried out directly and documented directly by the two parties involved in the transaction.

The verified correct version of the block is detected by the majority of participating computers and added to other previously verified blocks, thus increasing the chain of blocks. As soon as the block containing the initial operation is added to the chain of blocks and this additional link is stored by a sufficient number of network participants, the operation is confirmed, as both parties involved in the operation are informed.

We will also analyze this technology using a PESTLE analysis. The purpose of the analysis is to evaluate the current position and the development of blockchain technology.

Politics. The first thing that comes to mind when considering blockchain technology in the field of politics is transparency, and one of the key factors in a “healthy” policy is transparency in the government. This technology can provide access to the history of past transactions of any of its participants, with the inability to hide or change it. Something similar was used for the first time in West Virginia during the midterm elections in 2018.

Technology helps solve the issue of identity among the population. There has been tremendous interest in distributed ledger technology (DLT), and more countries are publishing plans for investing and adopting distributed ledger governments. It is important

[14] Oxford Learner's Dictionaries, 2019

to note, however, that a distributed ledger technology is not quite a blockchain and information can be hidden from the general mass of the population, providing only to confirmed users.

Economy. This technology offers safer transaction and banking methods at reduced costs. Technology can do without an intermediary and third parties, which leads to risk for many structures, such as banks.

There is serious concern about the adoption of blockchain technology, because it can be applied to many areas and could pose a threat to millions of jobs. As mentioned above, the blockchain was created in order to find a faster and cheaper way to complete transactions and store information. This implies that bureaucratic processes will either contract, or completely disappear.

Social. In 2018, there were recent problems with open data, which became the largest violation of information on Facebook. This launched a trigger and the public became interested in the confidentiality and security of their data. This technology provides data security, but the user will be able to receive damage due to their own sloppiness.

Despite the problems that may arise with the adoption of this technology in third world countries, this can have an effect on society, because it is a well-known fact that corruption and fraud are a constant problem in developing countries.

Technology. Due to the constant development of technologies, huge interest and demand for blockchain technology leads to a new stage of technological innovation. Companies from various fields, from medicine and energy to finance, are trying to apply this technology. This leads to the emergence of new high-tech companies and services that stimulate competition in the market.

The key factors for the blockchain are the quality and reliability that it can offer to companies and governments that want to accept it.

Legal. By applying the agreed protocol, we can guarantee the validity of the contract, ensuring that no changes or interference will be made after signing the contract. Moreover, smart contracts follow a system of evidence of consensus protocols, therefore they exclude any possibility of information destruction. This has led to an increase in the demand for security and confidentiality of legal documents.

Ecology. The need for new solutions to current environmental problems was emphasized in the 2015 Paris Agreement. Cleanliness and protection of the planet is a priority factor not only of the government, but also of the public.

There is a growing interest in solving environmental problems, which will lead to an increase in the number of countries and companies investing in the environment. An example is the reduction of paper, and the transition of almost all information to a digital level.

It is important to note that we took the Ripple company for comparison, and not another because it is the closest in its model to the SWIFT system and does not pose a threat to banking institutions, such as Bitcoin or Etherium.

Bitcoin is based on blockchain technology, while Ripple uses blockchain in a separate form of a distributed registry.

Ripple is a more suitable system for settlements, currency exchange and money transfers, intended for financial institutions. The company was created as a system of direct transfer of assets (for example, money, gold), which calculates almost in real time and is a cheaper, more transparent and safe alternative to other systems.

4.2.1 Ripple

Ripple is a provider of various services, a real-time gross settlement system and currency exchange and money transfers. Although the company is better known for its cryptocurrency (XRP), it also develops a number of banking products under the Ripple brand, whose assets account for half of their market capitalization.

The popular xCurrent product from this company can be directly integrated with existing registries of various banks and currently offers banks a faster two-way communication protocol. The two-way protocol allows you to exchange messages and carry out calculations in real time. Currently, Ripple has several hundred customers who have joined the experiment from around the world, including major market players.

RippleNet network provides a single, convenient for global payments functionality to all its members. Instead of combining disparate technologies, non-standard communications and centralized networks, RippleNet is a single global network of participants who send and receive payments through Ripple distributed financial technology, providing real-time messaging, clearing and settlement of transactions.

RippleNet is a distributed ledger network based on an agreement between Ripple and network members. They all use the same technology and adhere to an agreed set of payment rules and standards that streamline the transaction process.

RippleNet banks benefit from reliable connectivity and standardized technology. According to experts, the distributed financial technology of Ripple is superior to modern infrastructure, because there are lower costs for participants, high data processing speed, and Ripple provides end-to-end transparency of payments, timelines and costs.

In the system, RippleNet participants are divided into two key groups:

1)network members, which are banks and payment providers

2)network users, which are corporations, consumers and others.

It is important to note that the company Ripple, despite the fact that it is a representative of blockchain technology, does not change the system of data transfer and transaction, from four to trilateral. Therefore, Ripple is a kind of modern SWIFT, a faster, cheaper and more technologically advanced communication channel between organizations.

Since Ripple payments are almost instantaneous (3 seconds), their model eliminates credit and liquidity risks, thereby significantly reducing bank (and social) expenses. Since the network finds the best price for exchange (conversion from one currency to another) and liquidity (delivery of the recipient's currency), pricing is optimized and customers are no longer tied to the wide spread that is reflected in the rates on bank accounts. The benefits to corporations are obvious in terms of price and speed. Corporations will also appreciate the elimination of calculated risk. The needs of today's Transaction Banking corporate and retail customers have changed significantly.

In addition to sending high-value payments, they need the ability to send low-cost international payments on demand and in real time - not only through banking networks, but also to emerging financial networks (for example, mobile wallets).

Many of the limitations of modern transactional infrastructure make banks need to process payments in batch mode, which leads to high processing costs and long settlement times, because if you process each payment separately, the transaction fee will be enormously high for the end consumer.

Ripple software connects these disparate networks using the open neutral protocol - Interledger Protocol (ILP), which provides new financial settlement efficiency, real-time

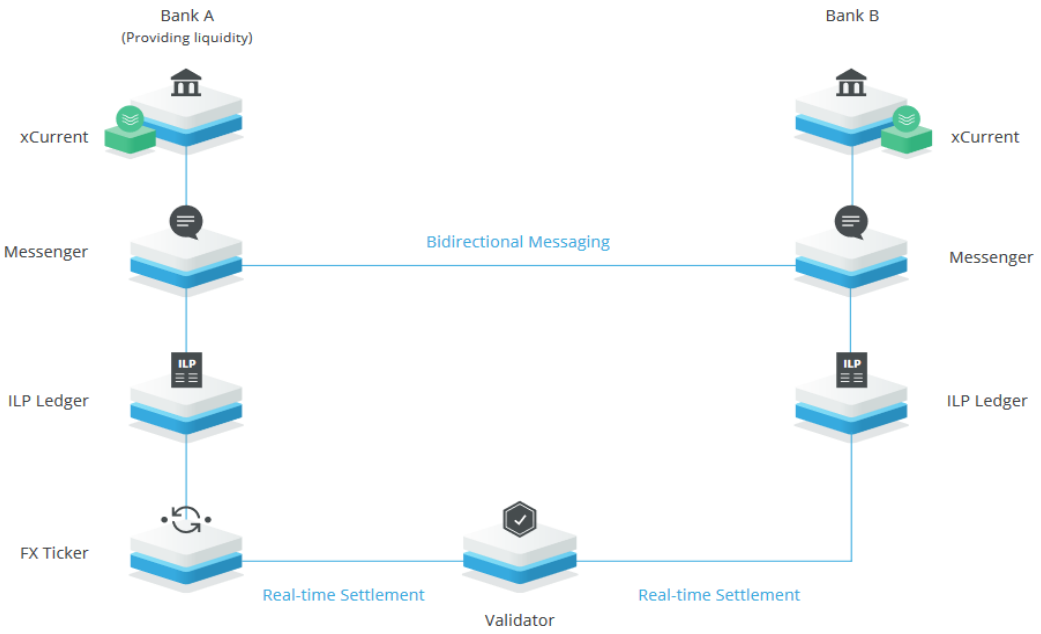
settlement, guaranteeing transaction accuracy and eliminating settlement risk. Ripple software also includes messaging between all transactional parties, providing real-time data exchange for the end user. An important advantage of Ripple xCurrent software is the fact that more profitable and faster transactions can help banks attract customers by offering new cross-border payment services while lowering the overall transaction cost.

According to Ripple, the solution was designed specifically to meet the needs of banks, fitting into their existing risk management structures, meeting the requirements and information security of the banks themselves. That is, networks are being integrated into existing banking networks.

Ripple software is installed in the bank's infrastructure and is designed to interact with banking systems using the Application programming interface (API) or through another platform that it can use for traditional systems to reduce time costs. All RippleNet members are connected through Ripple and standardized technology for all xCurrent members.

xCurrent is the first global real-time gross settlement system (RTGS), which allows banks to send, clear and settle their transactions with increased speed, transparency and global efficiency RippleNet among banks and payment systems.

Figure 14 - Ripple Transaction Diagram



Source: Ripple Repotr, 2018

The solution is based on the open neutral protocol ILP, which provides interoperability between various registers and payment networks.

The solution offers a cryptographically secure end-to-end payment flow with transactional immutability and redundancy of information. It is designed to comply with each bank's requirements regarding risks, confidentiality and compliance.

Since the software is designed to fit the existing infrastructure of banks, it minimizes the overhead of integration and the negative consequences for the business.

We indicated the components of the solution in the table below, where all the links of the chain for conducting an interbank transaction are painted.

Table 8 – Solution components

Messsenger	This is a messaging module that provides two-way communication between banks that work with RippleNet. It is connected to the recipient bank's unit to exchange information on commissions, exchange rates, payment details and expected delivery time of funds. If the information is incorrect or missing, the parties to the transaction will know about it before the start of the transaction.
FX Ticker	A component that facilitates the exchange between books of account, allowing suppliers to publish exchange rates. It also tracks the account, currency, and authentication credentials for each configured ILP workbook. During the transaction, he coordinates transfers to the ILP registers for settlements.
Validator	A component that cryptographically confirms the success or failure of a payment. He coordinates the movement of funds through the books of accounting of the parties involved in such a way that eliminates all risks of settlements and minimizes delays in settlements. The validator is the only source of truth for counterparties regarding the success or failure of a payment.
ILP Ledger	Used to track loans, debits and liquidity between parties to a transaction. Allows transactional parties to calculate funds atomically, which makes the transaction instant, regardless of the number of parties. Designed to provide transactional banks with round-the-clock availability on demand.

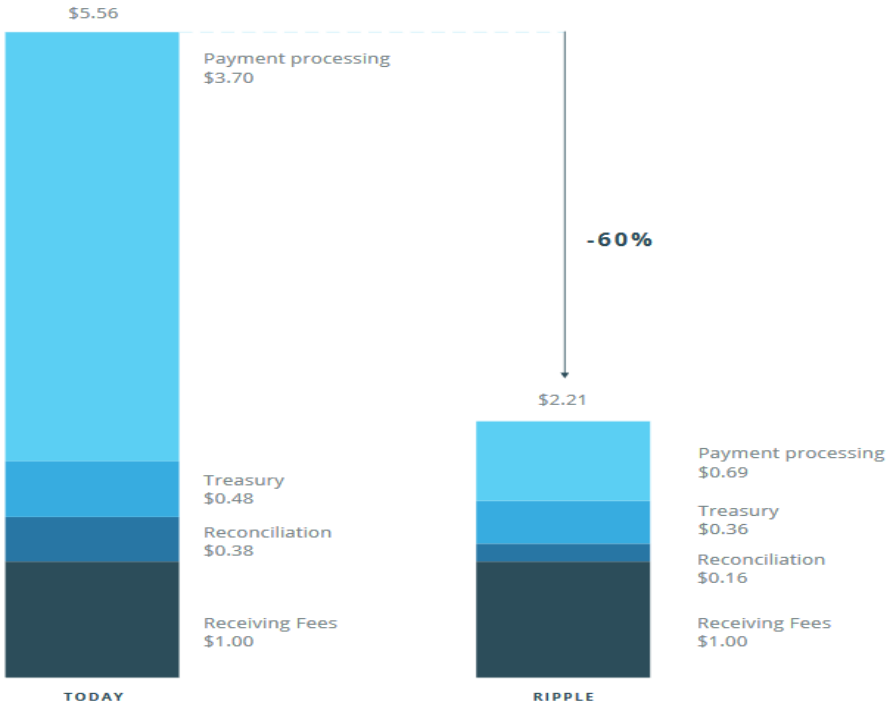
Source: Ripple Report, 2018

The combination of these features allows banks to profitably offer low-cost products for international payments and on-demand services.

Since xCurrent is a bi-directional messaging, banks can more efficiently exchange information about the sender, recipient, tariffs, tariffs, delivery estimates and payment status in order to reduce their operating costs for processing international payments. Payment processing costs are significantly reduced thanks to xCurrent's ability to raise

rates and eliminate SWIFT fees. The cost of treasury operations is reduced by lowering capital requirements during the flight, liquidity costs, counterparty risk, and compliance costs. Reconciliation costs are reduced thanks to xCurrent's ability to provide instant confirmation and real-time liquidity monitoring.

Figure 15 - Estimated Total Cost Per Payment



Source: Ripple Report, 2018

Note: Modeled use-case: Annual Payment Volume: $ 100M; Number of Annual Payments: 200K; Average Payment Size: $ 500; Corridor: CADUSD

xCurrent is a bi-directional messaging, banks can more efficiently exchange information about the sender, recipient, tariffs, tariffs, delivery estimates and payment status in order to reduce their operating costs for processing international payments.

The cost of treasury operations is reduced by lowering capital requirements to liquidity costs, counterparty risk, and compliance costs. Reconciliation costs are reduced thanks to xCurrent's ability to provide instant confirmation and real-time liquidity monitoring.

In addition, Ripple uses the industry standard ISO and MT, and since participants are directly and multilaterally connected, there is no loss of corporate data in payment messages. Full fees and messages can significantly increase the performance of automatic reconciliation. Unlike some other fintechs, Ripple is focused on banks. Banks are

connected to the Ripple network, not their customers. Today, this can be positioned as an advantage. Because customers are used to using banks and they have a higher level of trust. It is also easier for financial regulators to interact with such networks. It is not completely clear how Ripple will look after the introduction of new standards, as well as new technologies by SWIFT.

Ripple provides one hassle-free experience for sending money around the world using the power of blockchain.

By joining the growing Ripple global network, financial institutions can process payments from their customers anywhere in the world instantly. Ripple has offices in San Francisco, New York, London, Sydney and Luxembourg, over 300 financial institutions across 40 countries worldwide.

4.3 Analysis of indicators of blockchain technology and centralized SWIFT

We will start this part with the fact that, according to expert forecasts, the total amount of international payments is expected to grow annually by 5.5%, from 22 trillion US dollars in 2016 to 30 trillion US dollars in 2022, including retail and corporate payments.

New business models and service providers are starting to emerge, offering cross-border payments for segments of the retail market. At the same time, the number of active correspondent banks in the world is declining, as we showed on the example of Russia in chapter 4.1. Between 2011 and mid-2017, the number of active correspondent banks in the world decreased by 8%.

All this, to one degree or another, affects money transfers within the markets of the whole world. Today, cross-border payments are expensive, can take several days and not have transparency in terms of both costs and delivery times.

This is primarily due to the complexity of the cross-border payment process, which includes the participation of several organizations in cross-border transactions, the level of regulation, for example, the law on combating money laundering and the financing of terrorism.

The difficulties in developing the system are also related to the divergence of regulatory approaches in different jurisdictions.

We will consider the main problems associated with cross-border payments and settlements today.

Let us describe the influence of factors on various participants in the value chain of payments and, as a result, on end users (senders and beneficiaries). In addition, the table lists the main causes of various problems.

Table 9 - The main problems of cross-border payments

Impact on financial markets	Description and degree of impact on different participants	Root Cause
Time taken for payment processing	**Commercial Banks** • Inability to straight-through process payments • Investment in message mapping protocols between different payment networks	Regulatory requirements to undertake processes such as sanctions screening, collateral requirements, payments message details (clearing codes, purpose of payment), etc., can prevent straight-through processing of payments. Requirements are often duplicated across multiple entities and jurisdictions
High costs associated with the correspondent banking model	**End-users (Sender and Beneficiary)** Significant cost of cross-border payments passed on to end-users **Commercial Banks** Increased costs (explicit and implicit). Costs are relatively higher for local banks due increased reliance on correspondent banking arrangements	Reliance on multiple intermediaries (with associated cost and complexity) for cross-border payments and settlements; Challenges associated with legacy payments infrastructure across networks, central banks and commercial banks; Restrictive central bank policies on access

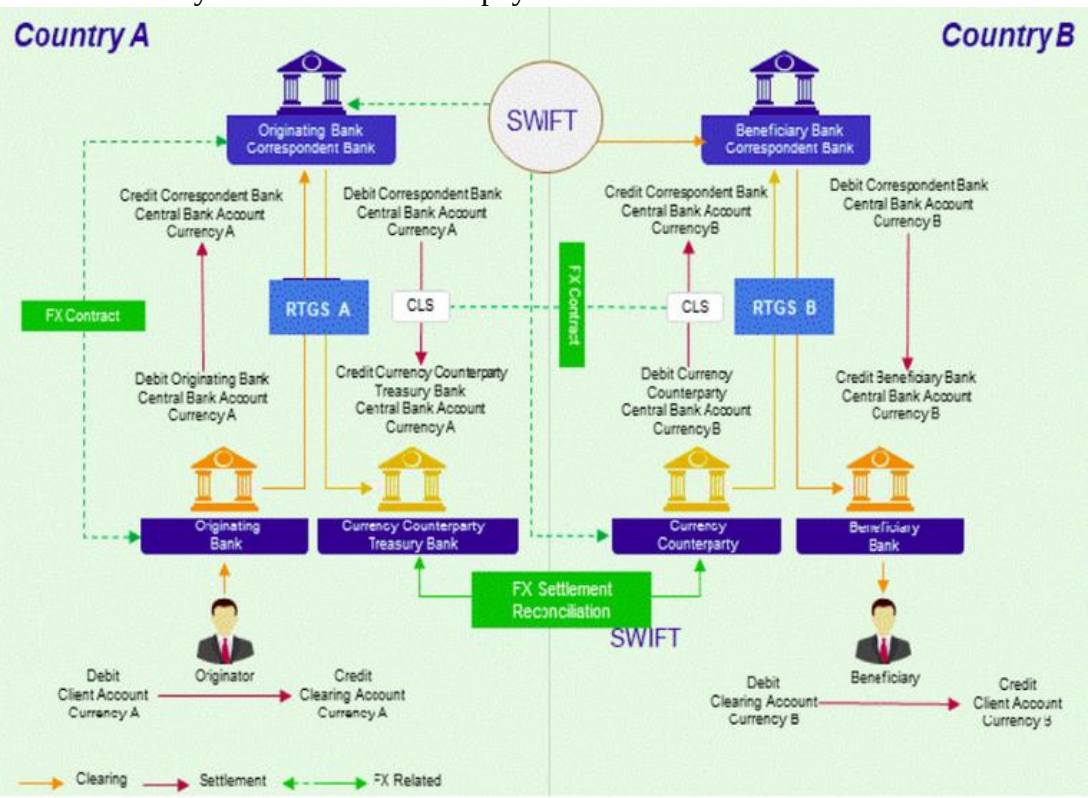
Source: Bank of England, *Cross-border Interbank payments and settlements*, 2018

We single out as two main problems of cross-border payments - this is the time (from the moment the transaction starts from the sender's account to the moment the beneficiary receives the funds), as well as the high cost, which also depends on various factors and varies, as a result, all this affects the final user more than anyone. Undoubtedly, there are many reasons and the correct systematization with general jurisdiction can change the big picture.

The process of accepting cross-border payment involves several parties, each of which faces its own challenges. Therefore, the above analysis focuses on key participants and intermediaries between them.

Below we will consider the current scheme of cross-border payments and settlements. It is assumed that the sender bank does not include SWIFT support, that is, the sender must transfer funds to a local correspondent bank with SWIFT support, which, in turn, will send messages about the transfer of SWIFT to the recipient bank or correspondent banks of the recipient on behalf of the sender of the bank.

Figure 16 - Modern system of international payments



Source: Bank of England, *Cross-border Interbank payments and settlements*, 2018

As we see in the diagram and, part of which was shown earlier in chapter 4.1.1, the transaction goes a long and multi-stage path before reaching the beneficiary.

It is a large number of intermediaries that is the main reason for such a long time journey, taking into account one-way messages and, as we said earlier, this issue cannot be solved solely by an increase in the number of computers, which is why banks are developing their blockchain technologies (R3), which we will introduce in the next chapter.

This is also why SWIFT themselves see the potential in the development of the blockchain and are introducing new standards, for example, SWIFT gpi.

It may seem that we are critical of the SWIFT system and loyal to the blockchain system, but this is not so. We are trying to assess the overall situation in the world of transactions as soundly as possible and determine the development paths with existing tools.

Below we have presented a table with the written out main indicators of SWIFT from 2014-2018. The total amount of messages transmitted within SWIFT.

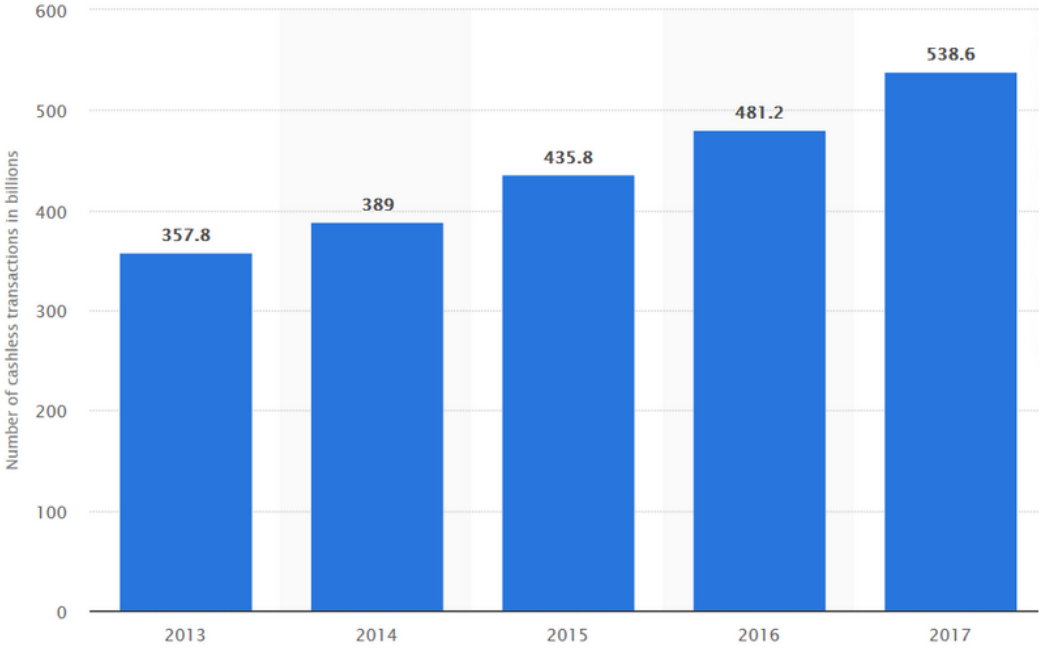
Table 10 - Main SWIFT indicators, 2014-2018

	2018	**2017**	**2016**	**2015**	**2014**
Total number of transactions, million	7800	7100	6500	6100	5600
Daily transactions, on average, million	31.3	28.1	25.8	24.2	
The maximum number of transactions per day, million	35.2	32.8	30.3	27.5	25.8
Height, %	11.3	8.4	6.9	8.8	11

Source: SWIFT Annual Report, 2018

We see continuous growth, the average value of which is 9.28%. Also, the total number of financial messages within the system is about 8 billion. For an example, we will give the diagram with a global level of transactions.

Figure 17 - The number of transactions worldwide from 2013 to 2017 (in billions)



Source: Source: Bank of England, *Cross-border Interbank payments and settlements*, 2018

In the Comparison we see that SWIFT makes 1.5% of the total number of payments. A general analysis of us led to the following values:

Table 11 - The total number of transactions with the level of annual growth

	2014	**2015**	**2016**	**2017**	**Σ**
Transactions, bill	389	435.8	481.2	538.6	1844.6
Growth, %	100.0	112.0	110.4	111.9	34.4

Source: Own work

Comparing these two tables, we see that the overall growth rate both in the World and in SWIFT coincides with a difference of 1%. Average annual growth also correlates with a slight difference from year to year.

In comparison, we give the main indicators of the company Ripple, published on their website:

1) Average transaction time - 3 seconds, 24/7;

2) The number of transactions per second - 1500 (it is possible to expand to the volume of VISA, which are more than 65000 transactions per second)

According to these indicators, the potential of Ripple has not yet been revealed and its total number of transnational payments and transactions of any other nature can significantly exceed SWIFT.

We do not undertake to say that this will happen. Everything will depend on new technologies that SWIFT introduces and will introduce in the near future. We will describe them in more detail in Chapter 5.

It is important to analyze the system and Ripple itself. As the most suitable, we chose a SWOT analysis and examined all the most important aspects of this company in table 13.

Table 12 - SWOT analysis of Ripple

Strengths. Ripple does not threaten banks in any way, but only increases their speed of transactions and does it almost instantly and cheaply. Ripple confirms transactions in less than 4 seconds and can process more than 15,000 transactions per second.	**Weakness.** Ripple Labs is still a relatively young company and has not shown itself in the financial markets as SWIFT, which has existed for many decades and guarantees the reliability of all transactions. Ripple also has a relatively small portfolio of partners, which repels many other financial market players.
Opportunities. Ripple could ultimately revolutionize the entire global payment infrastructure and become one of the main providers of financial messages on a distributed ledger system.	**Threats.** Traditional legacy payment systems can create their own blockchain platforms. Integration or acquisition of this company by a larger participant in the financial market is also possible.

Source: Own work

Based on a general analysis, we conclude that the distributed registry system itself has great potential, and as for Ripple itself, we don't dare to claim that this company will become the main player or completely disappear, although its partner network already has large international companies.

There are also too many variables for predictions in this direction. In the near future, it will become more clear to us where this trend is moving.

5 Results and Discussion

5.1 Current payment trends

To analyze this chapter, we need data that we will operate on and to which we will refer. In the beginning, it is worth noting that the topic of this work was not chosen by chance and is associated with the accelerated growth of cashless payments in the world, which leads to an increase in operating loads per unit of computer technology.

At this stage, the question cannot be solved by the number of computing units, and a qualitative leap in the system of calculations (transactions) is required. Therefore, we believe that changing a system or technology for transmitting data, that is, transactions, in the financial sector is only a matter of time.

Consider a chart with the level of cashless payments. In the diagram below, we see that in 2017, 160.6 billion US dollars were spent in non-cash operations in North America, which is higher than in any other region. This is followed by Europe and developing Asia, with transactions of 133.8 and 96.2 billion US dollars, respectively.

Figure 18 - The number of non-cash transactions in the world (in billions of dollars) by region, 2017–2022F

Source: Capgemini Financial Services Analysis, 2019; Countries' Central Bank Annual Reports, 2018

Tracing the trend in the chart, we notice that leadership for North America remains temporary until 2020, then Asia becomes the leader in terms of cashless transactions. Also, the total amount of non-cash transactions will almost double in 5 years. We will consider the chart in more detail in the table below.

Table 13 - The number of non-cash transactions in the world (in billions) by region, 2017–2022F

	CAGR (2017-22F)	Growth (2017-18F)	
Global	14.00%	11.20%	
MEA	21.60%	17.90%	**Developing 23.5%**
Latin America	6.00%	5.50%	
Emerging Asia	29.70%	28.60%	
Mature Asia-Pacific	10.20%	10.20%	**Mature 7.1%**
Europe (incl. Eurozone)	8.50%	6.30%	
North America	4.70%	4.70%	

Global non-cash transactions grew by 12% and reached $ 539 billion during 2016-17. The 2019 World Payment Report suggests that the global non-cash transaction volumes in 2017-2022F will have a Compound annual growth rate of 14%. The diagram also shows that emerging markets will increase the global growth rate of transaction volumes, where the average annual growth rate will be 23.5%, while developed markets are expected to grow by an average of 7.1%. It is expected that over the next five years in Europe, including the Eurozone, there will be a steady increase of 8.5%.

For clarity, consider a table with cashless payments in the European Union at five-year intervals.

Table 14 - Cashless payments in Europe

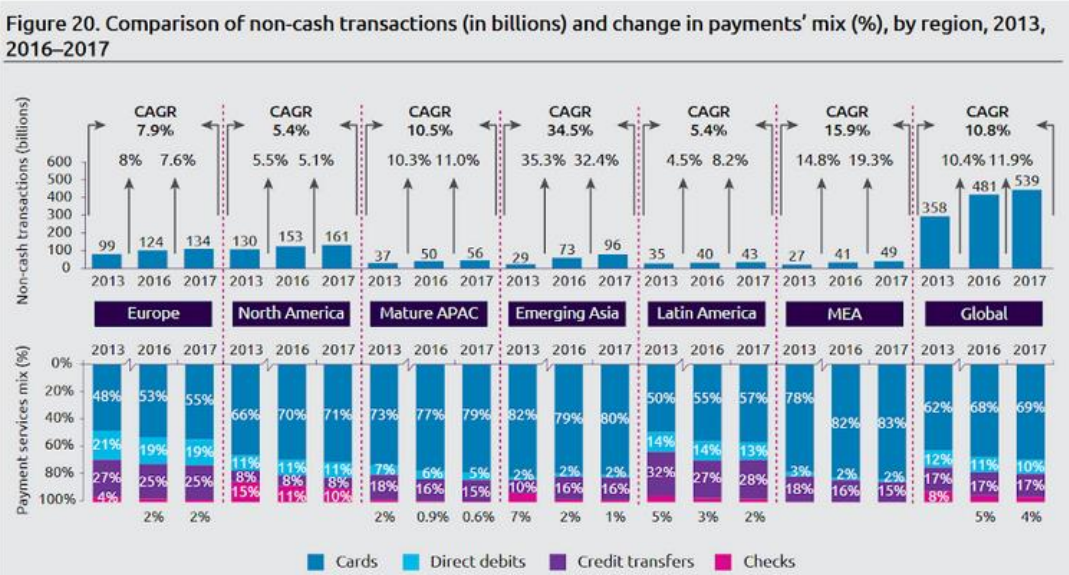
Year	USD Billions	Growth, %
2005	70	100.00
2010	87	24.29
2015	121	39.08
2020e	171	41.32

Source: A.T. Kearney, European Central Bank, 2018

We see a clear growth trend with increasing growth every five years. The average annual growth is also significant, in these calculations we did not take into account the

annual increase in the money supply and take average values, not average weighted ones. In any case, the growth will be significant.

Figure 19 - Comparison of non-cash transactions (in billions) and changes in the structure of payments (%) by region, 2013, 2016–2017



Source: Capgemini Financial Services Analysis, 2019; Countries' Central Bank Annual Reports, 2018

The basis of non-cash payment instruments are:

- credit transfer;
- direct debit;
- payment cards;
- checks.

The difference in their application is due to the variety of payment systems that have been created and formed over the years under the influence of historical, economic and technological factors.

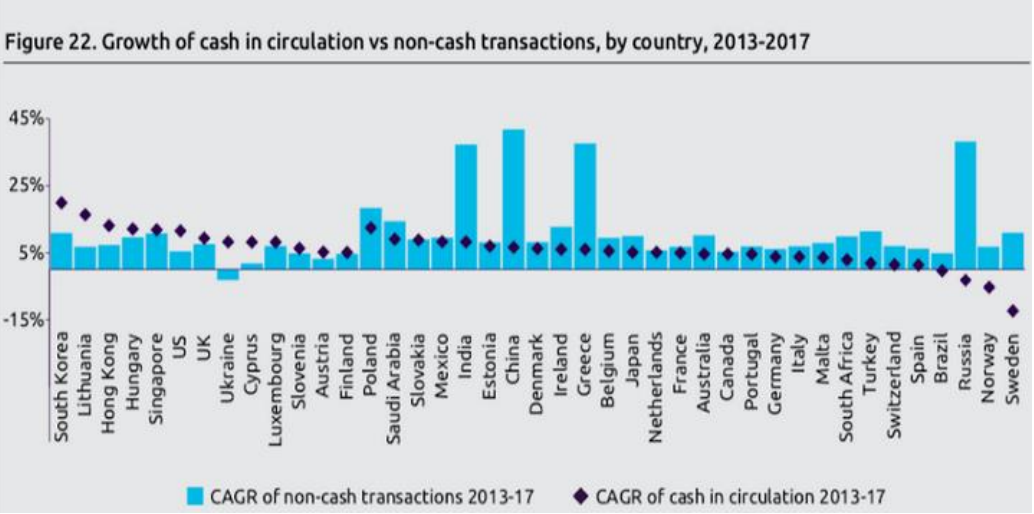
An increase in the use of payment cards and a decrease in the share of cash is an indicator of changes in recent years. As a result, we observe that payment cards have become the main tool that payers use for payments around the world. However, their share in the total number of cashless transactions was very diversified - the largest in developing Asia (more than 80%), and the lowest, which is surprising, in European countries, where it reached 43% in 2012.

In North America and developing Asian countries, checks are still a relatively popular means of payment; in Latin America, CEMEA and Mature Asia-Pacific, about ⅓ non-cash payments are made as cash credit transfers. In Europe, the structure of payments is somewhat different, for example, although here payment cards are the main instrument of non-cash payments, their predominance is not as obvious as in other regions. A relatively high proportion of direct debit and credit transfers that reach a similar level is a typical feature of the payment structure in Europe.

Perhaps we will not notice the moment when we stop using cash, and this event is really close. This statement is supported by many factors, including the dynamic development of technology, the expansion of electronic commerce, as well as social and cultural changes. Changes include growing virtualization and digitalization, leading to changes in the lifestyle and behavior of modern consumers. According to many organizations, cash is becoming a relic of the past, a form of payment that does not correspond to the modern way of life.

We see that the rhythm of life in people has accelerated at times. Business processes take much less time than before, thanks to the introduction of new technologies and robotization of production. All this is accompanied by a transaction speed, which obviously depends on the type of payment used by one or another party. Nevertheless, we do not take the responsibility of unambiguously concluding that the rejection of cash is inevitable, because in some countries the opposite trend is observed, although they are rare (Figure 19). We only state the facts of reduction in their volume referring to official sources.

Figure 20 - Growth of cash and non-cash transactions in cash turnover



Source: Capgemini Financial Services Analysis, 2019

All this information does not give an obvious answer to the question whether cash will remain our means of exchanging value or will it be completely replaced by electronic money. There is no doubt that financial institutions, including banks or card schemes, and more recently, other engaged in the development of payment innovations, are the main proponents of cash exclusion from circulation. In many countries, government agencies also seek to reduce the use of cash. According to them, their main task in this is to reduce the shadow economy and reduce the cost of cash circulation. However, it seems that these goals are not shared by a fairly large group of consumers. In many countries, people show a strong commitment to money and still consider it the most convenient, fast, cheap and safe form of payment, especially in P2P (people-to-people) or C2B (client-to-business) transactions. Cash also has an additional, very important value that cannot be ignored, which is anonymity. This provides privacy to consumers, which is now becoming a rare and increasingly valuable good in a world where mass surveillance is becoming common practice. As a result, in Europe we can find countries such as Sweden or Norway, where cash use is low and still declining, as well as countries such as South Korea, Lithuania and Greece, where their use is only growing.

For these reasons, replacing cash with other payment instruments will not be as simple and quick as it might seem. Given the pace of development and the speed of implementation of the main types of payment innovations, it should be noted that contactless payments are the most promising alternative for cash in personal transactions. These include contactless cards and mobile contactless payments, especially NFC payments. Their promotion mainly depends on the desire of consumers to change existing payment habits.

Coverage of a larger volume depends on the development of business models that take into account the interests of all market participants, including a pricing strategy that requires proper sharing of costs between stakeholders. However, before this happens, it is necessary to develop technical standards and interests of the parties that would be approved by most market participants.

5.2 The future of banks and the development of transaction system

Over the past fifteen years, classic banks have invested heavily in updating and developing automated systems, remote channels, business processes, and in terms of the level of development of digital services, they have come close to digital banks, and due to the versatility of their business models for many products, they look more attractive and complex with remote maintenance point of view.

Today there is no single method for assessing the degree of digitalization. If we talk about upper-level metrics, then here, as a rule, they focus on:

- level of automation of business processes;
- development of self-service channels (services and functions available in digital channels);
- speed of operations (offline, online, in real time);
- the level of development of data management, including machine learning, data governance;
- 24/7 service availability;
- rate of change, time to market (time-to-market)..

The main indicators, which are also affected by the listed properties, are the share and volume of service operations. These parameters allow you to understand how effectively the bank works with its customers in a digital environment. There are obvious changes in the competitive environment, which can be divided into three groups - fin-tech, neobanks and big-tech (Figure 20). One of the most important unifying properties of new players in the financial market is the speed of product delivery (time-to-market), and at the same time it is the weakest side of classical banks.

Table 15 – New players in banking system

	Fin-tech	**Neobanks**	**Big-tech**
Description	High-tech startups, blockchain, P2P, crowdfunding	High-tech startups with a banking license,	Technology giants
Examples	Ripple, Etherium, Bitcoin, Stripe	Starlin, Revolut, Monzo	Amazon, Google, Facebook, Apple

Benefits	Speed, price, technology	Quality, price, availability of a banking license	Customer base, scalability, quality, speed
Disadvantages	Customer trust, financing, legislative regulation	Business Financing and Scalability	Lack of banking experience
Prospects	Bank vendors or partial integration	Part of the banking ecosystem or future competitors	Competitors for banks or partial integration

Source: Control Engineering, *Digitalization of classic banks, Technology in Finance and Banking*, 2019

We see the development not only towards the reduction of branches, but also changes in customer experience regarding payment and purchases of something. The development of new directions.

General trends tell us about the movement of customer activity online and the high level of development of distance services, which means banks need to learn how to convert the huge traffic of contacts with customers in digital channels. Already today, the following figures are typical for a classic bank: more than 90–95% of contacts with customers occur in remote self-service services, and only 5–10% are accounted for by a network of offices and a call center.

The banking industry is quickly adopting many modern technological trends, often experimenting with completely new approaches, tools and technologies. Many leading banks have created their own R&D laboratories (Research and Development), in which ideas are generated and tested, prototypes are created to determine possible growth points for an existing business model or to search for new ones.

A major role in a modern bank is also played by information systems for working with data and other data layer components. This can include everything that is usually ranked as BigData. Some banks create special units in order to ensure the necessary level of accessibility and applicability of data, modeling and, in general, for more efficient work with big data when solving business problems.

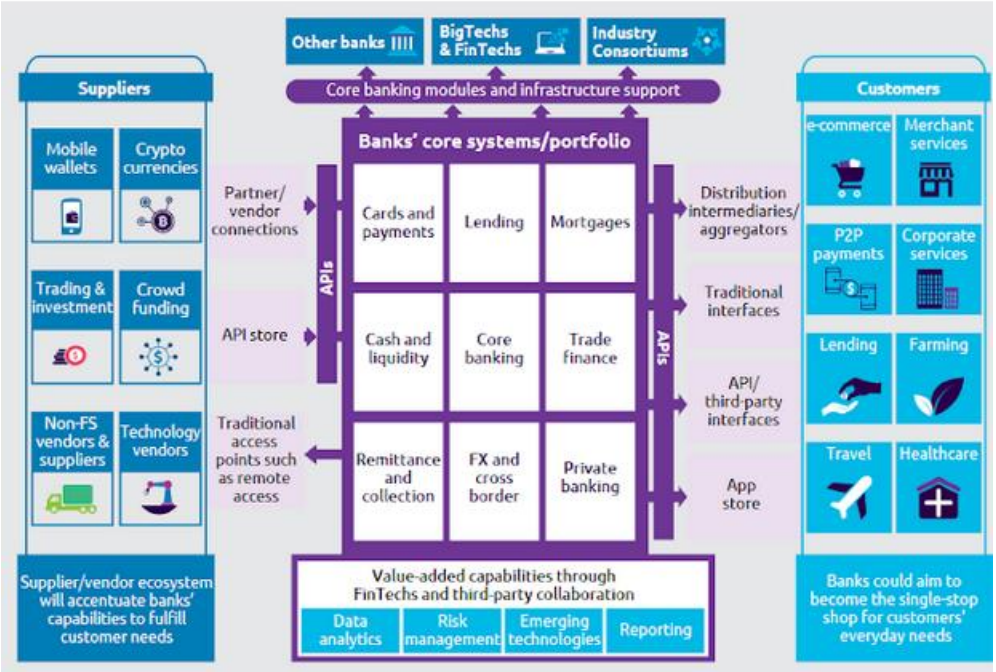
Along with the above-mentioned technological blocks, a modern integration bank is extremely important, often representing a set of technologies, solutions, adapters,

components and modules for ensuring the interaction of information systems. A few years ago, the main trend was the creation of a centralized data bus linking the bank's information systems through a single message format, rules and interaction protocols. Many banks have implemented such projects, but the integration environment that could cover the entire bank did not appear; many goals were only partially achieved. If we are asked to describe in a word, in which direction all the banks of the world are developing, we will answer - the ecosystem. Yes, all the leading banks of many countries are developing in this direction.

The banking ecosystem is an interconnected set of services in which customers can satisfy various needs in a single integrated experience. That is, from buying a product to paying utility bills or parking fines, all in one integrated banking application based on open banking.

Open banking and ecosystem business models are the main directions for preserving banks. 90% of surveyed banks said participation in ecosystem-based business models is key to long-term success in the new payment market. Most banks are either ecosystem participants or an aggregating partner who shares the API, but only a few of them create and manage the ecosystem from scratch. Some firms favor a hybrid approach, participating in an ecosystem while creating an ecosystem. An example of how a bank can schematically look in the context of an open ecosystem is shown in Figure 21.

Figure 21 - Bank like the open ecosystem



Source: Capgemini Financial Services Analysis, 2019

The “face” of the modern classical bank, of course, is remote digital services - Internet banks, mobile banks, personal accounts, websites and other specialized services for private and corporate clients. As already noted, these channels account for more than 90% of customer contacts that occur 24 hours and 7 days a week. In large cities with developed Internet, classic banking has already become digital in many respects. Consequently, banks invest a significant part of their investments in improving their customer experience in digital channels, introducing new services and functions, simplifying interfaces, and increasing the reliability, security, availability and speed of online services.

The mobile banking application is already part of everyday life, and banks are striving to interest customers with additional opportunities - interesting information, life hacks, information about where it is better to pay with a bank card for additional benefits, and others. Mobile banking applications with an integrated ecosystem will be the main element of the business model of any bank working with the mass segment.

Therefore, the general development trend of banks is approximately clear to us. An important condition for its development is the factor that the bank is not a closed system, but an open one, with a certain set of partners providing the bank with certain services. Obviously, one of the most important such partners is MasterCard, Visa, SWIFT. That is, companies that carry out the fact of the transfer of communication, transactions. Since our work is focused more on the SWIFT system, it is in the context of this company that we will consider the trends in the development of the transaction system.

The most common standard for international payments is the SWIFT MT standard. With the development of technology and changing business needs, this standard has become obsolete and a new ISO 20022 standard has been proposed. By 2023, the ISO 20022 messaging standard will account for about 79 percent of all high-value payments, and there are proposals to transfer the cross-border SWIFT network to this standard by 2025. One of the main advantages of the wide coverage of the SWIFT network is its potential to ensure consistent data standards. The widespread adoption of this highly structured messaging standard can help overcome many of today's challenges.

A significant factor is that ISO 20022 can be implemented in systems associated with domestic and international payment networks, which increases interoperability between systems and reduces costs and complexity for banks using these systems.

This can reduce regulatory compliance costs and, in turn, lower the cost of cross-border payments and improve the availability of related banking services.

More structured data can support more automated processing and reconciliation, providing benefits along the entire value chain and further reducing the cost of cross-border transactions for correspondent banks and their customers.

Finally, the process of implementing ISO 20022 in legacy infrastructure is likely to require system upgrades from RTGS operators, network providers, commercial banks, providers and large corporations. This process can help increase efficiency. For jurisdictions, the implementation of ISO 20022 can create various difficulties. The flexibility offered by the new standard means that in each jurisdiction a version of the standard can be implemented that is unique and specific to its individual needs. This may reduce efficiency when adopting the same standard. We assume that banks need clear and common standards both within the system and outside it, regardless of the specifics of their location, for more effective interaction.

ISO 20022 can be entered in conjunction with other data standards such as Legal Entity Identifier (LEI). LEI can provide a globally standardized mechanism for identifying parties within a given transaction. This can improve compliance processes and lower costs. In addition, the scale of implementation can be a problem for large financial institutions and is a serious obstacle to the implementation of new data standards. Each new data item has an impact on banking platforms, data warehouses and customer-oriented channels. The cost of such changes may mean that jurisdictions or institutions with less developed financial infrastructure or less incentive to change decide not to switch to new standards.

The SWIFT Global Payments Initiative (gpi) addresses issues related to payment speed and visibility. SWIFT gpi allows you to view payments on the SWIFT network. This feature is available for SWIFT members who have subscribed to the service. Registered banks can transmit tracking information to customers, which gives a complete picture of the status of a payment transaction from the moment it is sent to the moment it reaches the recipient’s account, with confirmation as soon as the recipient receives the money. There are plans to expand the range of functions, including stopping and revoking a transaction.

In addition, SWIFT gpi is designed to ensure transparency of levied bank charges and applicable exchange rates.

The problem for gpi is that it is available only to SWIFT member banks. This limits the number of users who can use this feature. However, the SWIFT gpi Service Level Agreement dictates a “use the same day” policy to expedite payment processing, thereby reducing the overall time for international payments and settlements for transactions with gpi support.

According to experts, the profit of banks in the transaction business is about $ 1,600 billion.

Another major project is the blockchain consortium R3 (Corda), which includes the largest banks in the world, including JPMorgan and Citigroup. The consortium wants to offer "a new operating system for financial markets."

Corda is a distributed ledger platform designed from the ground up to register, manage and synchronize financial arrangements between regulated financial institutions. It is largely inspired and reflects the benefits of blockchain systems.

Key features of Corda include:

- Data exchange is possible only between those parties that have a legitimate need for this, and can see the data under the agreement.

- The Corda design directly allows the use of regulatory and supervisory nodes of observers.

- Corda transactions verified by transaction parties

- Supports various consensus mechanisms

This project is positioned as a new platform for interbank relations, more than 70 large banks from different countries are already participating in and financially supporting it. Also, the likelihood of integration of this project into SWIFT or their partnership is not small. SWIFT previously tested payments on the Corda platform meringue.

22 EU countries have signed an agreement to create a European blockchain community. The organization’s goal is to launch a single platform for international transfers. According to the document, the first transfers can be completed by the end of 2019.

After establishing ISO 20022, the API will allow banks and fintech companies to directly connect to the international payment network SWIFT. Despite the fact that SWIFT

is a representative of a centralized system, we observe how it also creates new projects and tests various platforms of other companies operating on distributed registries.

In anticipation of the success of checking the concept with the R3 platform (Corda), gpi payments on trading platforms based on DLT (distributive ledger technology) can also be included.

Whether the old system of payments or the developing system of distributed registries wins the battle for control over international payments is still unknown. But regardless of the outcome, such fierce competition can only be good news for end consumers. One way or another, instant, non-sleeping, ubiquitous and cheap global payments will be available for both companies and individuals in the near future.

6 Conclusion

We analyzed several dozen reports from various audit and technology companies, reviewed data from various resources and even studied video interviews on resources such as Bank of International Settlements (BIS).

We believe that we have done a great job and can put forward several conclusions based on the entire body of information that we have studied.

We want to note that the general trend remains in the direction of increasing non-cash payments and, according to experts, there will be only growth in the future. Therefore, changing the transaction systems themselves is only a matter of time. More precisely, these processes are already taking place, and many companies are using them, only their scale is not so global and obvious to everyone. We are too used to everything new that we often don't even notice.

The change in the transaction system will lead to cheaper and faster delivery, which in turn will affect business processes within companies. That is, money will come to the accounts of companies faster, therefore it will be faster to ship goods or start their production. The costs of companies associated with financial settlements will decrease, and the accounting system itself may become more integrated and compact.

The presence of companies such as Ripple or R3 (Corda) compete with established giants and force them to create new projects that meet the wishes of end users.

We mentioned the four-sided modern model of financial interaction, in which the aforementioned companies are included as assistants to banks for settlements. But we do not exclude that the blockchain system can change this approach and build a new, tripartite system. We still assume that banks will do everything possible to prevent this, because the blockchain threatens to oust a player like a bank from the financial market and therefore they are now integrating this system into their business processes, preventing the situation from getting out of control.

During the integration of new systems, banks came to such a concept as an "ecosystem", which in a figurative sense represents one common platform where all the goods and services a bank customer needs are presented. This trend is being developed by many banks, in partnership with other market participants.

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Appendix

List of Supplements…